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Original Article

Frequency and Knowledge of Halitosis Among Students of Khyber Medical University-Institute of Dental Sciences and Khyber Medical University-Institute of Medical Sciences, Kohat

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ABSTRACT

Common oral malodor, halitosis, may damage social relationships, self-confidence, and quality of life. Oral health education is demanded of university students, especially medical and dentistry students. **Objective:** To determine the frequency and knowledge of halitosis among the students of Khyber Medical University, Institute of Medical/Dental Sciences, Kohat. **Methods:** A standardized, self-administered questionnaire was used to gather data. The survey included data on demographics, self-perceived halitosis, oral hygiene habits such as brushing teeth, wiping the tongue, and using mouthwash, as well as knowledge on the causes, effects, and treatment of halitosis. **Results:** 300 students in all took part in the research; 150 (50%) came from Kohat's KMU Institute of Dental Sciences (KMU-IDS) and 150 (50%) from KMU Institute of Medical Sciences (KMU-IMS). The mean age of the participants was 21.8 ± 2.1 years, with ages ranging from 18 to 25 years. Among the respondents, 168 (56%) were female, and 132 (44%) were male. **Conclusion:** Medical and dental students have different types of awareness regarding halitosis, which is a common problem among students nowadays.

INTRODUCTION

Halitosis, often known as foul breath or oral malodor, is a major oral health problem that most people don't think about. It affects individuals of all ages [1]. There are several reasons for this, such as not brushing your teeth well enough or having specific health problems. Halitosis may significantly impact a person's mood via social communications, lowering their self-esteem and bothering both their work and social life. The scenario is considered unpleasant due to an odor originating from the mouth, which may consequently result in significant social, psychological, and professional issues. People with halitosis are often humiliated, have low self-esteem, and

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have problems socializing. Halitosis is a common problem, but traditional healthcare methods don't always take care of it properly, which may lead to situations where it stays misdiagnosed or isn't treated properly [2]. The main causes of bad breath are the emission of volatile sulfur compounds, such as hydrogen disulfide, dimethyl sulfide, and methyl mercaptan. These chemicals cause various kinds of bad smells in the mouth to varying degrees. Volatile Sulphur compounds (VSCs) are generated by gram-negative proteolytic anaerobes, including *Treponema denticola, Porphyromonas gingivalis, Porphyromonas endodontalis, Prevotella intermedia, Bacteroides loescheii, Enterobacteriaceae, Tannerella forsythensis, Centipeda periodontii, Eikenella corrodens,* and *Fusobacterium nucleatum,* which reside in the oral cavity [3]. The bacteria in question help break down amino acids that contain sulfur. This releases volatile sulfur compounds (VSCs) that cause bad breath. These Sulphur-containing amino acids are present in saliva, blood, cells, and gingival crevicular fluid [4]. Halitosis results from the degradation of sulfur-containing amino acids. This may specify other health issues, containing lung infections, diabetes, gastrointestinal diseases, and renal failure. Halitosis often develops in the later stages of numerous diseases, concurring with the advent of more severe symptoms. The rapid development and progression of halitosis specify a possible infectious process that may be connected with carcinomas or other airway conditions [5]. A public investigation carried out in the year 2005 in the Netherlands revealed that halitosis ranked among the 100 most significant human irritations [6]. A cross-sectional study conducted in Brazil comprising only university students. The study indicated that the frequency of persistent oral malodor among students and their families was 15%. Men experienced greater difficulties with the issue compared to women, particularly those over the age of 20 [7]. Japanese researchers determined that 15% of a sample of 33,000 adults experience halitosis. In Tokyo, over 70% of businessmen regularly exhibit personal halitosis [8]. In China, approximately 25% of 2000 individuals appear to be affected by halitosis [9]. Men and women seem to suffer at comparable rates, although women are more likely than men to seek professional assistance. Given their frequent interactions with others and heightened self-awareness, university students are a group particularly vulnerable to the social consequences of halitosis [10]. Because of their educational background, medical and dental students are expected to have higher degrees of health consciousness. A thorough understanding of halitosis is essential for future duties in patient education and early diagnosis of oral health problems, in addition to personal oral health [11].

There aren't many studies in Pakistan that look at halitosis in groups of medical students, and most of the ones that do exist are limited to certain institutions or don't compare medical and dentistry students. Furthermore, Khyber Pakhtunkhwa data is scarce. Determining educational gaps and developing focused preventative efforts requires an understanding of the prevalence of halitosis and the degree of awareness among students at KMU-IDS and KMU-IMS, Kohat. The study aims to determine the frequency and knowledge of halitosis among the students of Khyber Medical University, Institute of Medical/Dental Sciences, Kohat.

METHODS

This descriptive cross-sectional study was conducted among undergraduate students registered at Khyber Medical University-Institute of Dental Sciences and Khyber Medical University-Institute of Medical Sciences, Kohat. The study was carried out from December 2023 to August 2024. Ethical approval was obtained from the Institutional Ethical Review Committee before the commencement of the study via approval # KIDS-IRBB/ECC/23-04/13 dated 09-11-2023. Informed consent was obtained from all participants before inclusion, and participation was entirely voluntary. A non-probability convenience sampling approach was used because participants were recruited from students who were available and willing to participate during the data-collection period. The students who were not willing to take part in the study, had known systemic disease, or were receiving any medical treatment, were excluded from the study. The sample size of 300 was calculated using a 95% confidence level and an expected proportion of 50%, with the latter selected as a conservative estimate in the absence of suitable prevalence data for the target population. The sample size was calculated using the Epi Info sample size calculator based on the primary outcome of self-reported halitosis prevalence among university students. An expected prevalence of 50% was assumed to obtain the maximum required sample size, as no prior local or regional prevalence data were available for the target population following standard epidemiological guidelines [12]. A standardized, self-administered questionnaire was used to gather data. The questionnaire was pilot-tested among a small group of students to assess clarity, comprehensibility, and feasibility. Formal psychometric validation was not performed." The survey included data on demographics, self-perceived halitosis, oral hygiene habits such as brushing teeth, wiping the tongue, and using mouthwash, as well as knowledge on the causes, effects, and treatment of halitosis. Halitosis was assessed based on self-reported perception and was not confirmed by clinical organoleptic assessment or instrumental measurement of volatile sulfur compounds. A small cohort

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of students participated in pilot research to ensure dependability and clarity, with necessary changes made before final administration. It consisted of four domains with a total of 20 items and was administered in English. The use of binary Yes/No responses may have limited the ability of the questionnaire to capture the depth and nuance of participants' knowledge regarding halitosis.

The surveys were checked for accuracy before being entered into SPSS version 28.0 for analysis. We used descriptive statistics to determine frequencies, percentages, means, and standard deviations. We used the chi-square test to assess associations between categorical variables. A two-sided p-value <0.05 was considered statistically significant.

RESULTS

300 students in all took part in the research; 150 (50%) came from Kohat's KMU Institute of Dental Sciences (KMU-IDS) and 150 (50%) from KMU Institute of Medical Sciences (KMU-IMS). The mean age of the participants was 21.8 ± 2.1 years, with ages ranging from 18 to 25 years. Among the respondents, 168 (56%) were female, and 132 (44%) were male. No statistically significant difference in gender distribution was observed between the two groups (p=0.180)(Table 1).

Table 1: Demographic Characteristics of Study Participants (n=300)

Variables	KMU-IDS (n=150)	KMU-IMS (n=150)	Total (n=300)	p-value
Gender				
Male	60 (40.0%)	72 (48.0%)	132 (44.0%)	0.180
Female	90 (60.0%)	78 (52.0%)	168 (56.0%)	
Mean Age (Years)	21.6 ± 2.0	22.0 ± 2.2	21.8 ± 2.1	0.210

Self-reported halitosis was reported by 162 students (54%). The frequency of halitosis was higher among medical students, 90 (60%), compared to dental students, 72 (48%). A statistically significant association was observed between institute affiliation and self-reported halitosis (p=0.03)(Table 2).

Table 2: Frequency of Self-Reported Halitosis Among Students

Halitosis Status	KMU-IDS, n (%)	KMU-IMS, n (%)	Total, n (%)	p-value
Present	72 (48.0%)	90 (60.0%)	162 (54.0%)	0.030
Absent	78 (52.0%)	60 (40.0%)	138 (46.0%)	
Total	150 (100%)	150 (100%)	300 (100%)	

With regard to oral hygiene practices, 198 students (66%) reported brushing their teeth twice daily, while 102 students (34%) brushed once daily or irregularly. Tongue cleaning was practiced by 165 students (55%), whereas 135 students (45%) reported not cleaning their tongue regularly. Students who observed regular tongue cleaning stated a lower incidence of halitosis than those who did not (p<0.001)(Table 3).

Table 3: Oral Hygiene Practices of the Participants

Oral Hygiene Practice	KMU-IDS, n (%)	KMU-IMS, n (%)	Total, n (%)	p-value
Brushing twice daily	108 (72.0%)	90 (60.0%)	198 (66.0%)	0.040
Brushing once/irregular	42 (28.0%)	60 (40.0%)	102 (34.0%)	
Tongue cleaning practiced	96 (64.0%)	69 (46.0%)	165 (55.0%)	<0.001
Tongue cleaning is not practiced	54 (36.0%)	81 (54.0%)	135 (45.0%)	

Dental students showed much greater understanding of the causes and treatment of halitosis, according to a knowledge evaluation. 126 dentistry students (84%) indicated knowing that halitosis is mostly of oral origin, whereas 75 medical students (50%) did the same. Similarly, dental students were far more aware of the connection between periodontal disease and tongue covering (p<0.001)(Table 4).

Table 4: Knowledge Regarding Halitosis Among Medical and Dental Students

Knowledge Parameter	KMU-IDS, n (%)	KMU-IMS, n (%)	p-value
Awareness of Oral Causes of Halitosis	126 (84%)	75 (50%)	<0.001
Awareness of the Role of Tongue Coating	120 (80%)	66 (44%)	<0.001
Awareness that Halitosis is Treatable	132 (88%)	96 (64%)	0.002

DISCUSSION

The present study evaluated the frequency of self-reported halitosis and the level of knowledge regarding its causes and management among students of KMU Institute of Dental Sciences and KMU Institute of Medical Sciences, Kohat. The findings reveal that halitosis is a common concern among healthcare students, with more than half of the participants reporting its presence. Despite being enrolled in medical and dental programs, notable differences were observed in both prevalence and knowledge between the two groups. 162 (54%) of participants in this survey reported having halitosis, which is in line with prevalence rates among college students that have been previously documented. Previous studies conducted among selected student populations in Pakistan have reported varying levels of self-reported halitosis, reflecting differences in study populations and assessment methods [11]. Differences in self-awareness, cultural attitudes, oral hygiene practices, and reliance on subjective judgment rather than objective clinical examination may all contribute to the disparity in frequency among research. Halitosis was clearly associated with the dental hygiene habits. Out of 300 students, just 165 (55%) of students were regularly cleaning their tongues, even though 198 (66%) of them reportedly said about brushing twice daily. Due to the buildup of anaerobic bacteria that produce volatile sulfur compounds, tongue coating is generally acknowledged as a significant contributor to intra-oral halitosis. The current study's low frequency of

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tongue washing is concerning and aligns with findings from other regional research, which indicated that 40% to 60% of students engaged in tongue cleaning. Students who routinely cleansed their tongues in this study exhibited a significant reduction in halitosis, underscoring the importance of fundamental preventative measures in managing oral odor. There was a statistically significant difference in the prevalence of halitosis between medical students 90 (60%) and dental students 72 (48%). These findings showing dental students having a low ratio of halitosis might be due to the better knowledge regarding oral health and prevention. Dentistry students learn from their initial years to identify oral problems, understand the microbiological origins, and how to maintain good oral hygiene. All of these may enhance their dental health. Formal oral health instruments are rare in medical curricula, which may explain our study's greater frequency among medical students. Significant discrepancies between dentistry and medical students were identified in the assessment of knowledge. Only 126 (84%) of dental students accurately identified the oral etiologies of halitosis, in contrast to 75 (50%) of medical students. Similar trends were seen with awareness of periodontal disease and tongue covering as contributing factors. These findings are consistent with studies from Turkey [13], Saudi Arabia [14], India [15]. Previous Pakistani studies conducted in different student populations have also reported variation in knowledge, practices, and self-reported halitosis. [16-18], which often indicate that dental students possess a superior comprehension of halitosis compared to medical students [19, 20]. This discrepancy shows that the curriculum affects individuals' oral health knowledge. Dentistry students had terrible breath despite knowing more, showing that knowledge doesn't necessarily lead to good dental hygiene. Previous research [15-18] showed that even dental students used mouthwash to hide issues rather than fix them. This emphasizes the need for theoretical and practical training.

This study has several limitations. First, halitosis was assessed using self-reported perception rather than objective clinical methods such as organoleptic assessment or measurement of volatile sulfur compounds, which may have resulted in misclassification. Second, non-probability convenience sampling may have introduced selection bias and limits the generalizability of the findings beyond the participating institutions. Third, students with known systemic diseases or receiving medical treatment were excluded, which may have resulted in an underestimation of halitosis prevalence. Fourth, although the questionnaire was pilot-tested for clarity and feasibility, it was not formally validated and psychometric properties were not assessed. In addition, potentially relevant factors such as dietary habits, smoking, medication use, and systemic conditions were not comprehensively evaluated. The binary Yes/No format of the knowledge questions may also have limited assessment of the depth of participants' knowledge. Fifth, the sample size was estimated using a 75% prevalence of complicated appendicitis reported in a previous local pediatric study; therefore, this prevalence estimate may not be representative of other pediatric populations and may have influenced the precision of the calculated sample size. Finally, because several potential confounding variables were not comprehensively assessed, multivariable analysis was not performed. Larger multicenter studies using validated questionnaires, objective assessment methods, probability-based sampling, and comprehensive assessment of relevant behavioral and clinical factors are recommended.

CONCLUSIONS

Dental students demonstrated higher self-reported knowledge regarding halitosis than medical students; however, overall awareness and preventive practices remained suboptimal. Self-reported halitosis was frequent among the students included in this study, with a higher frequency observed among medical students. The findings also suggest that greater knowledge does not necessarily translate into optimal oral-hygiene practices. Targeted oral-health education should therefore emphasize the oral causes of halitosis, the role of tongue coating, regular tongue cleaning, appropriate tooth-brushing practices, and evidence-based approaches to halitosis management.

Authors' Contribution

Conceptualization: NSK, SS
Methodology: NSK, FH
Formal analysis: FH, TM, DK
Writing and Drafting: AK, SS
Review and Editing: AK, NSK, SS, FH, TM, DK

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflict of Interest

All the authors declare no conflict of interest.

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