

## Medical Science

### To Cite:

Shahid S, Malik A, Javed E, Ayesha M, Fahad M, Mughal M, Qamar A, Qamar M, Bajwa A, Khan R, Iqbal MZ. Evaluation of knowledge, attitude and practices of oral health and hygiene among the future health care providers. *Medical Science* 2024; 28: e109ms3424  
doi: <https://doi.org/10.54905/dissci.v28i150.e109ms3424>

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### Peer-Review History

Received: 05 June 2024  
Reviewed & Revised: 08/June/2024 to 13/August/2024  
Accepted: 17 August 2024  
Published: 21 August 2024

### Peer-review Method

External peer-review was done through double-blind method.

Medical Science  
pISSN 2321-7359; eISSN 2321-7367



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# Evaluation of knowledge, attitude and practices of oral health and hygiene among the future health care providers

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## ABSTRACT

**Background:** Oral health is crucial for overall well-being, as it helps prevent dental diseases and reduces the risk of conditions like cavities, gum disease, and infections that can lead to more serious health issues. **Objective:** The aim of the present study was to evaluate the knowledge, attitude and practice of Oral Health among the future health care providers from different medical institutes from Lahore, Pakistan. **Methods:** A cross-sectional, multi-centered observational study was performed at multiple medical institutes. A structured, self-made questionnaire was designed to have knowledge, attitude, and practice-related questions. The study sample included 140 undergraduate students from the medical, dentistry, physiotherapy, and pharmacy departments. Data was collected from the respondents after getting informed consent. The study period of the research project was 12 weeks. The collected data was analyzed through SPSS, utilizing descriptive and inferential statistics to summarize the results. **Results:** The study involved 140 future healthcare providers from various universities in Lahore, Pakistan. The majority of participants were female (67.9%) and under 30 years old, primarily in their pre-final and final years of medical, dental, physiotherapy, and pharmacy programs. **Conclusion:** According to the study's findings, dental students possess the maximum basic knowledge, attitude, and oral health practices when compared to the students in medical, pharmacy, and physiotherapy departments. Students studying physiotherapy and pharmacy also adopt improved oral hygiene practices. On the other hand, medical and pharmacy students exhibit positive attitudes.

**Keywords:** Oral Hygiene; Cross-sectional; Health care provider; Oral Health; Knowledge; Practices; Dental Health; Hygiene; Undergraduate students.

## 1. INTRODUCTION

Oral hygiene is a crucial component of personal hygiene routines and thus, should not be disregarded. The prevention of infection in the mouth and its spread to the respiratory tract needs good dental hygiene. Today's accepted oral hygiene practices include daily thorough cleaning of the tongue, inter-dental spaces, and all tooth surfaces. Oral cleanliness is essential for preventing infection from the oral cavity. The importance of maintaining excellent oral health in critically ill hospitalized patients is emphasized by studies showing how tooth-brushing-induced bacteremia is increased in patients with poor oral-dental health (Bains and Bains, 2020).

Since the founding of the first dental institution in the United States (Baltimore College of Dental Surgery) in 1840, dentistry has evolved into a separate profession from medicine. The teachers in primary and high school have the chance to give their students accurate information on oral health. Unfortunately, there is no instruction on how to teach kids to maintain and improve oral health during the development of the teacher profession, making it impossible for them to actively promote the oral health of kids (Gilbert et al., 2013). The most frequent major cardiac arrhythmia in clinical practice is atrial fibrillation (AF). A number of inflammatory biomarkers influence the signaling pathways of AF pathogenesis. According to the data, poor oral hygiene increases inflammatory biomarker levels and is linked to a number of cardiovascular disorders.

Poor dental health is associated with a risk of cardiovascular diseases more than two times higher in the future (Ogawa et al., 2021). The COVID-19 epidemic has presented significant health issues for kids. Beginning in March and April 2020, the United States enacted lockdowns and school closures. Several studies show that during the pandemic, children's consumption of sugar-sweetened drinks and snacks has increased, and their frequency of brushing is reduced, which increases the risk of cavities and periodontal disease (Lyu and Wehby, 2022). A persistent, frequently incapacitating, and chronic gastrointestinal (GI) tract ailment is inflammatory bowel disease (IBD). There are 2 types of inflammatory bowel disease: ulcerative colitis (UC) and Crohn's disease (CD).

Patients with active CD experience more xerostomia and higher amounts of the bacterium *Streptococcus mutans* in their saliva, which is strongly linked to the development of dental caries (Tan et al., 2020). The most prevalent kind of dementia in seniors is Alzheimer's disease (AD). Oral diseases are more common in dementia patients than in healthy individuals. Patients with AD had older, less clean dentures and much more gingival plaque, bleeding, and calculus than people without dementia (Ribeiro et al., 2012). Afterward, these conditions lead to tooth decay, which results in root canal treatments that impose serious financial burdens as well as reduced health-related quality of life (Shahid et al., 2024a). Best oral hygiene practices include thorough daily cleaning of the tongue, interdental spaces, and tooth surfaces for at least 2 minutes with a toothbrush and toothpaste.

Replace your toothbrush every three months or sooner if it looks shredded due to vigorous brushing or ineffective cleaning (Bains and Bains, 2020). It's recommended to disinfect toothbrushes after each use by immersing them in antibacterial mouthwash for a few minutes following rinsing with water. Brushing alone has a limited impact on preventing dental cavities; the primary preventative effect comes from regular fluoride application through toothpaste. Cleaning the tongue, especially from back to front, can reduce halitosis (Choo et al., 2001). Different tools and oral hygiene aids are used for improved oral health. Toothbrush designs are evolving with recent changes; however, the effectiveness of plaque removal depends more on individual thoroughness than on technique or design. Dental floss is the best method for removing interdental plaque and minimizing gingival irritation.

Chewing sugar-free gum after food enhances the production of saliva, aiding in food particle removal, neutralizing plaque, and promoting remineralization of early carious lesions (Pitiphat et al., 2002). Chemotherapeutic drugs like fluoride and chlorhexidine, along with compounds such as strontium chloride and pyrophosphate, enhance oral hygiene. Modern dentifrices, such as pastes or gels, supplement brushing by inhibiting calculus, reducing plaque, preventing cavities, strengthening enamel, and desensitizing exposed root surfaces. Antibacterial and cariostatic mouthwashes containing CHX, Triclosan, and fluoride complement mechanical plaque control. Chlorhexidine gluconate effectively treats gingivitis. Despite the huge advances in dental technology in wealthy nations, people in rural areas of developing and poor countries still lack the opportunity for basic oral health care.

In developing countries like India, between 60% and 65% of people live in rural areas where the main industry is agriculture, ignorance is common, and people routinely ignore their dental health out of ignorance. Although primary health centers have been built in certain areas, they need more resources to provide high-quality dental care (Auluck, 2005). Dental health includes the absence of oral disorders such as tooth decay, periodontal disease, and persistent orofacial pain (gum disease). According to the survey, improper brushing accounts for 26% of diseases, poor eating habits account for 13%, and daily brushing accounts for 61% of ailments

(Akter and Parveen, 2018). Poor oral hygiene is proven to have unwanted general health consequences. In children, dental decay may lead to sleeping problems, pain, behavior problems, and trouble eating (Vakani et al., 2011a).

Poor oral hygiene may contribute to diabetes, lung diseases and cardiovascular diseases (Prusty, 2017). Dental diseases such as periodontal disease and caries affect the quality of life because they have effects on drinking, eating, swallowing, communicating, and smiling (Thapa et al., 2016). Practices regarding oral health will be improved if the knowledge of healthcare professionals is enhanced. It would benefit not only them but also the public health, as educational intervention by healthcare professionals has been proven to be most effective in enhancing and promoting health-related knowledge in patients (Shahid et al., 2022a; Shahid et al., 2022b). Therefore, the present study was conducted to evaluate the knowledge, attitude, and practices of future health care providers regarding oral health and hygiene.

## 2. METHODOLOGY

### Study Design & Study Subjects

A self-made questionnaire (SMQ) was used to perform a multi-centered, cross-sectional observational study to evaluate the knowledge, attitude, and practice among the upcoming oral health care professionals in Lahore, Pakistan. Data was collected using a quantitative research methodology involving a validated questionnaire with a consent form regarding Oral Health.

Pre-final year, final year undergraduate students and postgraduate students were recruited for this study from different medical institutes in Lahore, Pakistan. A signed consent form was provided, and the collection of data was done after the consent of the participant. Responses that were not complete were excluded from the final study. Ethical approval was attained from the Institutional Ethical Review Board and Bio-Ethical Committee (BEC) of Lahore University of Biological & Applied Sciences with protocol approval number ERB-PHRMD-DPP/9099-B attributed to the present study.

### Inclusion & exclusion criteria

The inclusion criteria for this research included pre-final and final year undergraduate students (future healthcare professionals) and postgraduate students of different medical institutes belonging to the Medical, Dental, Physiotherapy, and Pharmacy departments, who signed the consent form to voluntarily participate in the present study. However, students in the 1st, 2nd, and 3rd years of study from the medical, dental, physiotherapy, and pharmacy departments were excluded from the current study. Moreover, students who were reluctant to take part in the current study were not included.

### Sample size

The Rao soft sample size calculator was used to calculate the size of the sample with a 95% confidence level, a 5% margin of error, and a 5% precision. A number of 140 students, both male and female, were approached for the data collection, and after providing consent, they were added to the current study. The study participants included four different health sciences departments at various medical institutions in Lahore, Pakistan, i.e., Medical, Dentistry, Pharmacy, and Physiotherapy.

### Study Setting & duration

The study settings of this research were multiple medical institutions in Lahore. The purpose of the current study is to evaluate the knowledge, attitude, and practice of future healthcare workers from medical institutes in Lahore, Pakistan. There are almost 16 private medical institutes in Lahore from which data was collected from the health care providers of different departments. The study time period of the research was approximately 12 weeks approximately, from June 2022 to August 2022.

### Questionnaire Development

The questionnaire was divided into different sections regarding demographic factors, knowledge, attitude and practice related to Oral Health. The demographic section involved information on age, gender, faculty/ department, level of study, nationality, residence and educational background. The knowledge section involved information regarding dental plaque, the effect of fluoride on teeth, oral cancer, calculus, bleeding gum, and cleaning teeth. The next section consisted of the attitude of students toward Oral Health and Hygiene. The last section is related to perception regarding OH, which involves the opinions and beliefs of students towards Oral

Health. The questionnaire was designed after an extensive literature review of the published research. After developing the questionnaire, the questions were subdivided into detailed and formal sub-questions.

Each question was reviewed to ensure it aligned precisely with our objectives, and any questions that elicited unnecessary or sensitive information were removed. Afterwards, content validity was attained by sending it to 3 academicians from the clinical department who were experts; as a result of their suggestions, the questionnaire was modified and face-validated by checking on a small number of respondents. The pilot study was conducted on 10 faculties and 20 students, and Cronbach's alpha values of 0.76, 0.71, and 0.73 were attained for the knowledge, attitude, and practice sections, respectively. The results of the pilot study were excluded from the current study's results. The questionnaire's first part contained demographic information of the respondents, followed by 10 Knowledge questions, 10 attitude and 10 practice questions. The cut-off points were decided on 60% scores for appropriate knowledge, positive attitude, and good practices.

### Statistical analysis

The collected data from the study subjects was analyzed and interpreted using SPSS v21.0, IBM. To summarize the variables, descriptive and inferential statistics were used. Frequencies and percentages were used to represent categorical variables. Chi-square tests (Pearson chi-square) were used to find factors relating associations between independent variables. Fisher exact tests were used to obtain p-values in cases when the assumptions of the chi-square analysis requirements were not met. P-values were regarded as statistically significant values if they were less than 0.05.

## 3. RESULTS

The current study recruited 140 future healthcare providers from different universities in Lahore, Pakistan. The majority of the study subjects were female, i.e., 67.9 % with less than 30 years of age and belonging to the pre-final and final year of medical, dental, physiotherapy, and pharmacy departments. Table 1 presents the knowledge questions regarding oral health among future healthcare providers. Among the 10 questions, the maximum correct answers were provided by the students of the dentistry department.

Specifically, dentistry students offer 100% correct answers for question no 3, i.e., What are the reasons for oral cancer? The 2nd number of correct answers was given by pharmacy students and physiotherapy students who have better knowledge than the medical students. This study showed that dentistry students have the maximum basic knowledge regarding oral health as compared to the students of medical, pharmacy, and physiotherapy students.

**Table 1** Knowledge questions regarding oral health

Sr. No	Questions	Categories								P Value
		Medical Students N (%)		Dentistry Students N (%)		Pharmacy Students N (%)		Physiotherapy Students N (%)		
		Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	
1-	What is Dental Plaque?	22 (62.9)	13 (37.14)	34 (97.1)	1 (2.9)	24 (68.6)	11 (31.4)	26 (74.3)	9 (25.7)	0.001
2-	What are the effects of fluoride on teeth?	27 (77.1)	8 (22.8)	33 (94.3)	2 (5.7)	19 (54.3)	16 (45.7)	27 (77.1)	8 (22.8)	0.001
3-	What are the reasons of oral cancer?	34 (97.1)	1 (2.9)	35 (100.0)	0 (0.0)	35 (100.0)	0 (0.0)	34 (97.1)	1 (2.9)	0.566
4-	Total number of deciduous and permanent teeth	32 (91.4)	3 (8.57)	34 (97.1)	1 (2.9)	18 (51.4)	17 (48.5)	22 (62.9)	13 (37.14)	0.001

5-	How many permanent teeth are there in adult's mouth?	19 (54.3)	16 (45.7)	30 (85.7)	5 (14.28)	30 (85.7)	5 (14.28)	19 (54.3)	16 (45.7)	0.001
6-	If there is a yellow or brownish yellow discoloration near tooth/gum, what is it?	25 (71.4)	10 (28.5)	27 (77.1)	8 (22.8)	23 (65.7)	12 (34.2)	18 (51.4)	17 (48.5)	0.192
7-	Is it possible to correct irregularly placed teeth?	31 (88.6)	4 (11.4)	32 (91.4)	3 (8.57)	32 (91.4)	3 (8.57)	32 (91.4)	3 (8.57)	0.337
8-	If there is bleeding from gums while brushing, what is it?	27 (77.1)	8 (22.8)	28 (80.0)	7 (20.0)	28 (80.0)	7 (20.0)	31 (88.6)	4 (11.4)	0.503
9-	What should be used for cleaning teeth?	32 (91.4)	3 (8.6)	33 (94.3)	2 (5.7)	32 (91.4)	3 (8.6)	30 (85.7)	5 (14.28)	0.365
10-	What are the effect of retention of sweet food on teeth?	29 (82.9)	6 (17.1)	33 (94.3)	2 (5.7)	32 (91.4)	3 (8.6)	32 (91.4)	3 (8.6)	0.309

Table 2 shows the attitude questions about oral health among future healthcare professionals. Out of the 10 questions, dentistry students demonstrated the best attitude toward oral health, followed by pharmacy and medical students compared to physiotherapy students.

**Table 2** Attitude questions regarding oral health

Sr. No	Questions	Categories								P Value
		Medical Students N (%)		Dentistry Students N (%)		Pharmacy Students N (%)		Physiotherapy Students N (%)		
		Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	
1-	Dental problems affect general health.	13 (37.1)	22 (62.8)	20 (57.1)	15 (42.8)	13 (37.1)	22 (62.8)	8 (22.9)	27 (77.1)	0.105
2-	Well cleaning of teeth can be done without using toothpaste	14 (40.0)	21 (60)	16 (45.7)	19 (54.2)	14 (40.0)	21 (60)	20 (57.1)	15 (42.8)	0.227
3-	Dentists plays role only in treatment part and not in the	16 (45.7)	19 (54.2)	14 (40.0)	21 (60)	10 (28.6)	25 (71.42)	4 (11.4)	31 (88.5)	

	prevention.									
4-	Gutkha and tobacco chewing is a bad habit.	24 (68.6)	11 (31.4)	27 (77.1)	8 (22.8)	25 (71.4)	10 (28.5)	29 (82.9)	6 (17.1)	0.860
5-	Smoking in any form is a bad habit.	24 (68.6)	11 (31.4)	23 (65.7)	12 (34.2)	22 (62.9)	13 (37.1)	26 (74.3)	9 (25.7)	0.832
6-	Hardness of bristles on teeth has any effect on teeth and gums.	14 (40.0)	21 (60)	16 (45.7)	19 (54.3)	11 (31.4)	24 (68.6)	17 (48.6)	18 (51.4)	0.548
7-	Immediate replacement of missing teeth by artificial teeth is necessary.	13 (37.1)	22 (62.9)	16 (45.7)	19 (54.3)	22 (62.9)	13 (37.1)	15 (42.9)	20 (57.1)	0
8-	Fluorides prevent dental decay.	20 (57.1)	15 (42.9)	11 (31.4)	24 (68.6)	19 (54.3)	16 (45.7)	27 (77.1)	8 (22.8)	0.046
9-	Flossing teeth is recommended.	14 (40.0)	21 (60)	16 (45.7)	19 (54.3)	13 (37.1)	22 (62.9)	5 (14.3)	30 (85.7)	0.032
10-	Dentist should be visited regularly.	12 (34.3)	23 (65.7)	18 (51.4)	17 (48.6)	12 (34.3)	23 (65.7)	7 (20.0)	28 (80.0)	0.064

Table 3 revealed the practice questions related to oral health among future healthcare providers. Our analysis of 10 practice questions has shown that dental students have the best oral health practices. In contrast to medical students, pharmacy and physiotherapy students follow better practices. In particular, regarding question number 1: Do you use fluoridated toothpaste? Students studying dentistry provide 100% accurate responses.

This research study proved that the students of dentistry have the best knowledge, attitude, and practice related to oral health compared to the students of medical, pharmacy, and physiotherapy departments. So, dentistry students play an important role in the prevention of oral/ dental disease and awareness of oral hygiene among people.

Table 3 Practice questions regarding oral health

Sr. No	Questions	Categories								P Value
		Medical Students N (%)		Dentistry Students N (%)		Pharmacy Students N (%)		Physiotherapy Students N (%)		
		Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	
1-	Do you use toothpaste containing fluoride?	30 (85.7)	5 (14.3)	35 (100.0)	0 (0.0)	32 (91.4)	3 (8.6)	28 (80.0)	7 (20.0)	0.022
2-	Can health of teeth and mouth affect health of body?	33 (94.3)	2 (5.7)	30 (85.7)	5 (14.28)	30 (85.7)	5 (14.28)	33 (94.3)	2 (5.7)	0.278
3-	Do you clean your tongue?	17 (48.6)	18 (51.4)	31 (88.6)	4 (11.4)	25 (71.4)	10 (28.5)	26 (74.3)	9 (25.7)	0.014
4-	Do you use oral hygiene aids like dental floss?	14 (40.0)	21 (60)	27 (77.1)	8 (22.8)	19 (54.3)	16 (45.7)	10 (28.6)	25 (71.4)	0.004
5-	Do you have any other habits like Gutkha and tobacco chewing or smoking?	28 (80.0)	7 (20.0)	29 (82.9)	6 (17.1)	30 (85.7)	5 (14.28)	29 (82.9)	6 (17.1)	0.940
6-	Have you ever experienced bleeding from gums while brushing teeth?	24 (68.6)	11 (31.4)	19 (54.3)	16 (45.7)	27 (77.1)	8 (22.8)	23 (65.7)	12 (34.3)	0.361
7-	Have you experienced the presence of bad breath?	16 (45.7)	19 (54.3)	21 (60.0)	14 (40.0)	16 (45.7)	19 (54.3)	21 (60.0)	14 (40.0)	0.373
8-	Have you ever visited a dentist?	28 (80.0)	7 (20.0)	30 (85.7)	5 (14.28)	21 (60.0)	14 (40.0)	25 (71.4)	10 (28.6)	0.140
9-	Do you use mouthwash?	20 (57.1)	15 (42.9)	31 (88.6)	4 (11.4)	13 (37.1)	22 (62.9)	20 (57.1)	15 (42.9)	0.002
10-	Do you feel, dental treatment is expensive?	27 (77.1)	8 (22.8)	26 (74.3)	9 (25.7)	27 (77.1)	8 (22.8)	24 (68.6)	11 (31.4)	0.854

#### 4. DISCUSSION

The practice of keeping the mouth and teeth clean in order to prevent dental issues is known as oral hygiene. An individual's oral health behaviors affect their everyday functioning as well as how well they grow and develop from early childhood to maturity. Since the mouth cavity is where viruses enter the human body and can then spread to the upper and lower respiratory system, maintaining

good oral hygiene is crucial to preventing infection from the oral cavity. Oral hygiene is a crucial component of personal hygiene and should not be disregarded. Maintaining proper dental hygiene is essential to preventing oral cavity infections and their subsequent transmission to the upper and lower respiratory systems. Poor oral hygiene is proven to have unwanted general health consequences. In children, dental decay may lead to sleeping problems, pain, behavior problems, and trouble eating.

It also influences growth in children (Vakani et al., 2011b). Poor dental hygiene can lower one's quality of life and cause discomfort and disabilities. It may contribute to diabetes, lung diseases, and cardiovascular diseases (Prusty, 2017). Unfortunately, most people think little about oral and dental health compared to general health issues. Therefore, the purpose of this study is to assess future healthcare workers' knowledge, attitudes, and practices related to oral health. The findings of our study show that the basic knowledge of dentistry students is more than that of the students of the medical, pharmacy, and physiotherapy departments. The reason is that the dental students were doing the 5-year Professional Bachelor in Dental Surgery degree. Their 5-year study comprised oral and dental education and surgery to treat dental diseases. That is why their knowledge is best related to oral health.

Similar to the last study, this one was carried out in a health center in Bhubaneswar, Odisha, India, comparing dental and medical students' knowledge, attitudes, and behaviors about oral health. A self-administered structured questionnaire consisting of 27 questions was used to recruit 150 BDS and MBBS students from Kalinga Institute of Dental Sciences and Kalinga Institute of Medical Sciences of KIIT University, Bhubaneswar, respectively, to participate in this study. The purpose of the questionnaire was to assess oral health knowledge, attitudes, and practices. When knowledge, attitude, and practice scores were compared, dentistry students' mean knowledge score was noticeably higher than that of medical students (Kumar et al., 2017). An analogous investigation was carried out in the Indian city of Gurugram, Haryana.

This study's goal was to assess the preventive dentistry practices, attitudes, and knowledge of Gurugram's private dental practitioners. This study used a 40-item self-administered, closed-ended, structured questionnaire as part of a descriptive cross-sectional survey study design. According to the study's findings, the majority of dentists adopted preventive measures in their practices and had high knowledge and attitudes about preventive dentistry (Bhardwaj et al., 2019). However, the findings of a different study carried out in Davangere City were different. The goal of the current study was to evaluate dentists in Davangere, Karnataka, India, with regard to their current level of knowledge and attitude toward preventive measures in dental care. A survey with a cross-sectional format was used to conduct the study among the city's 97 active dentists.

The study's findings demonstrated that dental professionals lack a basic understanding of the prevention of oral health issues (Sushanth et al., 2015). Comparing dentistry students to other department students, our data reveals a higher percentage of attitude. This is due to the increased likelihood that the curriculum's direct effects would be attributed to each dental student's attitude and practice scores. Our findings are consistent with a study done in the United Arab Emirates, which found that dental students' positive attitudes on oral health result from their training in the field. The purpose of this study is to compare the attitudes and behaviors of second-year dental and medical students at the University of Sharjah regarding oral health. Compared to medical students, dental students' attitudes about oral health are significantly improved by dental education (Prusty, 2017).

An additional study of a similar nature was carried out in Mangalore to assess clinical medical, dental, and paramedical students' behavior and understanding of oral health. The study's findings demonstrated that good oral health knowledge and attitudes were anticipated of the clinical dentistry students involved, as this is a crucial area of study for them as future healthcare providers will need to use this knowledge to educate patients and the public (Sargod et al., 2007). Our current study is comparable to another that was done on a study of Turkish dental students' attitudes and behaviors toward oral health. This study demonstrated that dental students' knowledge, behavior, and attitudes toward oral and dental health care improved as their education level increased. It also showed that female students' oral and dental health care was superior to that of male students and that non-smokers' oral and dental health care was superior to that of smokers (Peker and Alkurt, 2009).

The findings of our study diverge from those of a study on Iranian dentists, where it was thought that the dentists' attitudes and understanding of prevention needed to be updated in order to enable and motivate them to offer preventative care to their patients (Prusty, 2017). Our study shows that the practice of dental students regarding oral health is higher than that of the other students due to their dental education and more clinical practice opportunities during their study course. Similar to our study, another study carried out in Kuwait showed that dental students practice better oral hygiene than non-dental students. As they progress through their dental education, the dental students' clinical exposure to oral health and preventative care courses may be responsible for their improved oral health attitudes and behavior (Ali, 2016).



Another study carried out in Yemen evaluated undergraduate dentistry and medical students' self-reported oral health attitudes and behaviors. It also examined the differences in oral health attitudes according to gender, educational attainment, study discipline, academic average, and university type. The results of this study, in contrast to ours, showed that Yemeni dentistry and medical students had notably poor oral health attitudes and behaviors. These outcomes are a result of Yemen's dental students' inadequate oral hygiene education (Halboub et al., 2016). Our current study is comparable to a study on oral health attitudes and behavior among a group of dentistry students conducted in Bangalore, India. Although there were several areas where dental students' knowledge was lacking, overall, their understanding of oral health was good.

The oral health attitudes and behavior of dentistry students increased with increasing levels of education (Neeraja et al., 2011). There are insufficient clinical rotations exposing pharmacy and allied health students to subjects on oral health maintenance, which results in a decrease in the knowledge, attitude, and practice of medical, pharmacy, and physiotherapy students. In addition, students in the Faculty of Pharmacy or Allied Health have shorter training terms than students in the Faculty of Dentistry or Medicine, which could have an effect on how much oral healthcare exposure these students have while doing their training. However, as seen from a cross-sectional study conducted on healthcare students regarding Japanese encephalitis, the medical students had the highest knowledge ratio as compared to dental or medical students (Shahid et al., 2024b).

## 5. CONCLUSIONS

Oral health is crucial for overall well-being, as it helps prevent dental diseases and reduces the risk of conditions like cavities, gum disease, and infections that can lead to more serious health issues. Additionally, a healthy mouth contributes to better self-esteem, social interactions, and quality of life. The presented study was conducted to assess the knowledge, attitudes, and practices of future healthcare professionals regarding oral health. The study's findings indicate that dental students have the highest level of basic knowledge, attitude, and oral health practices compared to students in the medical, pharmacy, and physiotherapy departments. Additionally, students in physiotherapy and pharmacy demonstrate improved oral hygiene practices, while medical and pharmacy students display positive attitudes toward oral health.

### Limitations of the study

This study was only conducted in selected educational institutions in Lahore, Pakistan; therefore, the results could not be extrapolated nationwide.

### Authors' Contributions

This work was carried out in collaboration among all authors. Authors MZI, SS, AM and EJ, designed the study, performed the initial statistical analyses and wrote the protocol. Authors MA, MF, MM and AQ collected the data. Authors MQ, AB, RK and TR wrote the first draft of the manuscript. Authors MZI and SS managed refined analyses. Authors MA, AM and SS revised the manuscript. All authors read and approved the final manuscript.

### Acknowledgement

We would like to thank present sincere thanks to Lahore University of Biological & Applied Sciences for ethically approving the study and allowing future healthcare professionals to participate in the current study.

### Ethical approval

The study was approved by the Medical Ethics Committee of Lahore University of Biological & Applied Sciences, Lahore, Pakistan with the ethical approval number (ERB-PHRMD-DPP/9099-B).

### Informed consent

Written & Oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

**Funding**

This study has not received any external funding.

**Conflict of interest**

The authors declare that there is no conflict of interests.

**Data and materials availability**

All data sets collected during this study are available upon reasonable request from the corresponding author.

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