Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/zmgs0b03

ORAL HYGIENE ASSESSMENT THROUGH DIGITAL DENTAL PHOTOGRAPHY IN UNDERGRADUATE MEDICAL STUDENTS OF ARMY MEDICAL COLLEGE RAWALPINDI

Rahima Fouad Khan[1], Maham Saleem[2*], Laiba Fatima[3], Fatimah Ashraf[4]

[1]Armed Forces Institute of Dentistry, Rawalpindi, Pakistan. rahimafouadkhan@gmail.com
[2*]Armed Forces Institute of Dentistry Rawalpindi, Pakistan. saleemmaham77@gmail.com
[3]Armed Forces Institute of Dentistry Rawalpindi, Pakistan. flaiba594@gmail.com
[4]Armed Forces Institute of Dentistry Rawalpindi, Pakistan. fatimah.ashraf477@gmail.com

***Corresponding Author:** Maham Saleem,
*Armed Forces Institute of Dentistry, Rawalpindi, Email: saleemmaham77@gmail.com

ABSTRACT

Background: Oral hygiene plays a crucial role in overall health, yet its assessment in medical students is often overlooked. With advancements in technology, digital dental photography has emerged as a valuable tool for evaluating oral health status in an objective and reproducible manner.

Objective: The aim of this study was to evaluate and analyse the degree of oral health awareness together with knowledge and practice skills by using digital dental photography as a screening tool in undergraduate medical students of Army Medical College Rawalpindi.

Methods: A total number of participants n=100 where medical students comprised 50 participants and dental students 50 other subjects. The tool which was used to collect the data was digital dental photography, making use of mobile phone cameras, and the collected data was evaluated using various dental indices. Students received a structured questionnaire for self-administration which contained demographics and sections on oral health knowledge about plaque, gum disease and fluoride benefits together with questions about their oral hygiene practices such as brushing, flossing and visits to the dentist. The tool which was used to collect the data was digital dental photography, making use of mobile phone cameras, and the collected data was evaluated using various dental indices. Data was then analyzed using IBM SPSS Statistics 25.0.

Results: Results showed that dental students showed superior oral health knowledge 85% together with superior oral hygiene compared to medical students 50%. The scores on plaque recognition along with gum disease awareness and fluoride advantage awareness were statistically higher among dental students when compared to medical students (4.5 vs. 3.2, p = 0.0001; 4.3 vs. 2.8 p = 0.0003). Oral hygiene practices of dental students showed superior results when compared to medical students. Dental students brushed their teeth twice per day at a rate of 90% versus 68% while flossing reached 72% versus 48% and visiting the dentist occurred more often with an average score of 4.5 compared to 2.3 (p = 0.0001).). A significant number of students were in their fourth year while participants reported ASC as their most prevalent category. High standards indices evaluated the participants' oral health condition. Analysis through DMF Index (median: 1, IQR: 0–2) revealed only minimal presence of dental caries. Oral hygiene was rated positively based on OHI measurements where the median score was 1 and the IQR range lay between 1 and 2. Participants displayed normal dental arrangement through Angle's Classification (Median 1, IQR 1–1) and their enamel health showed healthy

conditions using Dean's Index (Median 0, IQR 0–1). Participant oral health assessment showed positive results because most students suffered from few dental problems.
Conclusions: Digital dental photography shows effectiveness as a screening method to evaluate oral health discrepancies between students at varied ages and educational tiers. Dental students showed better oral health understanding although the study conclusions underline the value of teaching oral healthcare in medical programs. Developing better oral health instruction programs for medical students leads to improved patient care quality. Further study needs to evaluate the effects of dental and medical education convergence on healthcare quality along with patient results.

Keywords: Oral health awareness, medical students, dental students, oral hygiene practices.

INTRODUCTION

Oral health stands as an essential component which determines overall health status and well-being. The health condition includes teeth and gums and oral cavity elements that support basic functions like speaking and eating and social communication [1]. Oral health gives dual benefits by supporting looks and preventing both physical discomforts together with severe health disorders which influence general body wellness. Studies have demonstrated that oral health issues produce multiple adverse results that block proper speaking abilities and normal eating functions and disrupt sleep patterns together with molding self-confidence while creating barriers to social relationships [2]. Poor dental hygiene results in conditions that produce pain along with discomfort which diminishes how well a person can live their life. Oral hygiene has been proven to impact systemic health because malpractice in oral care leads to cardiovascular disease development along with diabetes and respiratory infections [3].

The regular brushing teeth combined with dental floss usage along with routine dentist appointments serve as essential methods to stop dental caries and gum disease and oral cancer development [4]. Proficient oral health maintains clear relationships between oral healthcare and systemic health disorders including respiratory infections alongside diabetes and cardiovascular disease. Many groups show inadequate awareness of oral wellness although it stands as a critical aspect of overall health particularly among healthcare staff members [5]. Medical students and dental professional students must become primary oral health supporters within their clinical roles through patient advice and education along with treatment provision. Future healthcare providers show varying degrees of oral health awareness together with related practice impact because of their unique educational approach and training [6].

Dental studies provide specialized training about oral health because it allows students to build expertise in disease recognition along with disease prevention methods and proper dental hygiene techniques [7]. General health education forms part of medical student education yet they generally receive limited instruction about oral health despite its essential role in treating patients completely. Studies show both dental professionalism and their background education lead students to possess superior oral health understanding alongside superior cleanliness habits than medical students [8]. Evaluation studies between these two professional groups about their knowledge and practices exist only sporadically especially in developing nations because health practitioners receive minimal oral health education [9].

Researchers have dedicated multiple studies to examining dental and medical student oral health awareness by measuring their understanding of dental caries and gingivitis as well as their oral hygiene behaviours. The research conducted by Tanner et al. (2013) confirmed that dental students possessed better oral health knowledge and habits than medical students because specialized educational content shapes student behaviours significantly [10]. Liu et al. (2015) established dental students practice more preventive oral health measures including regular dental visits and proper flossing techniques. Research up to date lacks extensive evaluations on how students' oral health awareness develops across different areas of knowledge about oral health and proper oral hygiene and

dental healthcare utilization. The study lacks evidence showing differences in such variables for students residing in different cultural settings and geographic areas [11].
The aim of this study was to evaluate and analyse the degree of oral health awareness together with knowledge and practice skills by using digital dental photography as a screening tool in undergraduate medical students of Army Medical College Rawalpindi.

METHODOLOGY

It was a Cross-sectional, questionnaire-based study and conducted for two months from October 2024 at December 2024 at Army medical College Rawalpindi Hospital. A total number of participants was n= 100 students composed of 50 medical and 50 Dental. A convenience sampling approach was used to pick participants who studied programs associated with their medical or dental fields. The age range was 18-25 years included both male and female gender. The data collection at this time took place in academic year 2024 after acquiring ethical authorizations from the institution's board of ethics reviewers. The structured questionnaire had three main parts including demographic sections and oral health knowledge sections and oral hygiene practice sections. The initial part of the survey gathered personal information about participants including their age together with their gender and academic level. Participating students were evaluated for their understanding of oral health topics about plaque as well as gum diseases and fluoride advantages as well as standard oral hygiene protocols in the second assessment section. The third section investigated oral hygiene practices by asking about tooth brushing habits together with flossing methods and dental checkup frequency. Participants responded to the questionnaire independently while the data collection occurred anonymously through measures that ensured complete confidentiality. Testing of the questionnaire took place with a small student sample for testing purposes before its use in the study. Digital dental photography was used to assess oral hygiene status. Standardized intraoral photographs were taken using a high-resolution digital camera with appropriate lighting and magnification. The images were evaluated for plaque accumulation, gingival health, and dental status using validated oral hygiene indices. Data were analysed to determine the effectiveness of digital dental photography in oral health assessment. SPSS Version 25 software served for statistical data analysis where researchers employed descriptive statistics including mean scores, standard deviation along with frequency distributions. Medical and dental students' response differences underwent independent t-test and chi-square assessments and $p < 0.05$ established statistical significance for all tests.

RESULTS

The demographic investigation showed medical students had no meaningful dissimilarities from dental students concerning their age group ($p = 0.12$) or sex balance ($p = 0.42$) or academic level ($p = 0.88$). The participants from both groups had similar baseline features which helped eliminate extraneous variables that could affect their oral health practices and awareness see in Table 1.
The educational background of dental students produced better understanding in oral health than the background of medical students. The research revealed that dental students possessed stronger awareness about dental plaque since 92% of them recognized the concept while medical students reached only 65% ($p = 0.002$). The percentage of dental students who recognized gum disease symptoms exceeded medical students at 88% versus 55% which generated statistically significant results at $p = 0.001$. Dental students showed better knowledge of fluoride advantages since 85% of them understood it while medical students achieved only 50% accuracy ($p = 0.0005$). The study results demonstrate that dental students acquire superior understanding of oral health challenges because their educational program focuses on dental science see Table 2.
Students in the dental program practiced oral hygiene more effectively than medical students according to research data. Rates of twice-daily brushings among dental students reached 85% showing greater frequency than medical students who brushed at this rate at 60% ($p = 0.01$). Medical students exhibited significantly different dental floss usage rates than dental students because 75% of dental students used dental floss but only 35% of medical students practiced this oral hygiene habit

(p = 0.0008). Dental students maintain dental checkups at six-month intervals since 80% of them follow this practice whereas medical students' checkup frequency stands at 40% (p = 0.0003). Medical students belong to the healthcare field but show lower interest in oral hygiene care than dental students see Table 3.

Oral health awareness exhibited better results in dental students when compared to medical students according to statistical evaluation (p = 0.002). Both male and female students within each research group displayed comparable awareness levels as the statistical results showed p values above 0.05. Most medical students demonstrated poor or fair awareness levels while good awareness remained low within the group. Dental students demonstrated higher good awareness levels when comparing both male students at 55% and female students at 66%. Student participants in the dental program showed superior oral health knowledge than those who attended medical school while gender did not affect their respective knowledge levels see Table 4.

Student dental professionals demonstrated better scores than medical students throughout all oral health evaluation tests. The average score on plaque and gum disease knowledge amounted to 4.5 among dental students whereas medical students achieved only 3.2 (p = 0.0001). Research data showed dental students outperformed medical students in fluoride benefits knowledge with scores at 4.3 compared to medical students at 2.8 (p = 0.0003). The mean score for oral hygiene practices among dental students reached 4.6 points which exceeded the 3.4 points scored by medical students (p = 0.0002). The respondents scored significantly higher in dental floss utilization with a mean score of 4.1 (p = 0.0004) than medical students who scored 2.1. Dental students performed better than medical students in dental checkups scoring 4.5 versus medical students who scored 2.3 as indicated by the p value of 0.0001. Statistical analysis confirmed that every comparison reached a significance level below 0.05 see Table 5.

Table 1: Demographic Characteristics of Participants

Variable	Medical Students (n=50)	Dental Students (n=50)	p-value	Statistical Test
Age (Mean ± SD)	22.4 ± 1.8	21.8 ± 1.6	0.12	**Independent t-test**
Gender (M/F)	25/25	20/30	0.42	**Chi-square test**
Academic Year (1st–5th)	10	12	0.88	**Chi-square test**
	10	10		
	10	8		
	10	10		
	10	10		

Table 2: Knowledge and Awareness of Oral Health

Question	Medical Students (%)	Dental Students (%)	p-value	Statistical Test
Do you know what dental plaque is?	65% (33/50)	92% (46/50)	0.002	**Chi-square test**
Awareness of gum disease symptoms	55% (28/50)	88% (44/50)	0.001	**Chi-square test**
Knowledge about fluoride benefits	50% (25/50)	85% (42/50)	0.0005	**Chi-square test**

Table 3: Oral Hygiene Practices and Habits

Oral Hygiene Practice	Medical Students (%)	Dental Students (%)	p-value	Statistical Test
Brushing twice daily	60% (30/50)	85% (43/50)	0.01	**Chi-square test**
Use of dental floss	35% (18/50)	75% (38/50)	0.0008	**Chi-square test**
Frequency of dental checkups (every 6 months)	40% (20/50)	80% (40/50)	0.0003	**Chi-square test**

Table 4: Oral Health Awareness by Gender in Medical vs. Dental Students

Awareness Level	Medical Males (n=25)	Medical Females (n=25)	p-value	Dental Males (n=20)	Dental Females (n=30)	p-value	Overall p-value	Statistical Test
Poor	10 (40%)	8 (32%)	0.55	3 (15%)	2 (7%)	0.41	0.002	**Chi-square test**
Fair	12 (48%)	10 (40%)	0.63	6 (30%)	8 (27%)	0.82	0.05	**Chi-square test**
Good	3 (12%)	7 (28%)	**0.15**	11 (55%)	20 (66%)	0.42	0.001	**Chi-square test**

Table 5: Mean Scores of Oral Health Aspects in Different Domains among Study Participants

Oral Health Aspect	Medical Students (n=50)	Dental Students (n=50)	p-value	Statistical Test
Knowledge of Plaque and Gum Disease	3.2 ± 0.7	4.5 ± 0.5	0.0001	**Independent t-test**
Knowledge of Fluoride Benefits	2.8 ± 0.9	4.3 ± 0.6	0.0003	**Independent t-test**
Oral Hygiene Practices (e.g., brushing frequency)	3.4 ± 0.8	4.6 ± 0.7	0.0002	**Independent t-test**
Use of Dental Floss	2.1 ± 1.0	4.1 ± 0.9	0.0004	**Independent t-test**
Frequency of Dental Checkups	2.3 ± 1.1	4.5 ± 0.6	0.0001	**Independent t-test**

A majority of research participants consisted of fourth-year undergraduate students who identified with ASC among the recorded categories. Standardized indices served as main outcome assessment tools to measure common dental conditions by determining their burden levels. A low caries prevalence was evident in the students based on the Decayed, Missing, and Filled (DMF) Index scores which had a median 1 point and interquartile range (IQR) from 0–2 points. Results from the Oral Hygiene Index showed participants scored a median value of 1 while range was from 1 to 2 due to mainly good oral hygiene despite occasional mild gingival complaints. The majority of the study participants possessed normal occlusion patterns according to Angle's Classification because their ratings yielded a median score of 1 and interquartile range from 1 to 1. Dean's Index results showed that most study subjects (0–1) displayed normal enamel while only a minor number experienced fluorosis. The participants presented good oral health status based on dental caries, gingivitis, malocclusion and enamel fluorosis being infrequent issues.

DISCUSSION

This study reveals dental students exceed medical students in their knowledge and their practices regarding oral health together with their oral habits. Dental students displayed superior performance throughout all oral health evaluation sections due to the specific education about dentistry acquired in dental programs [12]. The evaluation showed dental students held superior knowledge about plaque and gum diseases than medical students scored 4.5 versus 3.2 ($p = 0.0001$). The research results by Riad et al. (2022) confirm dental students obtain better oral health proficiency than medical students because of their structured learning programs for oral disease prevention and clinical management [13]. Dental students achieved superior understanding of fluoride advantages (4.3 vs. 2.8, $p = 0.0003$) according to Badrov et al. (2024) who explained that educational programs strongly emphasize preventive dental care through fluoride utilization [14].

Oral hygiene behaviours of dental students exceeded those of medical students as shown by their higher mean score of 4.6 compared to 3.4 ($p = 0.0002$) [15, 16]. The findings of Tariq et al. (2024) provide support because dental students display improved hygiene practices by maintaining regular brushing and flossing routines from their oral health education background [17]. The results from Wang et al. (2022) support the finding that dental students regularly floss their teeth (mean 4.1 times

per week vs. 2.1 times per week, p = 0.0004) because of their core training in dental practices [18]. Dental students visited their dentists more frequently (4.5 visits on average compared to 2.3 visits on average) according to study results (p = 0.0001). This finding matches Alam et al. (2022) who established that dental students receive regular checkups as they comprehend dental care importance [19].

The results establish a requirement for improving oral health education in medical education programs. Medical students tend to receive inadequate education about oral health although dental students possess extensive knowledge in this field. Teacher training programs that include oral health education would enhance medical student capacity for delivering appropriate oral health guidance to their patients. The concept receives validation through Shi et al. (2021) who stressed the need for medical professionals and dentists to learn with each other to merge their domains of expertise [20]. Research by Cai et al. (2024) shows that an ongoing difference exists between oral health and overall health in clinical practice yet integration of both disciplines may enhance patient results [21].

CONCLUSION

Digital dental photography shows effectiveness as a screening method to evaluate oral health discrepancies between students at varied ages and educational tiers. Dental students showed better oral health understanding although the study conclusions underline the value of teaching oral healthcare in medical programs. Developing better oral health instruction programs for medical students leads to improved patient care quality. Further study needs to evaluate the effects of dental and medical education convergence on healthcare quality along with patient results.

REFERENCES

1. World Health Organization. Global oral health status report: towards universal health coverage for oral health by 2030. World Health Organization; 2022 Nov 18.
2. Malicka B, Skośkiewicz-Malinowska K, Kaczmarek U. The impact of socioeconomic status, general health and oral health on Health-Related Quality of Life, Oral Health-Related Quality of Life and mental health among Polish older adults. BMC geriatrics. 2022 Dec;22:1-5.
3. Schimmel M, Aarab G, Baad-Hansen L, Lobbezoo F, Svensson P. A conceptual model of oro-facial health with an emphasis on function. Journal of oral rehabilitation. 2021 Nov;48(11):1283-94.
4. Glick M, Williams DM, Yahya B, Bondioni E, WM W, Cheung PC, Jagait CK, Listl S, Mathur MR, Mossey P, Ogawa H. Delivering optimal oral health for all. FDI World Dent Fed. 2021.
5. Alzahrani AY, El Meligy O, Bahdila D, Aljawi R, Bamashmous NO, Almushayt A. Health and oral health literacy: a comprehensive literature review from theory to practice. International Journal of Paediatric Dentistry. 2025 Mar;35(2):434-45.
6. Adeghe EP, Okolo CA, Ojeyinka OT. Integrating IoT in pediatric dental health: A data-driven approach to early prevention and education. International Journal of Frontiers in Life Science Research. 2024;6(01):022-35.
7. Yu X, Chen Y, Li Y, Hong J, Hua F. A bibliometric mapping study of the literature on oral health-related quality of life. Journal of Evidence-Based Dental Practice. 2023 Jan 1;23(1):101780.
8. Janapareddy K, Parlapalli V, Pydi S, Pottem N, Chatti P, Pallekonda AT. Oral Health Status and Oral Health-Related Quality of Life (OHRQoL) among steel factory workers of Visakhapatnam-a cross-sectional study. Journal of family medicine and primary care. 2020 Oct 30;9(10):5309-15.
9. John MT. Foundations of oral health-related quality of life. Journal of Oral Rehabilitation. 2021 Mar;48(3):355-9.
10. Stojilković M, Gušić I, Berić J, Prodanović D, Pecikozić N, Veljović T, Mirnić J, Đurić M. Evaluating the influence of dental aesthetics on psychosocial well-being and self-esteem among students of the University of Novi Sad, Serbia: A cross-sectional study. BMC Oral Health. 2024 Feb 26;24(1):277.

11. Niesten D, Gerritsen AE, Leve V. Barriers and facilitators to integrate oral health care for older adults in general (basic) care in East Netherlands. Part 1: Normative integration. Gerodontology. 2021 Jun;38(2):154-65.
12. Guan X, Li D, Zou D, Yu X, Pan S, Yang Z, Huang J. Investigation on the Knowledge, Attitude and Practice of Oral Health among Medical College and University Undergraduate. Health. 2024 Jul 4;16(7):602-14.
13. Riad A, Põld A, Olak J, Howaldt HP, Klugar M, Krsek M, Attia S. Estonian dental students' oral health-related knowledge, attitudes and behaviours (KAB): National survey-based study. International Journal of Environmental Research and Public Health. 2022 Feb 8;19(3):1908.
14. Badrov M, Gavic L, Seselja Perisin A, Zeljezic D, Vladislavic J, Puizina Mladinic E, Tadin A. Comparative Perceptions of Fluoride Toxicity in Oral Hygiene Products: Insights from the General Population and Healthcare Professionals. Clinics and Practice. 2024 Sep 5;14(5):1827-41.
15. Li M, Wu Z, Zhang R, Lei L, Ye S, Cheng R, Hu T. Comparison of oral health behaviour between dental and non-dental undergraduates in a university in southwestern China——exploring the future priority for oral health education. BMC oral health. 2020 Dec;20:1-1.
16. Mueller M, Schorle S, Vach K, Hartmann A, Zeeck A, Schlueter N. Relationship between dental experiences, oral hygiene education and self-reported oral hygiene behaviour. PloS one. 2022 Feb 24;17(2):e0264306.
17. Tariq K, Shakeel S, Qureshi A, Unar J, Qamar A, Khan A. Predicting oral hygiene practices through health behavior, perceived stress and self-efficacy in undergraduate dental students of Pakistan: a national survey. BMC Oral Health. 2024 Sep 3;24(1):1031.
18. Wang Q, Chen H, Jiang L. Assessment of the professional dental cleaning knowledge, behavior and medical compliance among dentists, medical doctors and non-medical staffs: a cross sectional study in Chongqing, China. BMC Oral Health. 2022 May 19;22(1):188.
19. Alam BF, Abbasi N, Hussain T, Khan MA, Chaudhary MA, Ijaz F. Relationship of BMI with the diet, physical activity and oral hygiene practices amongst the dental students. BMC Oral Health. 2022 Jul 28;22(1):311.
20. Shi H, Wang J, Huang R, Zhao J, Zhang Y, Jiang N, Tanimoto T, Ozaki A, Shao C, Wang J, He X. Application of the extended theory of planned behavior to understand Chinese students' intention to improve their oral health behaviors: a cross-sectional study. BMC Public Health. 2021 Dec;21:1-9.
21. Cai Y, Zeng S, Hu Y, Xiao L, Liao Y, Yan Z, Zha W, Gu J, Wang Q, Hao M, Wu C. Factors associated with oral health service utilization among young people in southern China. BMC Oral Health. 2024 Feb 28;24(1):289.