ORIGINAL ARTICLE

Oral Health Knowledge, Attitudes, and Behaviours among Preclinical and Clinical Dental Students at a Private College in Karachi: A Cross-sectional

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Abstract:

Background: Dental students play a significant role in public oral health education. Their knowledge and attitudes reflect their understanding of disease prevention and responsibility for improving oral health of patients.

Objective: To evaluate differences in oral health knowledge, attitudes, and practices among preclinical and clinical dental students in private college of Karachi, Pakistan, and to assess gender-based differences in these parameters.

Materials and Methods: This cross-sectional study was conducted among dental students at Baqai Dental College after obtaining ethical approval. Data were collected using a structured, validated questionnaire measuring oral health knowledge, attitudes, and behaviours. Statistical analysis was performed using SPSS version 23.

Results: A total of 220 Bachelor of Dental Surgery (BDS) students participated. The second-year cohort had the highest representation (31.8%), while the fourth year had the lowest (8.6%). Gender distribution varied, with an equal male-to-female ratio in the first year, more females in the second year, and a male majority in the fourth year. A statistically significant difference was found in attitude scores, which were higher in preclinical students compared to clinical students ($p = 0.038$). Gender analysis revealed no significant difference in knowledge scores ($p = 0.087$), but behaviour scores were significantly higher among female students ($p = 0.02$).

Conclusion: The study revealed that while foundational oral health knowledge remains consistent across the curriculum, preclinical students demonstrated stronger oral health attitudes than clinical students, suggesting that clinical training alone may not further enhance attitudinal scores. Female students exhibit superior oral health behaviours compared to their male counterparts.

Keywords: *Dental Students, Knowledge, Attitude, Behavior, Preclinical, Clinical*

Introduction

Oral health is an essential component of wellness and significantly affects an individual's quality of life. The World Health Organization (WHO) defines oral health as a state of being free from chronic oral pain, oral cancer, oral infection and sores, periodontal disease, tooth decay, tooth loss, and other diseases that limit functional capability of biting, chewing, smiling, speaking, and psychosocial wellbeing.[1] Oral diseases represent a major global public health burden, affecting an estimated 3.5 billion people worldwide. Dental caries and periodontal diseases continue to be the most prevalent oral conditions, particularly in low- and middle-income countries such as Pakistan, where access to preventive dental care is limited.[2,3] Dental students occupy a distinctive position as future oral health educators and role models. Their personal oral health knowledge, attitudes, and behaviours (KAB) not only reflect the caliber of their professional training but also influence their ability to promote preventive care among patients and communities.

Attitudes toward oral health are influenced by educational exposure and clinical experience. An attitude is defined as an individual's perspective and evaluative stance toward a specific object or concept, which ultimately guides related behaviours.[4] In dental education, the transition from preclinical to clinical years represents a critical phase during which students shift from theoretical learning to direct patient care. This transition is anticipated to enhance both professional attitudes and health-promoting behaviors.

A researchers has evaluated oral health KAB among dental students globally. A cross-sectional study among dental students at a Syrian private university found that while clinical students exhibited better oral hygiene behaviours in selected domains, overall attitudinal scores did not differ significantly between preclinical and clinical cohorts.[5] Studies from Qatar and similar contexts have similarly shown that health sciences students demonstrate variable oral health KAB profiles, underscoring the influence of curriculum design and institutional context on student preparedness.[6] In Germany, dental students showed overall high KAB scores, yet preclinical students presented marginally higher attitudinal scores than clinical counterparts, suggesting the preclinical–clinical transition does not uniformly improve oral health attitudes across settings.[7]

Gender differences in showing KAB showed in a past cross-sectional study of 1,098 Bangladeshi university students conducted in 2023 confirmed that females consistently demonstrated stronger oral health knowledge and practices than males, and that parental education, especially maternal education was a significant predictor of student oral health outcomes.[8]

In this regard, evidence from Pakistan remains limited. A cross-sectional national study evaluating the preparedness of undergraduate dental students in Pakistan identified significant gaps between classroom learning and clinical competency, particularly in preventive oral health domains.[9] Karachi, as one of the most densely populated urban centres in Pakistan, experiences a disproportionately high prevalence of dental caries and periodontal disease. The absence of comparative data on oral health knowledge, attitudes, and behaviours (KAB) across different academic training years constitutes a significant gap in the regional literature. Understanding the evolution

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of knowledge, attitudes, and behaviours (KAB) throughout the Bachelor of Dental Surgery (BDS) training years is significant for effective curriculum development and for preparing future dentists with the attitudinal and behavioral competencies necessary for patient-centered care.

The objective of this cross-sectional study was to evaluate and compare oral health knowledge, attitudes, and behaviors between preclinical (first- and second-year) and clinical (third- and fourth-year) BDS students at Baqai Dental College, Karachi, Pakistan, and to assess gender-based differences in these domains.

Material and Methods

The study was conducted after obtaining ethical approval from the Ethics Review Board (reference No: BDC/ERB/2024/0015). This cross-sectional study included 220 students enrolled in different years of the Bachelor of Dental Surgery (BDS) program at Baqai Dental College. Informed consent was obtained from all participants before the survey was administered. This ensured that participants understood that their identities would not be disclosed at any stage of the study or in the published results.

The study utilized a census sampling technique to include both preclinical (first- and second-year) and clinical (third- and fourth-year) BDS students. Students who voluntarily agreed to participate in the survey and were 18 years of age or older were included. Students who failed to complete the survey appropriately or were absent on the day of survey distribution were excluded. The survey was conducted using a structured, validated questionnaire comprising 10 questions on oral health knowledge, 7 questions on attitudes, and 13 questions on behaviours. The questionnaire consisted of multiple-choice and yes/no questions, and students were instructed to select only one answer per question. Each correct response in the knowledge section was awarded one mark, and each favourable response in the attitude section was awarded one mark.

For the behaviour section, a positive answer was scored one mark each and a negative behaviour item was reverse-scored. A cut-off of 50% of the total possible score for each section was used to categorize participants as having adequate or poor knowledge, positive or negative attitude, and good or poor oral health behaviour, consistent with the scoring approach adopted in comparable KAP studies among dental students [10,11]. It considered both gender differences and the distinction between preclinical and clinical education stages. Completed questionnaires were collected by the author and stored in secure folders. Once responses from all 220 participants had been gathered, they were entered into SPSS version 23 for statistical analysis. Mean scores for knowledge, atittude and behaviours were analysed by utilizing independent t test.

Results

Table 1 shows the distribution of study participants in preclinical and clinical years and shows that the first-year cohort accounted for 67 students, representing 30.5% of the total sample, while the second year had the highest representation, with 70 students (31.8%). The third-year group consisted of 64 students, making up 29.1% of the sample. In contrast, the fourth year had a significantly smaller representation, with only 19 students, which equates to 8.6% of the total participants.

Table 2 presents a comparison of mean scores for knowledge, attitude, and behavior between preclinical and clinical students. statistically significant difference was found in attitude scores, with higher scores among preclinical students compared to their clinical counterparts (p = 0.038). A significant difference was not observed in the sources of knowledge and practice.

Table 1: Distribution of Dental Students in Pre-clinical and Clinical Years

Year of Study	Frequency	Percentage
1st year	67	30.5
2nd year	70	31.8
3rd year	64	29.1
4th year	19	8.6
Total	220	100.0

Table 2: Knowledge, Attitude, and Behavior Scores between Preclinical and Clinical Dental Students

Variables	Preclinical Mean ±SD	Clinical Mean ±SD	p-value
Knowledge	8.09±0.54	8. 78±0.55	0.76
Attitude	4.73±0.19	3.75±0.18	0.03
Behavior	12.67±0.17	12.21±0.19	0.21

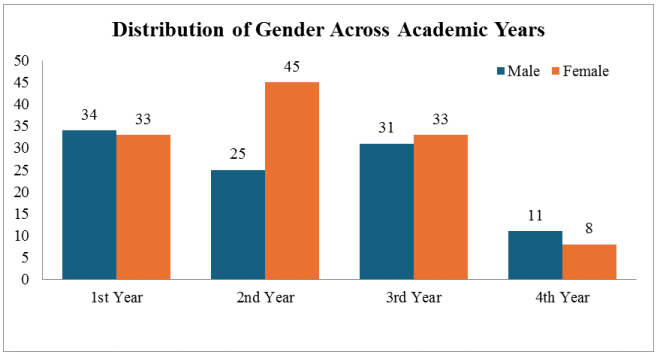

Figure 1: Distribution of gender across Academic Years at Baqai Dental College, Karachi

Table 3 summarizes the comparison of mean scores for knowledge, attitude, and behavior between male and female students. For knowledge, male students had an average score of 9.1 ± 0.59, slightly higher than the 8.01 ± 0.48 mean score among female students; however, this difference was not statistically significant (p = 0.087). For behavior, male students scored an average of 11.67 ± 0.188, which was lower than the female average of 12.21 ± 0.169 statistically significant differences (p-value, 0.02).

Discussion

This cross-sectional study evaluated oral health knowledge, attitudes, and behaviours among 220 BDS students at Baqai Dental College, Karachi, comparing preclinical and clinical cohorts and exploring gender-based differences. The key finding was a statistically significant difference in attitude scores, with preclinical students scoring higher than clinical students (p =

Table 3: Knowledge, Attitude and Behavior Scores between Male and Female Dental Students

Variables	Male Mean ±SD	Female Mean ±SD	p-value
Knowledge	9.1±0.59	8.01±0.48	0.08
Attitude	5.73±0.191	5.75±0.193	0.61
Behavior	11.67±0.188	12.21±0.169	0.02

0.038) ,while knowledge and behaviour scores did not differ significantly between the two groups.

The higher attitude scores observed among preclinical students in the present study may reflect an initial idealism and enthusiasm toward oral health care that is characteristic of early dental education. This is supported by evidence reported by Rehman et al[12] in a private dental institution in Karachi, which similarly found no significant improvement in attitudes with clinical progression, suggesting that clinical training alone may not always reinforce positive oral health attitudes. These findings highlight a potential gap in clinical training in Dental Colleges, where direct patient care exposure during clinical years may not be sufficient to reinforce or improve oral health attitudes beyond the foundational values established in preclinical years. The absence of a statistically significant difference in knowledge scores between preclinical and clinical students is noteworthy.

A possible interpretation is that foundational oral health knowledge is effectively established during the early years of the BDS curriculum, and significant incremental gains do not necessarily occur with clinical progression alone. This is supported by Jiang et al[13] whose systematic review and meta-analysis of 7,747 dental students from 17 countries noted that students generally demonstrate adequate knowledge levels, but that this does not automatically translate into improved attitudes or behaviours.

In contrast, Mohan et al[14] reported that clinical students demonstrated significantly better oral health attitudes than their preclinical counterparts ($p = 0.007$) in an Indian dental institution, attributing this difference to the motivational effects of real-world patient interactions.[2] Similarly, Mekhemar et al[15] found a statistically significant improvement in scores among clinical students compared to preclinical students in an Egyptian state-funded university, explained by increased dental awareness arising from direct patient exposure. These contrasting findings suggest that the impact of clinical training on attitude development may be curriculum- and context-dependent, and that institutional factors at Baqai Dental College may play a role in shaping this outcome.

The non-significant difference in behaviour scores between preclinical and clinical students similarly suggests that personal oral hygiene behavioural competencies may not be adequately reinforced through clinical training alone. Jiang et al [13]also highlighted in their meta-analysis that students generally demonstrate adequate knowledge but relatively fewer positive attitudes and behaviours, indicating a consistent gap between knowledge and practice across dental curricula globally.This finding highlights a gap in the curriculum: while clinical years did not further enhance oral health attitudes beyond preclinical levels, behavioural practice related to personal oral health may require dedicated educational reinforcement across all years of the BDS programme.

Gender-based analysis of the present study revealed a complex pattern across the three KAB domains. Male students recorded a marginally higher mean knowledge score (9.1 ± 0.59) compared to female students (8.01 ± 0.48), though this difference did not reach statistical significance ($p = 0.08$). This finding aligns with a cross-sectional study from Croatia involving 1,088 university students, which similarly found no statistically significant gender difference in oral health knowledge scores ($p = 0.082$), the authors noting that gender alone is an insufficient predictor of knowledge level in health sciences populations[16].In contrary Ehsan et al[17] reported that female health professions students at Kabul University of Medical Sciences were more concerned about oral health overall. These discrepant findings suggest that gender-based differences in oral health knowledge may reflect socio-cultural and institutional contexts rather than inherent differences in academic ability.

Behaviour scores were significantly higher among female students compared to male students ($p = 0.02$). This aligns with broad gender-based research in oral health. Su et al[18] demonstrated that women in the United States were consistently more likely to practise preventive oral health behaviours, including regular brushing, flossing and dental attendance. Furthermore, Mamai-Homata et al [19] confirmed in a meta-analysis of Greek dental students across three decades that female students consistently demonstrated better oral health behaviours than their male counterparts. The present findings underscore the need for gender-sensitive behavioural interventions in dental education, particularly targeting male students through peer-based counselling and reflective practice programmes.

Attitude scores showed no significant gender difference ($p = 0.61$), indicating comparable professional values across both groups. This is consistent with Arunachalam and Varghese who found no gender-based difference in oral health attitudes among dental undergraduate and postgraduate students in India [20] .This suggests that while behavioural practices differ significantly between genders, the underlying professional values and attitudes toward oral health care are similarly established in both male and female BDS students at this institution.

The findings of this study collectively highlight the need for curriculum refinement at Baqai Dental College and similar institutions. While clinical training is essential for developing clinical competencies, knowledge and behavioural domains appear to plateau early in the programme. Dental educators should consider integrating problem-based learning, community-based preventive education and early clinical simulation exercises to promote the translation of knowledge into consistent professional behaviour across all years of study. The significantly poorer behavioural scores among male students further underscore the need for gender-sensitive behavioural interventions within dental education.

This study is limited by its single-institution design and cross-sectional nature, which precludes causal inference. The relatively small fourth-year sample size ($n = 19$) may have reduced statistical power for year-wise comparisons. Social desirability and recall bias may have influenced participants' self-reported responses. Future longitudinal and multi-institutional studies across dental colleges in Pakistan are recommended to generate nationally representative data on oral health KAB among BDS students.

Conclusion

In conclusion, the study findings highlight the importance of addressing both academic and behavioural dimensions in dental education. Preclinical students demonstrated stronger oral health attitudes, suggesting that clinical training alone may not further enhance attitudinal scores

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Author Contributions

1. **Aisha Kiran:** Conceptualization of the study, methodology development, supervision, data interpretation, original draft writing, and critical review
2. **Ayesha Imtiaz:** Data curation, literature review, data collection and data interpretation
3. **Samreen Mazhar:** Data collection, formal analysis support, interpretation of findings
4. **Mahwish Bano:** Literature review, manuscript editing and final proofreading.