

# Comparison of Subjective and Objective Symptoms of Halitosis in Patients with liver and Kidney Diseases.

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## Original Article

### **Abstract:**

**Introduction:** Halitosis means bad breath from the oral cavity. Halitosis has its origin in systemic diseases such as hepatic, pancreatic, renal. It can also occur due to oral reasons such as xerostomia and poor oral hygiene.

**Objective:** This study compared the objective and subjective symptoms of halitosis in patients with liver and kidney diseases and to measure the oral hygiene status of the same patients.

**Methodology:** A cross-sectional study was conducted on liver and kidney patients in the Private Dental College of Central India in collaboration with tertiary hospital, Sawangi (Meghe), Wardha. Forty four patients were included in the study. The subjective symptoms were measured with the help of questionnaire and objective symptoms were measured with

*the help of halimeter. The oral hygiene status of patients was assessed by using the criteria of Silness J. and Loe H. Data was analysed using SPSS version 21.*

**Result:** *In the study conducted 81.81% of the patients showed evidence of true halitosis whereas 18.18% of patients showed no evidence of halitosis. Also 100% of the patients had fair oral hygiene out of which 40.90% of the patients had mild gingivitis and 59.09% of the patients had moderate gingivitis.*

**Conclusion:** *There was no statistically significant difference between the subjective and objective symptoms of halitosis in liver and kidney diseases patients.*

**Keywords –** *Halitosis, Liver patients, Kidney patients*

## **Introduction:**

Halitosis is a universal term which describes unpleasant breath specifically bad odour from the oral cavity.<sup>[1]</sup> It is well established fact that “mouth is the mirror of body”.<sup>[2]</sup> Scientific reports of halitosis first appeared in 1930’s.<sup>[3]</sup> But it was not until 1960’s the definitive aetiology, physiology, pathology and cure of halitosis was explained by Toenzetich.<sup>[4-6]</sup> Further research on halitosis was done in the 1990s by Rosenberg.<sup>[7-10]</sup> Modernised technology in dentistry have vastly improved the quality of care provided to the general population.<sup>[11]</sup>

In the year 1999 the Fourth World Conference on Halitosis was conducted which reported that 85-90% of cases had halitosis which was due to oral aetiology. In the remaining 10-15% of cases, halitosis was caused due to systemic diseases of liver, pancreas, and kidney. It can also occur due to respiratory tract infections, and the consumption of some specific medications.<sup>[12]</sup>

Halitosis is mainly caused by Volatile Sulphur Compounds (VSC) which include hydrogen sulphide, dimethyl sulphide, methyl mercaptan, volatile fatty acids with short aliphatic chains such as butyric acid and amines such as putrescin.<sup>[13]</sup> VSCs usually arises due to metabolism of bacterial sulphur amino acids such as cysteine and methionine.<sup>[14]</sup> Gram negative anaerobic periodontal pathogens such as Vellionella alcalescens, Porphyromonas gingivalis, Prevotella intermedia, Prevotella loeschii, Treponema denticola, Klebsiella pneumoniae, Fusobacterium nucleatum and Eubacterium produce VSCs in oral cavity.

Patients presenting with hepatic disorders and chronic kidney diseases (CKD) are prone to develop complications of oral health, such as narrowing of pulpal chamber, reduced mineralised tooth structure, dry mouth, early loss of tooth, high level of calculus deposition, gingivitis and periodontitis, when compared to the overall population. Along with serious systemic complication, diabetes mellitus presents with concomitant oral manifestations that impact dental care. It is suggested that due to the differences in the range and quality of health-care services provided, including rehabilitation, managed care and insurance findings reported on needs in studies from one country cannot be generalized to another.<sup>[15]</sup> Diabetic patients are at a high risk for periodontal disease as they are usually more susceptible to bacterial infections and have a low ability to fight bacteria that invade the gingiva.<sup>[16]</sup>

Reports have been found previously assessing the halitosis levels in patients with liver and kidney diseases but these have not measured the halitosis level and oral hygiene status in patients with hepatic and renal disorders who are at the early stage of treatment. The comparison between the oral health statuses in pre-dialysis, haemodialysis, peritoneal dialysis of CKD patients is done during respective undergoing treatment. Medical students usually

focus on factual information rather than diagnostic uncertainties and reasoning in their case presentations.<sup>[17]</sup> The current study was carried to compare the objective and subjective symptoms of halitosis in early stage of liver and kidney patients along with their oral health status.

### **Materials and Methods:**

Ethical approval for this study (DMIMS(DU)/IEC/2018-19/7574) was given by ethical committee of institute on 16 October 2018. This study was conducted by the Private Dental College of Central India in collaboration with tertiary hospital, Sawangi (Meghe), Wardha. Patients suffering from chronic kidney disease and liver disease from the department of medicine were included in the study. The study was conducted in a three month time period starting from December 2018 till February 2019. The purpose of the research was explained and a written consent was taken from patients who were willing to participate in the study. Patients were assessed for halitosis firstly by subjective symptoms by asking questions like- Whether the patient think he /she had bad breath? And whether anyone has pointed about their halitosis and then objective symptoms were assessed by halimeter [Tanita breath checker slim white HC-212S-WH]

Patients were asked to keep their mouth closed for 3 minutes before testing while breathing through the nose. The cap was put in the up position and the sensor was turned on and the number on the display was counted down from 5-1. As soon as 'START' was displayed the patient was asked to breath into the sensor for 4 seconds. The sensor was not covered from the front and the back with the hand. The breath odour level was displayed on the screen within 5 seconds. The breath odour levels were 0: No odour, 1: slight odour, 2: moderate odour, 3: heavy odour, 4: strong odour, 5: intense odour, E-error. Halimeter measurements were divided into three categories as follows- Normal: 80-160ppbs, Weak: 160-250ppbs, Strong >250ppbs. The interpretations were 0-1 being normal, 2-3 being weak, 4-5 being strong.

The assessment of the oral hygiene was measured by the presence of plaque using the criteria of Silness J. and Loe H. 1964 with the help of mouth mirror, explorer and disclosing agent on six index teeth (upper right first molar, upper right lateral incisor, upper left first bicuspid, lower left first molar, lower left lateral incisor, lower right first bicuspid) at the respective surfaces as mentioned in the criteria. The presence of gingivitis was assessed with the help of gingival index (Loe H. and Silness J.1963). The severity of gingivitis was recorded on the same six teeth as of plaque index by using mouth mirror and periodontal probe. A single examiner was trained for the examination of 10 to 15 patient per day in which for both plaque and gingival index 10 to 15 minutes were spent per patient. All the data which was collected was tabulated and statistically analysed using SPSS (Statistical Package for Social Science) version 21.

### **Result:**

Forty four patients (43%) suffering from liver diseases and (57%) suffering from kidney diseases were examined.

Table 1: Oral hygiene procedures and deleterious habits of the patients

The above table describes the various oral hygiene procedures chosen by patients. Out of all the patients who were examined (N=44), maxi. (n=26) who chose brushing as the oral

hygiene procedure. The table mentions the frequency of the oral hygiene procedures which is twice daily maxi.(n=36). Table also explains us the various deleterious habits that the patients tend to do in their daily routine. The most common deleterious habit was smokeless tobacco of maxi (n=28).

Table 2: Frequency distribution of patients

The answers to the questionnaire revealed that 29.5% (both liver and kidney patients) believed that they had bad odour in the mouth, whereas 70.5% of patients believed that they did not have bad odour in the mouth which is illustrated in table above. The table also reports whether the people are the patients mention about their bad breath or not.

Table 3: Comparison of mean score of clinical parameters using Paired t Test

The above table describes the p-value of the plaque and gingival index of 44 patients who suffer from liver and kidney diseases. There is no significant difference in the p-value of liver and kidney patients.

Table 4: Comparison of clinical parameters with halitosis by using chi-square test.

In the above table the most common result obtained in the objective study included Plaque index being fair ( both liver and kidney patients), Gingival index being mild gingivitis for (40%) of patients and moderate gingivitis for (60%) of the patients, halitosis level 2-3 being weak halitosis explaining patients had moderate to heavy odour. The findings in table 1, 2 and 4 showed that there was no considerable discrepancy between the subjective perceptions of patients and the objective findings.

### **Discussion:**

Halitosis has a complex multifactorial aetiology. Systemic disorders of liver, kidney, pancreas along with diabetes mellitus are frequently related with halitosis.<sup>[18]</sup> Likewise, drugs such as chemotherapeutic drugs, antipsychotic drugs may also lead to the production of halitosis.<sup>[19-20]</sup> In this study 81.81% of the patients showed evidence of true halitosis whereas 18.18% of patients showed no evidence of halitosis.

This study shows that 59.1% of the participants used brushing as the oral hygiene procedures giving it maximum frequency and also 63.6% of participated patients indulged in smokeless tobacco as the deleterious habit in their day to day life (table 1). The low prevalence of effective oral hygiene habits and high adverse habits regardless of having systemic conditions might be due to lack of knowledge and poor literacy rate, as the study was done in the rural population of central India.

Subjective symptoms of halitosis were found in 29.5% of the patients (table 2). On the contrary, in study conducted by Anna Nenova et al. in Bulgaria subjective symptoms of halitosis were found in 50% of the patients.<sup>[21]</sup> The predominance of systemic diseases such as ischemic heart diseases, diabetes mellitus, respiratory infection and hepatic diseases in Vidarbha region of Maharashtra (Central India) along with scarcity of literacy might be the reason that they are more concerned about as these diseases as compared to oral health.

Clinical parameters (table 3) such as plaque and gingival index were measured in this study which showed that 100% of the patients had fair oral hygiene. This study also showed 40.90% had mild gingivitis and 59.09% of the patients had moderate gingivitis. In the study conducted in Italy by M Guglielmi et al. also measured clinical parameters such as calculus

index which showed that 48% of the patients had poor oral hygiene.<sup>[22]</sup> The significant difference in the results could be due to ceaseless indulgence of deleterious habits such as smokeless tobacco in the rural population of Vidarbha (Maharashtra) which leads to increasing smooth surface areas of the oral cavity and thus reducing the plaque retentive properties. A number of articles on kidney and liver diseases and related factors are available<sup>[22-31]</sup>.

This study shows 81.81% of the patients had halitosis (weak halitosis) whereas 18.18% of the patients who participated in this study had no halitosis. The study conducted by M Guglielmi et al. measured halitosis in 25 liver disease patients which showed that 60% of the patients had no halitosis and 40% of patients had halitosis (both weak and strong halitosis).<sup>[22]</sup> The study conducted by Anna Nenova et al. measured the halitosis level of end stage chronic kidney disease patient on the basis of age (WHO classification of age) which showed 4.28% of patients had no halitosis and 95.72% of patients had halitosis (both weak and strong halitosis).<sup>[21]</sup>

### **Conclusion:**

The correlation between the subjective perception and objective results was merely contrary. There is a need for instrumental study of bad breath in this group of patients due to their inability of realistic self-assessment of the condition. Advance study is needed to amplify knowledge about halitosis using extensive number of patients and controls.

### **References:**

- [1] Kleinberg I, Westbay G. Oral Malodor. Crit Rev Oral Biol Med. 1990;1: 247-259.
- [2] Mohod S, Bhowate RR, Patel S. Role of oral physician in oral cancer palliative care. Journal of DattaMeghe Institute of Medical Sciences University 2016; 11(4):400-403.
- [3] Prinz H. Offensive breathe, its causes and its prevention. Dent Cosmos. 1930; 72:700-707.
- [4] Tonzetich J, Richter V J. Evaluation of volatile odoriferous components of saliva. Arch Oral Biol 1964; 9:39-45.
- [5] Tonzetich J, Kestenbaum R. C. Odor production by human salivary fractions and plaque. Arch Oral Biol 1969;14: 815-827.
- [6] Tonzetich J. Direct gas chromatographic analysis of sulphur compounds in mouth air in man. Arch Oral Biol 1971; 16: 587-597.
- [7] Rosenberg M, Kulkarmi GV, Bosy A, McCulloch CA. Reproducibility and sensitivity of oral malodor measurements with a portable sulphide monitor. J Dent Res. 1991;70(11):1436-1440.
- [8] Roesenberg M, Septon I, Eli I, Bar-Ness R, Gelemeter I, Brenner S, Gabby J. Halitosis measurement by an industrial sulphide monitor. J Periodontol 1991; 62(8): 487-489.
- [9] Rosenberg M. Clinical assessment of bad breath: current concepts. J Am Dent Assoc. 1996; 127(4):475-482.
- [10] Rosenberg M, Gabbay J. Halitosis a call for affirmative action. RefuatHashinayim 1987; 5(2):13-15.
- [11] Chandak M, Salgar A, Nikhade P, Shrivastava S, Sahni A, &Chandak R. Comparative evaluation of efficacy and effectiveness of profile rotary instruments in conjugation with solvent.2017;12:115-117.

- [12] Preti G, Clark L, Cowart B, Feldman RS, Lowry LD. Non oral etiologies of oral malodour and altered chemosensation. *J Periodontol* 1992; 63:790-796.
- [13] Miyazaki H, Sakao S, Katoh Y. Correlation between VSC and certain oral health measurements in the general population. *J Periodontol*. 1995; 66:679-684
- [14] Persson S, Edlund MB, Claesson R, Carlsson J. The formation of hydrogen sulfide and methyl mercaptan by oral bacteria. *Oral Microbiol Immunol* 1990; 5:195-220.
- [15] Grover S, Avasthi A, Shah S, Lakdawala B, Chakraborty K, Nebhinani N, Malhotra S. Indian psychiatric society multicentric study on assessment of health-care needs of patients with severe mental illnesses. *Indian Journal of Psychiatry*. 2015; 57(1), 43-50.
- [16] Swastika N, Gawande M, Chaudhary M & Patil S. Oral candidal carriage in subgingival sites and its subspecies identification in diabetic and non-diabetic patients with periodontitis. *Journal of International Dental and Medical Research*. 2013; 6(2), 69-73.
- [17] Jain V, Waghmare L, Shrivastav T, & Mahakalkar, C. SNAPPS facilitates clinical reasoning in outpatient settings. *Education for Health: Change in Learning and Practice*. 2013; 31(1), 59-60.
- [18] Preti G, Clark L, Cowart BJ, Feldman RS, Lowry LD, Weber E, Young IM. Non oral etiology of oral malodor and altered chemosensation. *J Periodontol* 1992; 63: 90-6.
- [19] Rashid M, Goldin R, Wright M. Drugs and the liver. *Hosp Med*. 2004; 65(8):456-61.
- [20] Sherlock S. The spectrum of hepatotoxicity due to drugs. *Lancet*. 1986; 23(8504):440-444.
- [21] Anna Nenova- Nogalcheva, Desislava Konstantinova. Halitosis in Patients with End-Stage Chronic Kidney Disease Undergoing Chronic Dialysis Treatment. 2016; 5(12).
- [22] M Guglielmi, M Beushausen, C Feng, A Beech, D Baur. Halitosis as a product of hepatic disease. 2014; 69: 364 – 367.
- [23] Balwani, M.R., C.P. Bawankule, P. Khetan, and A. Pasari. “Awareness about Kidney and Its Related Function/Dysfunction in School Going Children: A Survey from the Central India.” *Saudi Journal of Kidney Diseases and Transplantation: An Official Publication of the Saudi Center for Organ Transplantation, Saudi Arabia* 30, no. 1 (2019): 202–7.
- [24] Balwani, M.R., C.P. Bawankule, A. Pasari, P. Tolani, S. Vakil, and R. Yadav. “Minimal Change Disease and Kimura’s Disease Responding to Tacrolimus Therapy.” *Saudi Journal of Kidney Diseases and Transplantation: An Official Publication of the Saudi Center for Organ Transplantation, Saudi Arabia* 30, no. 1 (2019): 254–57.
- [25] Balwani, M.R., A. Pasari, and P. Tolani. “Widening Spectrum of Renal Involvement in Psoriasis: First Reported Case of C3 Glomerulonephritis in a Psoriatic Patient.” *Saudi Journal of Kidney Diseases and Transplantation: An Official Publication of the Saudi Center for Organ Transplantation, Saudi Arabia* 30, no. 1 (2019): 258–60.
- [26] Balwani, M., C. Bawankule, V. Ramteke, and A. Pasari. “Hepatitis C Virus, Directly Acting Antivirals and Guillain-Barré Syndrome.” *Saudi Journal of Kidney Diseases and Transplantation: An Official Publication of the Saudi Center for Organ Transplantation, Saudi Arabia* 29, no. 5 (2018): 1237–39. <https://doi.org/10.4103/1319-2442.243969>.
- [27] Balwani, M.R., C. Bawankule, P. Khetan, V. Ramteke, P. Tolani, and V. Kute. “An Uncommon Cause of Rapidly Progressive Renal Failure in a Lupus Patient: Pauci-Immune Crescentic Glomerulonephritis.” *Saudi Journal of Kidney Diseases and Transplantation: An Official Publication of the Saudi Center for Organ*

- [28] Balwani, M.R., A. Pasari, A. Meshram, A. Jawahirani, P. Tolani, H. Laharwani, and C. Bawankule. “An Initial Evaluation of Hypokalemia Turned out Distal Renal Tubular Acidosis Secondary to Parathyroid Adenoma.” *Saudi Journal of Kidney Diseases and Transplantation: An Official Publication of the Saudi Center for Organ Transplantation, Saudi Arabia* 29, no. 5 (2018): 1216–19.
- [29] Goswami, J., M.R. Balwani, V. Kute, M. Gumber, M. Patel, and U. Godhani. “Scoring Systems and Outcome of Chronic Kidney Disease Patients Admitted in Intensive Care Units.” *Saudi Journal of Kidney Diseases and Transplantation: An Official Publication of the Saudi Center for Organ Transplantation, Saudi Arabia* 29, no. 2 (2018): 310–17. <https://doi.org/10.4103/1319-2442.229268>.
- [30] Jain, J., S. Banait, I. Tiewsoh, and M. Choudhari. “Kikuchi’s Disease (Histiocytic Necrotizing Lymphadenitis): A Rare Presentation with Acute Kidney Injury, Peripheral Neuropathy, and Aseptic Meningitis with Cutaneous Involvement.” *Indian Journal of Pathology and Microbiology* 61, no. 1 (2018): 113–15. [https://doi.org/10.4103/IJPM.IJPM\\_256\\_17](https://doi.org/10.4103/IJPM.IJPM_256_17).
- [31] Kirnake, V., A. Arora, P. Sharma, M. Goyal, R. Chawlani, J. Toshniwal, and A. Kumar. “Non-Invasive Aspartate Aminotransferase to Platelet Ratio Index Correlates Well with Invasive Hepatic Venous Pressure Gradient in Cirrhosis.” *Indian Journal of Gastroenterology* 37, no. 4 (2018): 335–41. <https://doi.org/10.1007/s12664-018-0879-0>.

### Tables:

Table 1: Oral hygiene procedures and deleterious habits of the patients.

		Frequency	Percentage
Oral hygiene procedures	Brushing	26	59.1%
	Toothpaste/herbal powder	15	34.1%
	Finger	3	6.8%
Frequency of oral hygiene procedures	Once	2	4.5%
	Twice	36	81.8%
	Thrice	6	13.6%
Deleterious habits	Smoking	9	20.5%
	Smokeless tobacco	28	63.6%
	Betel nut chewing	4	9.1%
	Alcohol	23	52.3%
	None	5	11.4%

Table 2: Frequency distribution of patients by using chi-square test.

Patients response	Yes n (%)	No n (%)	Chi-square value	p-Value
Patients themselves think they have bad breath.	13 (29.5%)	31(70.5%)	4.100	0.045
People around patients mention that the patient has bad breath.	1(2.3%)	43(97.7%)		

Table 3: Comparison of mean score of clinical parameters using Paired t Test.

Clinical Parameters	Diagnosis	N	Mean	Std. Deviation	p-Value
Plaque index	Liver	19	1.30	0.11	0.90
	Kidney	25	1.27	0.11	
Gingival index	Liver	19	1.07	0.18	0.59
	Kidney	25	0.99	0.19	

Table 4: Comparison of clinical parameters with halitosis by using chi-square test.

		Halitosis		Total	Chi-square value	p-value
		Normal (no halitosis) (0-1)	Weak halitosis (2-3)			
Plaque index	Good (0.1-0.9)	0(0%)	0(0%)	0	NA	NA
	Fair (1.0-1.9)	8(18.18%)	36(81.81%)	44		
	Poor (2.0-3.0)	0(0%)	0(0%)	0		
Gingival index	Mild (0.1-1.0)	8(18.18%)	10(22.73%)	18	14.123	0.003
	Moderate (1.1-2.0)	0(0%)	26(59.09%)	26		
	Severe (2.1-3.0)	0(0%)	0(0%)	0(0%)		
Total		8	36	44		