

Relationship of Halitosis with Gastric Helicobacter Pylori Infection

RAKSHINDA JABEEN¹, AJMAAL JAMI², AIMAN SHAHAB³, ARMASH SHAHAB⁴

¹Associate Professor Medicine, Dow University of Health Sciences, Karachi

²Assistant Professor Medicine, Hamdard University of Medicine and Dentistry, Karachi

³Dental Surgeon, Dow University of Health Sciences, Dow International Dental College, Karachi

⁴Dental Surgeon, Dow University of Health Sciences, Dow International Dental College, Karachi

Corresponding Author: Dr. Ajmaal Jami, Email: ajmaaljami67@gmail.com, Cell No: +923213494249

ABSTRACT:

Background: Halitosis is a common human condition; however, the pathophysiological mechanism of halitosis is still unclear. Halitosis is mostly attributed with oral pathological conditions, in addition, halitosis resulting from gastrointestinal disorders is not rare either. Halitosis is often reported with symptoms related to Helicobacter pylori infection, epigastric pain and gastroesophageal reflux disease.

Objective: Halitosis can stem from a number of gastric conditions and one of the most common causes of halitosis include the presence of a gastric infection with Helicobacter pylori. This study was conducted to evaluate the incidence of halitosis in patients presenting with Helicobacter pylori infection and epigastric pain. Additionally, to review whether there is a correlation between H pylori infection and halitosis; moreover, to determine whether halitosis is a valid indication for H pylori infection.

Methods and Materials: This case control, comparative study was done at Medicine department of Isra University hospital and Civil hospital, Karachi during the period of January 2019 to December 2019. Participants were enrolled only after taking verbal and signed consent. Prior permission from the hospital management was taken as well.

Result: Halitosis and H pylori are statistically significant with p value of 0.026. There was a clear correlation between halitosis and H pylori infection, and it may be a common contributor to halitosis.

INTRODUCTION

The term halitosis originates from the Latin word "halitus", meaning breath. Halitosis is defined as any malodor irrespective of its origin. Even though halitosis is a common condition, many patients are not aware of their own bad breath and only learn about it from other persons. The term halitosis can be defined as a malodor with an intensity that is beyond socially acceptable [1][2]. Halitosis negatively affects personal relationships and quality of life, therefore, is of significant concern for many individuals [3]. Halitosis can be classified as physiologic halitosis, pathologic halitosis, pseudo-halitosis and halitophobia. There is no specific cause for physiologic halitosis, the bad breath is often transient and worse in the morning. Bad breath that is because of a specific identifiable cause is defined as pathologic halitosis. Pseudo-halitosis can be defined as the patient having a perception of bad breath in the absence of an objective evidence of bad breath. Whereas, halitophobia is when a patient is persistently distressed about bad breath, despite being evaluated as negative by a clinician.

Additionally, 10 to 20 percent of the cases of halitosis are associated with extra-oral diseases⁶, including gastrointestinal disorders, cancer, medications, metabolic disease, systemic diseases and respiratory tract infections [7]. The possible connection between *H pylori* infection and halitosis was first showed by Tiomny et al [8]. Data from a study showed that the eradication of *H pylori* can resolve the symptoms of halitosis, however, on the contrary, another study showed no association between halitosis and *H pylori* and that it always originates within the oral cavity [10].

Epidemiology: According to different epidemiological studies, nearly 30 percent of the population has halitosis. However, most of the epidemiological studies focus self-reported halitosis, therefore, limiting the validity of the

studies [11]. Most people affected with halitosis are unaware that they have the problem [4]. Although halitosis is seen more commonly in the adult population, it affects people of all ages, including children [12][13]. Moreover, the number of men and women affected are equal. In addition to this, approximately 25 percent of the patients seeing healthcare professionals for halitosis are halitophobics [14].

Pathogenesis: Majority cases of halitosis (80 to 90 percent) have intraoral causes [15]. Poor oral hygiene and periodontal diseases, including periodontitis and gingivitis are the most common causes of halitosis. On the contrary, individuals without these such disorders may also experience halitosis [16]. A primary cause of bad breath is the action of bacteria on the debris on the posterior one-third of the dorsal surface of the tongue and between the teeth [4]. The fissures and crevices on the tongue provide a favorable environment for the growth of bacteria that cause halitosis. Other factors predisposing to halitosis include unclean dentures, odontogenic abscesses, defective dental restorations and dry mouth.

Causes of Bad Breath

Physiologic: Physiologic halitosis occurs as a result of a decreased flow of saliva. Patients with physiologic halitosis often complain of bad breath in the morning. The decreased flow of saliva causes the food particles to get entrapped on the dorsal surface of the tongue, in addition, bacteria get trapped in the desquamated epithelial cells. However, the bad breath resolves usually immediately after drinking water, eating, flossing or brushing. Other causes of physiologic halitosis include consumption of certain beverages, such as, alcohol and coffee, aromatic food, for example, garlic and onions and smoking tobacco [4].

Pathologic: Pathologic causes of halitosis can be described according to the anatomic origin of the problem. A rare cause of halitosis is malignant tumors that can arise

from different anatomic sites, for example, the esophagus, trachea, larynx, hypopharynx, nasopharynx, oropharynx, nasal cavity and oral cavity [21].

Oral: The most commonly identifiable cause of halitosis is a pathology within the oral cavity. An observer will find that the greatest odor will come from the mouth if the cause of halitosis is because of a pathology in the mouth. Oral causes of halitosis include:

Periodontal infections – periodontal infections are a harbor for gram-negative bacteria that produce volatile sulfur compounds causing bad breath [22].

Caries and trapped food particles – halitosis can originate because of food particles trapped between the teeth and significant caries in patients [21].

Excessive tongue coating – halitosis can also be caused because of excessive tongue coating. In addition to this, halitosis because of excessive tongue coating, on the contrary to physiologic halitosis does not improve substantially or as the day progresses [21].

Dry mouth – a decreased flow of saliva leads to increased coating on the tongue, increased plaque on the teeth and more bacteria within the mouth because of compromised antibacterial action of saliva, causing halitosis. Dry mouth is generally caused because of certain medications, including, amphetamines, tricyclic antidepressants, decongestants, antihistamines and diuretics [21].

Tonsillar pathology – A small percentage of cases of halitosis is found in patients with chronic caseous tonsillitis. Patients with chronic caseous tonsillitis have discharge or retention of a cheese like whitish material from the crypts that causes malodor [17]. Peritonsillar abscesses are also a cause of bad breath.

Nasal: When the cause of halitosis is of nasal origin, the odor detected from nasal inhalation will be more compared to oral exhalation. Nasal causes of halitosis include, foreign bodies in the nose, this is an uncommon cause of halitosis and is usually seen in children, postnasal drip if the drip is decomposed with bacteria or because of acute and chronic sinusitis [21].

Respiratory: Pulmonary infections, including, lung abscess, bronchiectasis and bronchitis are rare causes of halitosis [21].

Gastroesophageal: Halitosis often originates from a gastrointestinal source. Bad breath can be caused because of volatile odors released from the stomach into the mouth through the esophagus. Gastroesophageal causes of halitosis include, gastroesophageal reflux diseases (GERD), *Helicobacter Pylori* infection, gastrocolic fistula and Zenker's diverticulum [21].

Systemic: Examples of systemic causes of halitosis include trimethylaminuria (a rare condition with signs of fishy odor in urine, sweat and breath), diabetic ketoacidosis, advanced liver disease and advanced renal disease [21].

Subjective: Also known as pseudo-halitosis, subjective halitosis can either be categorized as neurologic or psychologic with complain of bad breath without any objective cause. Psychologic causes of halitosis include olfactory reference syndrome and monosymptomatic hypochondriacal psychosis. In addition, patients often develop psychological bad breath after they have been

treated for objective bad breath. Neurologic bad breath is often developed because of dysgeusia (taste disorder) and dysosmia (smell disorder) that cause the patient to think that they have bad breath in the absence of an objective cause [21].

The study is conducted to evaluate the incidence of halitosis in patients presenting with *Helicobacter pylori* infection and epigastric pain.

METHODS AND MATERIALS

This case control, comparative study was done at Medicine department of Isra University hospital and Civil hospital, Karachi during the period of January 2019 to December 2019. Participants were enrolled only after taking verbal and signed consent. Prior permission from the hospital management was taken as well.

Inclusion criteria: All patients with epigastric pain with or without halitosis of either sex was included in the study. The age range among these patients was 20-60 years.

Exclusion criteria: Patients with other chronic illness like chronic liver disease, diabetes mellitus, gastrointestinal malignancy, oral malignancy were excluded from the study. Patients who were chronic smoker, alcoholics, gutka, pan and betel nuts chewer were excluded from the study.

Patients with multiple dental caries or obvious gum problems like gingivitis were excluded as well. A pretested Performa including questions regarding epigastric pain, nausea, constipation, diarrhea, heart burn and halitosis was used. All patients were subjected to have hemoglobin, alanine aminotransferase and stool Ag for *H pylori*. Statistical analysis was done on SPSS 23. Continuous variables were explained as mean \pm SD and % for categorical variables. Comparison of all variables was done by using Pearson's χ^2 . Data was analyzed by using analysis of variance and p value of <0.05 was taken as significant.

RESULT

Out of 188 recruited *H pylori* positive patients during January 2019 to December 2019, symptomatology nausea and constipation were significantly co-related with halitosis with the p value of 0.048 and 0.000 respectively. The correlation among halitosis and other two symptoms, heart burn and diarrhoea, were not statistically significant.

The mean Hb and ALT among the patients was 12.36 ± 1.72 and 26.85 ± 19.26 respectively. Haemoglobin is not statistically significant with both halitosis and *H pylori* with p value of 0.575 and 0.653 respectively. While ALT is significantly co-related with halitosis with a p-value of 0.042 but insignificant with *H pylori*.

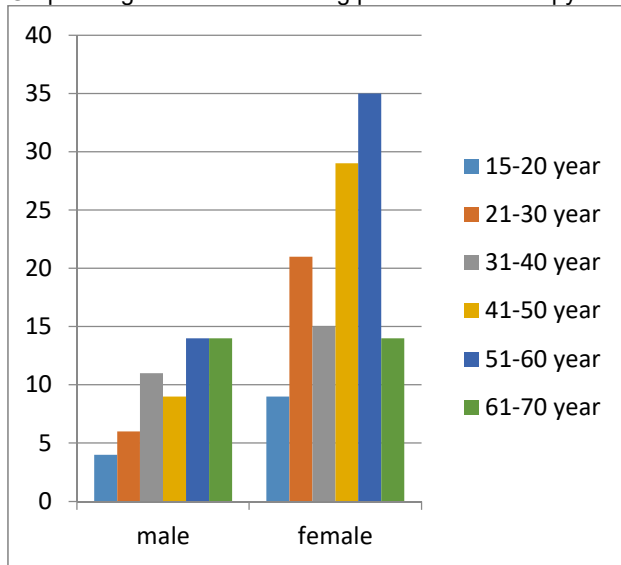
Out of 188 patients, 152 (80.9%) patients had halitosis while 36 (19.1%) were incurred without halitosis. Halitosis and *H pylori* are statistically significant with p value of 0.026. Considering the age distribution among patients without *H pylori*, 4 males were between 15-20 years in age, 6 were 21-30 years old, 11 were of 31-40 years, 9 were in between 41-50 years, and 14 males were of 51-60 and 61-70 years each. As of females, 9 were 15-20 years old, 21 aged between 21-30 years, 15 were 31-40 years, 29 aged 41-50 years, 35 were 51-60 years old, and 14 females were in there 61-70s (Graph-1).

According to the age distribution graph for patients with h-pylori, 4 males were 15-20 years old, 12 were of 21-30 and 31-40 years each, 11 were in between 41-50 years of age, 14 and 9 aged 51-60 and 61-70 years respectively. Similarly, 12 females were of 15-20 years, 19 aged 21-30 years old, 25 were 31-40 years old, 29 were 41-50 years old, 20 were from the 51-60 years group, and 12 aged 61-70 years old (Graph-2).

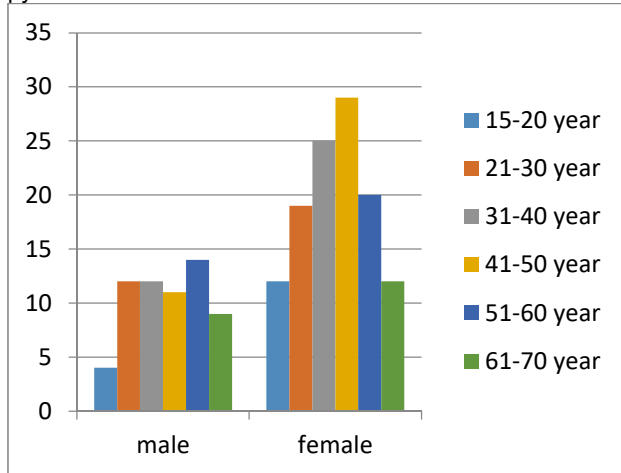
Considering the sex distribution, 62 males had h-pylori infection and 58 were tested negative. Furthermore, 126 females were tested positive for h-pylori and 123 didn't have the infection (Graph-3).

Among the patients tested positive for H-pylori, 80.9% reported halitosis, 20.7% had nausea, 47.9% experienced heart burn, 15.4% had diarrhoea and 18.6% suffered with constipation. Furthermore, among the patient tested negative, 45.3% had halitosis, 15.5% reported nausea, 38.7% had heart burn, 9.9% were with diarrhoea, and 21.5% had constipation (Table 1: symptomatology).

Graph 1: age distribution among patients without h-pylori



Graph 2: distribution of age in relation to patients with h-pylori



Graph 3: Sex distribution among patients with or without H-pylori infection

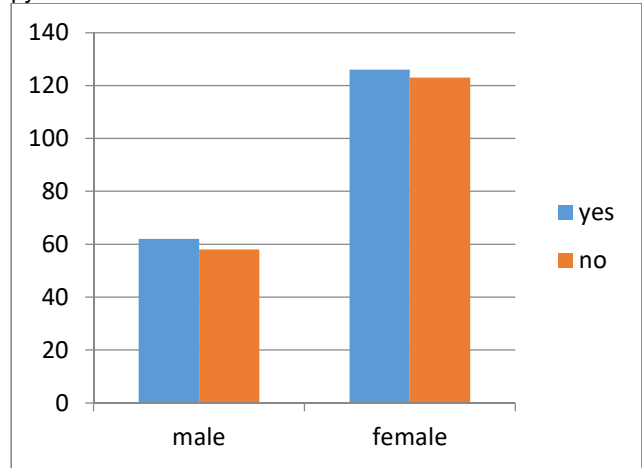


Table 1: Different symptoms among patients with or without H-pylori

Symptomatology	Positive H-pylori		Negative H-pylori	
	Yes	No	Yes	No
Halitosis	152 (80.9%)	36 (18.1%)	82 (45.3%)	99 (54.7%)
Nausea	39 (20.7%)	149 (79.3%)	28 (15.5%)	153 (84.5%)
Heart burn	90 (47.9%)	98 (52.1%)	70 (38.7%)	111 (61.3%)
Diarrhoea	29 (15.4%)	159 (84.6%)	18 (9.9%)	163 (90.1%)
Constipation	35 (18.6%)	153 (81.4%)	39 (21.5%)	142 (78.5%)

DISCUSSION

Halitosis is a common problem with various causative factors. The study suggests a strong relationship between halitosis and gastric helicobacter pylori infection. However, the pathophysiology behind halitosis is still unclear. Marshall et al. [18] first suggested that there is an association between halitosis and *H pylori* infection. Tiomny et al. [8] further studied the relationship between halitosis and *H pylori* infection. The study concluded a potential relationship between halitosis and *H pylori* through the effects of *H pylori* eradication therapy on halitosis. It was further concluded by Hoshi et al. [19] that the intensity of halitosis was higher in patients positive for *H pylori* infection compared to the negative patients. In addition to this, *H pylori*-positive patients also had higher levels of H₂S and dimethyl sulfide in breath compared to the *H pylori*-negative patients. In another study, Adler et al. [20] showed that histopathology in the gastric biopsies were positive of *H pylori* in 80.43% of the patients with halitosis. Whereas, 6.41% percent showed positive results for *H pylori* without halitosis. In addition, Katsinelos and colleagues reported similar findings in a survey investigation the incidence of long-term outcome of halitosis before and after in patients with *H pylori* and functional dyspepsia. The study suggested that the eradication of *H pylori* also resulted in a resolution of halitosis, at long-term follow up in majority of the cases [23]. Ieradi et al., also reported similar results. The study

concluded that no changes were seen in breath sulfide levels after using an antiseptic mouth rinse in patients who were *H pylori* positive and the infection was not eradicated [24]. Furthermore, Moshkowitz found that halitosis is a common symptom of gastric helicobacter pylori infection and may be an extra-esophageal manifestation of it [25].

In this case control, comparative study, all these studies were taken into account when evaluating the relationship between halitosis and *H pylori* infection. Out of 188 recruited *H. pylori* positive patients during January 2019 to December 2019, symptomatology nausea and constipation were significantly co-related with halitosis with the p value of 0.048 and 0.000 respectively. While the correlation among halitosis and other two symptoms, heart burn and diarrhoea, were not statistically significant.

The mean Hb and ALT among the patients was 12.36± 1.72 and 26.85 ± 19.26 respectively. Haemoglobin is not statistically significant with both halitosis and *H pylori* with p value of 0.575 and 0.653 respectively. While ALT is significantly co-related with halitosis with a p-value of 0.042 but insignificant with *H pylori*.

Out of 188 patients, 152 (80.9%) patients had halitosis while 36 (19.1%) were incurred without halitosis. Halitosis and *H pylori* are statistically significant with p value of 0.026.

CONCLUSION

In conclusion, there was a clear correlation between halitosis and *H pylori* infection, and it may be a common contributor to halitosis. A review of literature and the study results strongly suggest that halitosis might be a result of *H pylori* infection.

REFERENCES

1. McNab R. Oral malodour—a review. *archives of oral biology*. 2008 Apr 1;53:S1-7.
2. Yaegaki K, Coil JM. Examination, classification, and treatment of halitosis: clinical perspectives. *Journal-canadian dental association*. 2000 May;66(5):257-61.
3. Porter SR, Scully C. Oral malodour (halitosis). *Bmj*. 2006 Sep 21;333(7569):632
4. Rosenberg M. Clinical assessment of bad breath: current concepts. *Journal of the American Dental Association* (1939). 1996 Apr;127(4):475-82.
5. Blaser MJ. Helicobacter pylori and the pathogenesis of gastroduodenal inflammation. *Journal of Infectious Diseases*. 1990 Apr 1;161(4):626-33.
6. Harvey-Woodworth CN. Dimethylsulphidemia: the significance of dimethyl sulphide in extra-oral, blood borne halitosis. *British dental journal*. 2013 Apr;214(7):E20.
7. Van den Broek AMWT, Feenstra L, de Baat C. A review of the current literature on aetiology and measurement methods of halitosis. *J Dent* 2007; 35:627–635.
8. Tiomny E, Arber N, Moshkowitz M, et al. Halitosis and *Helicobacter pylori*. A possible link? *J Clin Gastroenterol* 1992; 15:236–237.

9. Ierardi E, Amoroso A, La Notte T, et al. Halitosis and *Helicobacter pylori*: a possible relationship. *Dig Dis Sci* 1998; 43:2733–2737.
10. Tangerman A, Winkel EG, de Laat L, et al. Halitosis and *Helicobacter pylori* infection. *J Breath Res* 2012; 6:017102.
11. Slot DE, De Geest S, van der Weijden FA, Quirynen M. Treatment of oral malodour. Medium-term efficacy of mechanical and/or chemical agents: a systematic review. *Journal of clinical periodontology*. 2015 Apr;42:S303-16.
12. Villa A, Zollanvari A, Alterovitz G, Cagetti MG, Strohmeier L, Abati S. Prevalence of halitosis in children considering oral hygiene, gender and age. *International journal of dental hygiene*. 2014 Aug;12(3):208-12.
13. Nadanovsky PA, Carvalho LB, Ponce de Leon A. Oral malodour and its association with age and sex in a general population in Brazil. *Oral diseases*. 2007 Jan;13(1):105-9.
14. Rosenberg M, Knaan T, Cohen D. Association among bad breath, body mass index, and alcohol intake. *Journal of dental research*. 2007 Oct;86(10):997-1000.
15. Fedorowicz Z, Aljufairi H, Nasser M, Outhouse TL, Pedrazzi V. Mouthrinses for the treatment of halitosis. *Cochrane Database of Systematic Reviews*. 2008(4).
16. De Geest S, Laleman I, Teughels W, Dekeyser C, Quirynen M. Periodontal diseases as a source of halitosis: a review of the evidence and treatment approaches for dentists and dental hygienists. *Periodontology* 2000. 2016 Jun;71(1):213-27.
17. Ferguson M, Aydin M, Mickel J. Halitosis and the tonsils: a review of management. *Otolaryngology—Head and Neck Surgery*. 2014 Oct;151(4):567-74.
18. Marshall BJ, Armstrong JA, McGeachie DB, Clancy RJ. Attempt to fulfil Koch's postulates for pyloric *Campylobacter*. *Medical Journal of Australia*. 1985 Apr;142(8):436-9.
19. Hoshi K, Yamano Y, Mitsunaga A, Shimizu S, Kagawa J, Ogiuchi H. Gastrointestinal diseases and halitosis: association of gastric *Helicobacter pylori* infection. *International dental journal*. 2002 Jun;52(S5P1):207-11.
20. Adler I, Denninghoff VC, Álvarez MI, Avagnina A, Yoshida R, Elsner B. *Helicobacter pylori* associated with glossitis and halitosis. *Helicobacter*. 2005 Aug;10(4):312-7.
21. Adler I, Muiño A, Aguas S, Harada L, Diaz M, Lence A, Labbrozzi M, Muiño JM, Elsner B, Avagnina A, Denninghoff V. *Helicobacter pylori* and oral pathology: relationship with the gastric infection. *World Journal of Gastroenterology: WJG*. 2014 Aug 7;20(29):9922.
22. Krespi YP, Shrimme MG, Kacker A. The relationship between oral malodor and volatile sulfur compound-producing bacteria. *Otolaryngology—Head and Neck Surgery*. 2006 Nov;135(5):671-6.
23. Katsinelos P, Tziomalos K, Chatzimavroudis G, Vasiliadis T, Katsinelos T, Pilpilidis I, Triantafyllidis I, Paroutoglou G, Papaziogas B. Eradication therapy in *Helicobacter pylori*-positive patients with halitosis: long-term outcome. *Medical Principles and Practice*. 2007;16(2):119-23.
24. Ierardi E, Amoroso A, La Notte T, Francavilla R, Castellaneta S, Marrazza E, Monno RA, Francavilla A. Halitosis and *Helicobacter pylori*: a possible relationship. *Digestive diseases and sciences*. 1998 Dec 1;43(12):2733-7.
25. Moshkowitz M, Horowitz N, Leshno M, Halpern Z. Halitosis and gastroesophageal reflux disease: a possible association. *Oral diseases*. 2007 Nov;13(6):581-5.