Frequency of halitosis among patients aged between 18 to 40 years reporting to Saidu group of teaching hospital, KPK, Pakistan

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ABSTRACT
Background: Oral health is associated with first-class teeth as it is essential for the general health and wellness of human beings. Poor oral hygiene leads to major issues including halitosis. Halitosis refers to an unpleasant breath odor that affects self-confidence and people’s professional and social life. Objective: The main of the current study was to uncover the frequency of halitosis among 18 to 40 years aged patients reporting to Saidu groups of teaching hospitals, swat KPK. Materials and Methods: A hospital-based descriptive cross-sectional study was conducted to determine the Frequency of halitosis among the patients in 6 months. Data was collected using a questionnaire and convenience sampling technique. Results: Out of 288 patients, 156 (54.2%) patients were affected while the rest 132 (45.8%) patients were not affected by halitosis. It was found more among males than females. The highly associated risk factors were smoking, patients having no knowledge of tooth cleansing protocol, interdental brush, not brushing their tongue, no use of mouthwash, and lack of monthly dentist visits. Conclusion: More than half of the population are suffering from halitosis where males are highly affected as compared to females. Patients having poor knowledge of teeth cleaning protocol and infrequent dental visits were among the more common causes of halitosis among the said age population.
Keywords: oral health, halitosis, risk factor, oral hygiene, teeth, dentists

INTRODUCTION
Halitosis or oral unpleasant and an offensive breath odor that hinders self-confidence and affects people’s capabilities and social life. It simply represents the existence of unpleasant breath produced consistently from a person’s mouth. The word halitosis or bad breath is commonly defined as any noticeable unpleasant odor of expired air irrespective of its origin [3].

Halitosis can be due to local factors of obsessive source such as reduced oral cleanliness, widespread caries, gingivitis, prolonged periodontal problem, and open interactions permitting for food impaction, fissured tongue, Vincent’s disease, bushy or covered patois, curing removal wounds, extreme smoking. Extended sinusitis with a postnasal leak, tonsillitis, rhinitis, syphilitic sores, pharyngitis, and polyps of the trachea and bronchi, and diseased malicious neoplasm of the oral and pharyngeal cracks are other situations associated, producing halitosis [4].
The chief regulating factor in the creation of bad breath is pH [5]. Two main foundations of volatile sulfur compounds in the mouth in both well and unhealthy residents are the gingival sulcus and paitois. Unproductivity of the spittle extreme smoking and dentures are indigenous influences of healthy origin that can yield bad breath [6]. Oral malodor can be the outcome of a complete cause of pathologic source.

Many non-oral situations have been reported, which might give rise to “bad breath.” Such as systemic illnesses including renal failure [7], diabetes, and cirrhosis of the liver [8, 9]. Various mouth odor also recommends critical illness such as rheumatic fever, and a vulgar putrefactive smell is symptomatic of lungs bronchiectasis [10, 11]. In acute and persistent scurvy, patients usually have the emblematic foul smell with fusospirochetal stomatitis [12]. Systematic disorders such as aplastic anemia, and thrombocytopenia, hemophilia, agranulocytosis, polychemychemia can also give rise to bad breath due to infective necrosis, and decomposed blood from accidental hemorrhage in the mouth [13].

Bad breath can also be due to the overuse of medications for the management of certain diseases. It includes antihistamines, tranquilizers, diuretics isosorbide (antianginal drug), etc. Some antineoplastic agents, atropine and amphetamines-like drugs decrease saliva production which reduces the self-cleaning capacity of the orifice [6]. Xerostomia is caused by dense smoking, established salivary gland aplasia, Mikulicz’s disease, Sjogren’s syndrome, macroglobulinemia, diabetes, radiation therapy, metabolic diseases, and menopause which causes instabilities and declines of oral cleanliness thus encouraging bad breath [14].

Halitosis may also result from unstable particles that are produced by an obsessive or nonpathological source or a non-oral source. Like, the combination of unstable aromatic compounds, amines, nitrogen-containing compounds, sulfur compounds, aliphatic compounds short-chain fatty acids, phenyl compounds, alcohols and ketones may lead to halitosis [15]. Sulfur compounds are most reported and highly blamable for intra-oral bad breath. These compounds are chiefly methyl mercaptan and hydrogen sulfide. They yield enzymatic responses by microorganisms that comprise sulfur-containing amino acids such as L-methionine and L-cysteine [16].

Besides, certain microorganisms yield methyl mercaptan and hydrogen sulfide from serum. The other sulfur compound is dimethyl sulfide which chiefly answerable for outer or blood-borne oral malodor but it can be a donor. Ketones such as benzophenone, acetone, and acetophenone have existed equally in the mouth, and in the lung and dimethyl selenide are present in alveolar air. These compounds are responsible for bad breath and are and are responsible for three categories: non-oral causes, oral causes, and the other origins halitosis [17].

The origin of halitosis is up to 90% of populations, is orally and merely a slight proportion belongs due to non-oral sources [16]. Oral microbes are an utmost source of oral malodor predominantly classes of Gram-negative bacteria including Bacteroides loescheii Treponema denticola, Enterobacteriaceae, Porphyromonas gingivalis, Prevotella intermedia, Porphyromonas endodontalis, Centipeda periodontii, Tannerella forsythiensis, Fusobacterium nucleatum and Eikenella corrodens [4].

Though, no clear relation between bad breath and any exact bacterial toxins, signifying that bad breath. Mediators that increase halitosis contain particularly the (VSCs), and short-chain fatty acids. The chief constituents of halitosis are (VSC), especially methyl mercaptan (CH3SH), and hydrogen sulfide (H2S), dimethylsulfide [(CH3)2S], or combinations of putrescine, propionic acid, butyric acid, and cadaverine [18]. These complexes result from the proteolytic degradation of sulfur-containing substrates in food debris, saliva, epithelial cells, and blood by Gram-negative oral microorganisms. Sulfur-containing amino acids such as cysteine, cystine, and methionine present in saliva or gingival fluid are Substrates for volatile sulfide compounds creation [19].

The oral malodor is not confined to the occurrence of unidentifiable Gram-negative but also Gram-positive rods Gram-negative rods, and coccobicilli can lead to halitosis. This establishes the relationship between bad breath and multifaceted exchanges in numerous microbial classes [20].

Taking into consideration the above clinical facts, the current study aims to find out the associated risk factors and the frequency of halitosis among patients aged between 18 to 40 years reporting to Saidu Group of Teaching Hospitals Swat, KPK.

MATERIAL AND METHODS

A total of 288 adult patients both male and female and aged 18 to 40 years who visited dental departments of the above-mentioned hospital were selected for the current study. Mentally handicap patients were excluded from the study. The duration of the study was 4 months (Dec 2019 to March 2020). A convenience sampling technique was used. The study was approved by the research and ethical committee of BIHS for conducting this research. The patients were given the written consent form.
before recruitment for this study. Also, prior approval and legal permission were taken from Saidu Group of Teaching Hospitals KPK Swat administration before the start of the project.

Sample size: The calculated sample size of this study was 288.

\[ n = \frac{Z^2 \times p(1-p)}{d^2} \]

Where \( Z = 95\% = 1.96 \)

\( P = 75\% = 0.75 \) (75\%)(29).

\( D = \pm 5 \)

Putting the values: \( n (1.96)^2 (0.75) (1-0.75) / 0.0025 = 288 \)

**Statistical analysis**

For continuous data, mean and standard deviation were calculated. While categorical variables like gender and education level were presented in terms of frequencies and percentage. A Chi-square test was applied. Results are calculated through appropriate statistical analysis. The data is analyzed by using SPSS version 22.

**RESULTS**

**Frequency of halitosis**

In the current study, 288 participants were examined to find the exact frequency of halitosis. Among them, 156 (54.17\%) were affected with oral malodor. And the rest 132 (45.83\%) were having no sign of halitosis. The data is shown in Fig.1.

![Figure 1. Frequency of halitosis.](image)

**Gender**

In the current study the male participants were \( n = 214 \) (74.3\%) while the female participants were \( n = 74 \) (25.7\%). In which 128 (59.81\%) males were having halitosis and 86 (40.19\%) males were safe. Female participants 28 (37\%) were having halitosis and 46 (63\%) females were safe. The results are presented in Table.1.

<table>
<thead>
<tr>
<th>Halitosis</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>128</td>
<td>86</td>
<td>214</td>
</tr>
<tr>
<td>Female</td>
<td>28</td>
<td>46</td>
<td>74</td>
</tr>
<tr>
<td>Total</td>
<td>156</td>
<td>132</td>
<td>2</td>
</tr>
</tbody>
</table>

**Age of patients**
There were three age groups participated in the study i.e. first group from 18 to 25 years n = 113 (39.2%) followed by the second age group 26 to 33 years was n = 102 (35.4%) third group 34 to 40 years was n = 73 (25.3%). In the first group, 62(54%) were having halitosis and 51(46%) were safe. In the second group, 54(53%) were having halitosis while the rest 48(47%) were with no sign of halitosis. In the third group, 40(54%) were having halitosis and 33(46%) were on the safe side. Data is presented Fig.2.

![Figure 1: Halitosis Associated with the age of patient.](image)

### Education

In the current study, the literacy rate was distributed in two categories. Literate n = 215 (74.7%) and illiterate n = 73 (24.3%). In literate 110(51.16%) were having halitosis and 105(48.84%) were having no sign of halitosis. On the other hand 46(63%) illiterate were having halitosis and 27 (37%) were on the safe side (Table.2).

<table>
<thead>
<tr>
<th>Halitosis</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literate</td>
<td>110</td>
<td>105</td>
<td>215</td>
</tr>
<tr>
<td>Illiterate</td>
<td>46</td>
<td>27</td>
<td>73</td>
</tr>
<tr>
<td>Total</td>
<td>156</td>
<td>132</td>
<td>288</td>
</tr>
</tbody>
</table>

### Occupation of patients

In the current study the occupation was distributed in several categories’ housewife n = 51 (17.7%) businessman n = 76 (26.4%) office worker n = 17 (5.9%) teacher n = 26 (9%) student n = 57 (19.8%) and labor 61 (21.2% ). In housewives, 24(47%) were affected by halitosis and 27(53%) were on the safe side. On the other hand, businessman, 48(63.15%) were targeted by halitosis and 28(36.85%) have no sign of halitosis. The office workers 5(29%) were having halitosis and 12(71%) were on the safe side. In teacher 9(34%) were affected by halitosis and the remaining 17(66%) were having no sign of halitosis. In student 26(45.61%) were targeted by halitosis and 31(54.39%) were on the safe side. The labour 44(72.13%) were having the sign of halitosis and 17(27.87%) were targeted by the halitosis. Figure. 3 represents occupation of patients.
Teeth cleaning

The answer to cleaning status of patient’s teeth through questionnaire was surprisingly amazing; there were 280(97%) patients with the answer YES to cleaning status of teeth 148(52.85%) patients were reported with halitosis while 132 (47.15%) were on the safe side. There were 8(100%) patients with the answer NO to cleaning status of teeth all of them were having halitosis. Results are shown in the table.3

Table 3. Halitosis associated with teeth cleaning.

<table>
<thead>
<tr>
<th>Teeth Cleansing</th>
<th>Halitosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Yes</td>
<td>148</td>
</tr>
<tr>
<td>No</td>
<td>008</td>
</tr>
</tbody>
</table>

Instrument type

The cleaning aid which the patient employ was as; patients using toothbrush and toothpaste were 160(55.56%), among them 76(47.5%) patients were having halitosis and 84(52.5%) patients were not affected with halitosis. Patients using toothbrushes and powder were 16(5.56%), among them 11(68.75%) patients were affected while 5(31.25%) patients were safe. Patients cleaning their teeth with fingers were 50(17.36%), among them 22(44%) patients were having halitosis and 28(56%) were safe. Patients using Miswak and dandasa were 62(21.52%) among them 47(75.80%) patients were reported with halitosis and 15(24.20%) were having no sign of halitosis. Data are shown in figure 4.

How often cleansing of teeth

Patients using a toothbrush once a day, were 89(30.90%), among them 53(59.55%) patients were affected with dental halitosis while 36(40.45%) patients were not affected. Patients using toothbrush twice a day were 69(23.95%), among them 24(34.78%) patients were having halitosis and 45(65.22%) patients were not affected. Patients using toothbrush more than twice were 3(1.04%), among them 2(66.67%) patients were involved in halitosis while 1(33.33%) were not affected. Patients using toothbrush sometimes were 17(5.90%) among them 11(64.70%) patients were involved in halitosis while 6(35.30%) were not affected. Table. 4 represents the data.
Table 4. Halitosis associated with how often cleansing.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Halitosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Once a day</td>
<td>53</td>
</tr>
<tr>
<td>Twice a day</td>
<td>24</td>
</tr>
<tr>
<td>More than two times</td>
<td>01</td>
</tr>
<tr>
<td>Sometimes</td>
<td>07</td>
</tr>
<tr>
<td>Not Applicable</td>
<td>67</td>
</tr>
<tr>
<td>Total</td>
<td>156</td>
</tr>
</tbody>
</table>

**Tongue Brushing**

Patients brushing the tongue were 53(18.40%) among them 23(43.39%) were affected by halitosis and 30(56.61%) were on the safe side, patients whose answer was in NO were 125(41.67%) among them 66(52.8%) were targeted by halitosis and 59(47.2%) were safe. Data is represented in Figure.5.
Total 67 (23.26%) were those patients who used to change their toothbrush after three months. There were 34 (50.74%) patients reported with halitosis and 33 (49.26%) were on the safe side. There were 40 (13.89%) patients who used to change their brush after six months. In these 40 patients, there were 13 (32.5%) which were reported with halitosis and 27 (67.5%) having no halitosis. Those patients changing their brush after one year they were 5 (1.73%) with 2 (40%) of them having halitosis and 3 (60%) were safe. While 71 (24.65%) patients are those who change their brush when brush gets worn out among them 42 (59.15%) patients were affected by halitosis and 29 (32.39%) were safe. And 105 (36.45%) patients were not applicable. There was a total of 288 patients associated with frequency of changing their brush in which 156 (54.16%) were reported with halitosis and 66 were on the safe side. Results are shown in the table 5.

### Table 5. Halitosis associated with brushing changing.

<table>
<thead>
<tr>
<th>Brush Changing</th>
<th>Halitosis</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Total</td>
</tr>
<tr>
<td>After three months</td>
<td>34</td>
<td>33</td>
<td>67</td>
</tr>
<tr>
<td>After six months</td>
<td>13</td>
<td>27</td>
<td>40</td>
</tr>
<tr>
<td>After twelve months</td>
<td>02</td>
<td>03</td>
<td>05</td>
</tr>
<tr>
<td>After worn out</td>
<td>42</td>
<td>29</td>
<td>71</td>
</tr>
<tr>
<td>N/A</td>
<td>65</td>
<td>40</td>
<td>105</td>
</tr>
<tr>
<td>Total</td>
<td>156</td>
<td>132</td>
<td>288</td>
</tr>
</tbody>
</table>

### Plaque Control

Patients using dental floss as a secondary method for plaque control were 65 (22.56%), among them 26 (40%) patients were affected with halitosis while 39 (60%) patients were not affected. Patients using an interdental brush as a secondary method for plaque control were 13 (4.51%), among them 8 (61.53%) patients were having halitosis while 5 (38.47%) patients were not affected. Patients using toothpick were 76 (26.39%), among them 37 (48.68%) patients were affected with halitosis while 39 (51.31%) patients were not affected. 134 (46.52%) patients were not using any secondary method for plaque control. Figure 5 Shows halitosis associated with a secondary method for plaque control. Results are represented in figure 6.

![Figure 4. Halitosis associated with plaque control.](image)

**Dentist visit by the patients**

Duration of visits to the dentist was as, 249 (86.45%) patients were visiting dentists only in problems, among them, 140 (56.22%) patients were having halitosis while 109 (43.77%) patients were safe. Patients visiting once in three months were 27 (9.37%),
among them 13 (48.14%) patients were affected while 14(51.86%) were having no halitosis. Patients visiting a dentist once in six months were 12 (4.17%) among them 3 (25%) were affected by halitosis and 9 (75%) were on the safe side (table 6).

Table 6. Halitosis associated with a dentist visit.

<table>
<thead>
<tr>
<th>Dentist visit</th>
<th>Halitosis</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Total</td>
</tr>
<tr>
<td>With problem</td>
<td>140</td>
<td>109</td>
<td>249</td>
</tr>
<tr>
<td>Once in three months</td>
<td>13</td>
<td>14</td>
<td>27</td>
</tr>
<tr>
<td>Once in six months</td>
<td>03</td>
<td>09</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>156</td>
<td>132</td>
<td>288</td>
</tr>
</tbody>
</table>

Mouthwash use by the patients

Patients using mouthwash were 47 (16.31%), among them 16 (34%) patients were having halitosis while 31(66%) patients were not affected. Patients not using mouth wash were 210(72.91%), among them 119 (56.67%) were having halitosis while 91 (43.33%) patients were not affected. The patient whose answer was —don’t know were 31 (10.76%) among them 21 (67.74%) were affected by halitosis and 10 (32.26%) were not affected with halitosis. Reports are presented in figure.7.

![Figure 5. Halitosis associated with mouthwash use.](image)

Smoking

Talking about the smoking status of patients, 38 (13.19%) patients were smoking, among them, 25(65.78%) patients were having halitosis while 13 (34.21%) patients were not affected. Patients not smoking were 248(86.11%), among them 129 (52.01%) patients were affected while 119 (47.99%) patients were not affected with halitosis. Former smokers were 2 both of them were having halitosis. Table. 7 shows the association between halitosis and smoking.

Table 7. Halitosis associated with smoking

<table>
<thead>
<tr>
<th>Smoking</th>
<th>Halitosis</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Total</td>
</tr>
<tr>
<td>Yes</td>
<td>25</td>
<td>13</td>
<td>38</td>
</tr>
<tr>
<td>No</td>
<td>129</td>
<td>119</td>
<td>248</td>
</tr>
<tr>
<td>Quite</td>
<td>2</td>
<td>00</td>
<td>02</td>
</tr>
<tr>
<td>Total</td>
<td>156</td>
<td>132</td>
<td>288</td>
</tr>
</tbody>
</table>

Diabetic status
The diabetic status of patients was as follows; 12 (4.16%) patients were diabetic, among them 8 (66.67%) were affected while 4 (33.33%) Patients were not affected with halitosis. 276 (95.84%) patients were nondiabetic, among them 148 (53.63%) patients were affected while 128 (46.37%) patients were having no Halitosis. Figure. Shows association between halitosis and diabetes. Results are shown in figure.8.

![Bar graph showing association between halitosis and diabetes.](image)

**Figure 8. Halitosis associated with diabetes.**

**Someone Smelled Your Mouth**

Patients who get complaints about their halitosis answer YES was 85 (29.51%) among them 59 (69.41%) were reported by halitosis and 26 (30.59%) were safe. Those whose answer was in NO were 203 (70.48%) among them 97 (47.78%) were having halitosis and 106 (52.21%) were on the safe side. Table.8 represents the patient’s data.

<table>
<thead>
<tr>
<th>Someone Smelled</th>
<th>Halitosis</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>59</td>
<td>26</td>
</tr>
<tr>
<td>No</td>
<td>97</td>
<td>106</td>
</tr>
<tr>
<td>Total</td>
<td>156</td>
<td>132</td>
</tr>
</tbody>
</table>

**DISCUSSION**

The term “halitosis” refers to displeasing or offensive odor coming from the mouth irrespective of its origin i.e., oral or non-oral. In the current study, we tried to found the relevant factors associated with halitosis. Our results revealed that halitosis is statistically significant among the patients, revealing that 54.17% of participants are affected with halitosis, while 45.83% of participants were asymptomatic for halitosis. Our results are consistent with the previous study which reported that 50%, 54%, and 60% of medical, pharmacy, and engineering students, respectively showed halitosis [21]. Another report revealed that Halitosis has a worldwide existence with a prevalence range of 22% to 50% which strongly supports our conducted study [22, 23].

A study conducted in Korea revealed that 33.2% of adolescent patients who visited dental hospital has reported halitosis [22]. This study is not in line with our current study, the high prevalence in the current study may be due to unawareness of oral health and poor hygiene in society.

In the current study, we observed that halitosis varies gender-wise, which is higher in males (74.3%) as compared to females (25.7%). A similar study is published from Iran reporting that male dental student participants were mostly targeted by halitosis as compared to female participants [24]. In contrast, research published in India reported that female participants are highly affected by halitosis than male participants [25].
In the current study, we reported that the risk factor of smoking in male participants is one of the reasons for the higher prevalence of halitosis than females. A study conducted in India Punjab by Saniya Setia et al in 2014 also revealed that tongue coating presented a higher prevalence of halitosis, which is in favor of the current study because we found that leaving the tongue during brushing is also a risk factor for halitosis [26].

It is also reported that chlorhexidine with an important oil mouth wash decreases VSCs and is extremely important. This strongly supported the current study, because we also found that not using mouthwash is a risk factor for halitosis [27]. Hence, it is one of the important studies reporting the risk factors for the occurrence and prevalence of halitosis.

A study conducted in Iran by Mahin Bakhshi et al in 2018 revealed that people who fluff their teeth once a day were more likely to develop halitosis than those who brushed more than twice a day [24]. In the current study, we also found that people who fluff their teeth more than twice a day are less likely affected than those who fluff their teeth once a day.

In the current study, we found that people who did not use dental floss are highly affected by halitosis than those who used dental floss. A study conducted in Iran by Mahin Bakhshi et al in 2018 showed that the people who used dental floss as a secondary plaque control are less likely affected by the halitosis [24, 28].

LIMITATIONS
The study represents an attempt to quantify halitosis and to determine the associated risk factors in the population of the society. Here are some of the limitations of the study given below:

This is an analytical cross-sectional study that only finds out prevalence and risk factors. For more complete information, longitudinal studies are needed which is the best study designs as compare to a cross-sectional study.

The study was only conducted on those patients who visited hospitals for other dental problems the reason is there as might be some cases which may be missing.

CONFLICT OF INTEREST
The authors declare no conflict of interest.

AUTHOR CONTRIBUTION
MDS collected and analyzed the data and revised the final version of the manuscript, HA helped in data analysis and drafting of the manuscript, MN helped in study design. BA and AN helped in the critical revision of the manuscript, MIS helped in the study design and data analysis.

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REFERENCES

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