

Clinical Encounter Requirements in Undergraduate Dental Education in Pakistan: A Nationwide Pilot Study

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Background: The hallmark of excellent oral health care is dental education. Undergraduate (UG) dentistry curricula around the world are designed to give students the essential abilities that represent the uniform application of information, clinical skills, professional judgment, and ethical practice to fulfill a variety of patient demands.

Objectives: The purpose of this nationwide pilot study was to compare the requirements of clinical encounters in different dental specialties and in institutions operating in the private and the public sector in Pakistan.

Methods: A faculty validated questionnaire was developed following an extensive review of published literature and PMDC undergraduate competency requirements. Content validity was established through expert review by experienced dental educators, and pilot testing was undertaken among faculty members from institutions not included in the final study to improve clarity and face validity. Each questionnaire was completed by a senior institutional representative (Principal, Dean, or Medical/Dental Educationist), with one official institutional response included for analysis. Descriptive statistical analysis was conducted using SPSS version 24.

Results: The results revealed considerable variability in clinical quotas across specialties. In oral and maxillofacial surgery, the mode for simple extractions was 75(range: 10-150), while complicated extractions had a mode of 15(range: 0-45). The mode for local anesthesia administration was also 75(range:10-105). In operative dentistry, wide variation was observed in restoration quotas, with modes of 15 for both amalgam and composite restorations, requirements for root canal treatments remained consistently low, with a mode of 3. Prosthodontic denture requirements showed modes of 3, while the mode for fixed orthodontic appliance fabrication was 1. In periodontology, the scaling requirements are clustered with modes of 25 for manual and 10 for ultrasonic procedures. Mean history taking requirements were lowest in Orthodontics and periodontology. Overall, public sector institutions generally reported higher mean procedural quotas for several commonly performed procedures; however, these observations are descriptive only and no statistical comparisons were performed.

Conclusions: This nationwide pilot study demonstrates substantial variability in institutional clinical encounter requirements across undergraduate dental programs in Pakistan. These findings highlight the need for greater standardization of clinical training expectations but should not be interpreted as defining competency thresholds.

Keywords: Undergraduate dental education, Clinical competency, Clinical encounter, Procedural quotas, Competency-based education

Introduction

Dental education is the hallmark of high-quality oral healthcare. Globally, undergraduate (UG) dental curricula are formulated in a manner that equip students with the key competencies, representing the homogenized application of knowledge, clinical skills, professional judgment, and ethical practice to meet diverse patient needs.¹⁻³ Clinical training aids in forming the foundation of this educational framework and emphasizes hands-on experiential learning through real-world patient interactions. However, the notable discrepancies in the quantity and quality of clinical encounters observed across institutions may influence the clinical training expectations of graduates stepping into their professional practice.⁴

Acquiring a defined set of competencies is a pre-requisite for the students of Bachelor of Dental Surgery (BDS) program that helps guarantee their readiness for independent clinical practice. Traditionally, competency development relied mainly on trial-and-error methods, later supplement-

ed by predefined checklists/proformas applied during or at the end of clinical rotations.⁵ Minimum Standards are set by Pakistan Medical and Dental Council (PMDC) for undergraduate dental training, including procedural quotas that graduates are expected to achieve prior to graduation.^{6,7} However, the rapid growth of dental institutes across Pakistan, along with developing educational dynamics, has led to the fragmentation of the existing patient pool. This distribution has led to considerable discrepancies in clinical exposure, potentially hindering students to achieve the necessary competency benchmarks.

While simulation and artificial intelligence (AI)-based methods offer alternative training pathways, their adoption in high-income countries has largely been driven by the need to compensate for diminished clinical exposure.⁸ Nevertheless, the high costs associated with these high-fidelity systems render them impractical in low-resource settings, including Pakistan.⁹ Furthermore, even within well-resourced educational contexts, the development of competencies, especially in patient management and clinical decision making, remains strongly dependent on authentic patient interactions.¹⁰

Standardization in clinical training draws strong support from the World Health Organization, aiming for uniformity in how dental education is delivered across institutions.¹¹ While evidence mounts, many investigations highlight how hands-on experience sharpens a learner's ability to reason through cases, pinpoint diagnoses, craft effective treatment strategies, and manage patients more effectively within dental education.^{12,13} Studies emerging

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from high income countries have explored the use of minimum clinical exposure thresholds as a strategy to support skill acquisition.¹⁴ However, findings from low- and middle-income countries, including Pakistan, remain scarce, particularly in settings characterized by inequalities in institutional resources and patient populations.¹⁵

Though hands-on patient care shapes skill growth in dentistry, little is known about differences in required clinical experience among dental schools nationwide in Pakistan. While current guidelines often set baseline numbers for procedures, how these expectations differ by college - or whether public versus private colleges demand more is poorly mapped. Accordingly, this exploratory pilot study was designed to describe institutional clinical encounter requirements rather than determine evidence-based competency thresholds. Its aims included spotting contrasts in needed procedures and patient interviews across key fields of dentistry. Differences between state-funded and privately run colleges also came under review. Finally, it considered how uneven demands might affect consistent training outcomes for future dentists.

Material and Methods

Ethical approval was granted by the Ethical Review Board of Islamic International Dental College, Riphah International University (Reference no: IIDC/IRC/2024/001/009). Written informed consent was obtained from all participants prior to data collection. Participant anonymity and confidentiality of collected data were ensured throughout the study in compliance with institutional ethical standards.

This study adopted a cross-sectional, exploratory pilot design to evaluate the institutional requirements for clinical encounters in undergraduate dental education. The dental institution served as the unit of analysis rather than individual faculty members or students, with data collected to reflect formally established or routinely implemented clinical training requirements¹⁶. All major clinical dental specialties were included in this pilot phase.

The study population included all public and private dental institutes recognized by the Pakistan Medical and Dental Council (PMDC). A purposive sampling approach was used to select institutions from all four provinces of Pakistan, thereby ensuring geographic diversity as well as variation in institutional age and sector (public vs private)¹⁷.

Within each participating institution, data were collected from senior academic or administrative personnel such as principals, deans, or medical/dental educationists who were responsible for supervising undergraduate clinical training and were therefore deemed suitable institutional informants. Each completed questionnaire reflected the clinical training requirements of a single institution.

A detailed analysis of existing studies on competency-driven dental teaching informed the creation of a participant-completed questionnaire. Built through careful selection, its questions recorded mandated numbers of procedures and patient interviews within core dental fields. Information about each institution - such as geographic placement, founding year, and public or private status - was also gathered systematically.

The questionnaire was developed following an extensive review of published literature and PMDC undergraduate competency requirements. Content validity was established through expert review by experienced dental educators, and pilot testing was undertaken among faculty members from institutions not included in the final study to improve clarity and face validity. Each questionnaire was completed by a senior institutional representative (Principal, Dean, or Medical/Dental Educationist), with one official institutional re-

sponse included for analysis.

One finalized questionnaire guided the gathering of data, sent by email or delivered face-to-face, based on accessibility of each institution. To maintain uniformity, respondents stated formal clinical training mandates instead of personal views. Only one complete questionnaire was accepted from each participating institution, with each institution contributing a single dataset. Fifty institutions in four provinces received contact; twenty-two returned responses - this amounted to forty-four percent participation. Institutional responses were accepted as official reports of implemented undergraduate clinical training requirements. Independent external verification of institutional data was not performed and is acknowledged as a limitation of the study.

Data analysis was carried out using SPSS version 24.0. To summarize institutional clinical encounter requirements descriptive statistics, including frequencies, percentage measures of central tendency (mean, median, and mode), and ranges were employed.

Considering the differences, public versus private colleges were compared alongside regional patterns. Since the work aimed to explore variation without preset expectations, no hypothesis testing took place. Sampling was deliberate, shaping the choice not to run inferential statistics. Patterns appeared through observation, not probability models.

Built on data that institutions report about themselves, these results point to stated training demands instead of actual hands-on learning by students or proof of skill precision.

Comparisons between public and private institutions were descriptive only and were not intended to infer statistically significant differences

Results

This study examined clinical training requirements across 22 dental colleges in Pakistan, including data collected from five public colleges and 17 private colleges, assessing quotas for various clinical procedures and history-taking competencies. The participating institutions exhibited considerable geographic diversity, with the largest proportion located in Punjab (41%) followed by the federal territory (27%), Sindh (18%), Khyber Pakhtunkhwa (9%), and Baluchistan (4.5%) (Figure 1). The dataset encompasses institutions with a range of establishment dates, 12 colleges (over 50%) have been operational for more than 15 years, five (23%) for 10 to 15 years, three (14%) for 5 to 10 years and two (9%) for fewer than five years (Table 1).

A statistical examination of procedural quotas across dental colleges reveals considerable variation in institutional expectations. The mode was selected as the primary measure due to its resistance to outliers, offering the most frequently assigned quotas for various procedures. Mode is particularly useful in analyzing categorical data where identifying the most frequent occurrence is more meaningful than averaging, especially in educational settings where extreme values may distort true training expectations¹⁸.

Analysis of Clinical Quotas

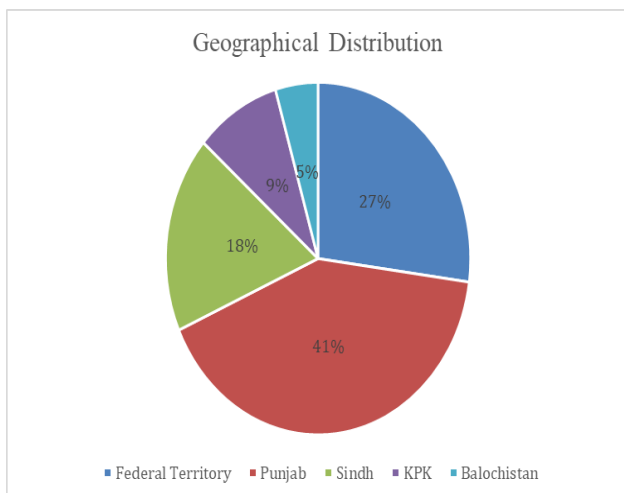
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Oral and Maxillofacial Surgery (OMFS)

The mode for simple extractions is **75**, whereas for complicated extractions, it is **15**. The highest recorded quota for

Table 1: Demographic Insights

Variable	Categories	Distribution
Geographical Distribution	Federal Territory	27%
	Punjab	41%
	Sindh	18%
	KPK	9%
	Baluchistan	4.50%
Institutional Age	>15 years	50%
	10-15 years	23%
	5-10 years	14%
	<5 years	14%
Curriculum Type	Hybrid	32%
	Integrated	32%
	Traditional	36%
Graduated Batches	Federal Territory	9.80%
	Punjab	36.40%
	Sindh	21.30%
	KPK	16.60%
	Baluchistan	15.60%
Type of Institute	Public	5
	Private	17

**Figure 1: Geographical distribution of participating dental institutes**

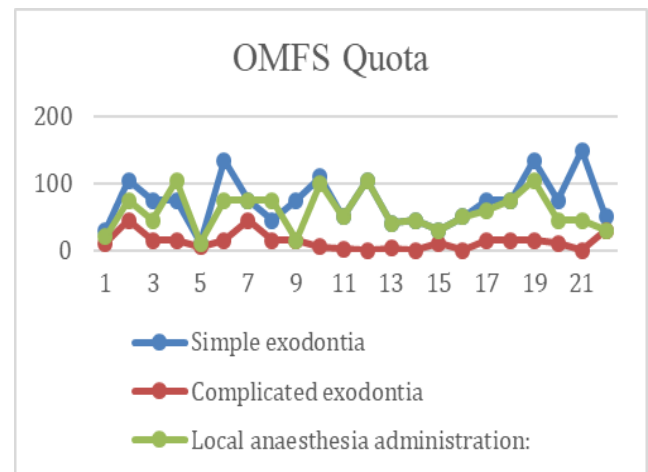
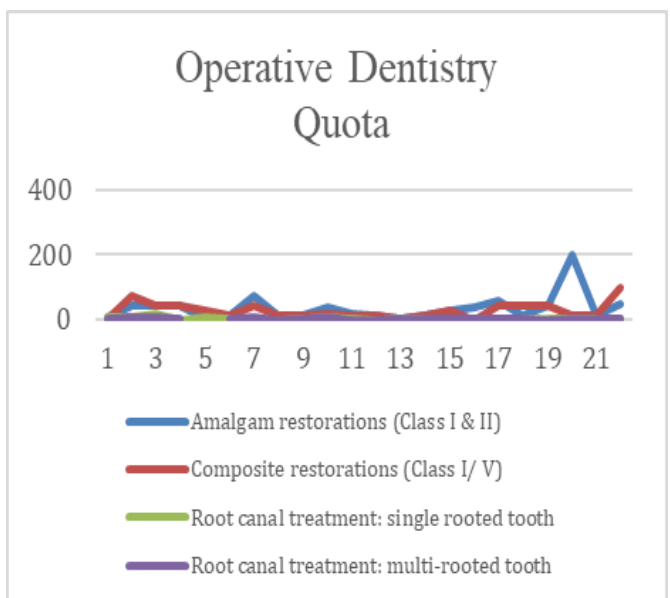
simple extractions is **150**, while the lowest is **10**. For complicated extractions, the highest is **45**, and the lowest is **0**. Mode for local anesthesia administration is **75**, with the highest quota being **105** and the lowest **10** (Figure 2).

Operative Dentistry

The mode for both amalgam and composite restorations is **15**, with amalgam restorations ranging from **5** to **200**, and composite restorations from **0** to **100**. Root canal treatment (RCT) quotas are low, with a mode of **3** for both single and multi-rooted teeth. The highest quota for single-rooted RCT is **18**, and the lowest is **0**; for multi-rooted RCT, the highest is **10**, and the lowest is **0** (Figure 3).

Prosthodontics

Partial and complete denture fabrication quotas both have a mode of **3**. The highest quota for partial dentures is **10**, while the lowest is **0**. For complete dentures, the highest is **5**, and the lowest is **2** (Figure 4).

**Figure 2: Oral and maxillofacial surgery (OMFS) quota for local anaesthesia administration, simple and complicated exodontia****Figure 3: Operative dentistry clinical quota for restorations and root canal treatment**

Orthodontics

Fabrication of fixed appliances has a mode of **1**, with the highest quota being **5** and the lowest **0**. Patient diagnosis and treatment planning show a mode of **3**, with the highest being **30** and the lowest **1** (Figure 5).

Periodontology

Manual scaling has a mode of **25**, whereas ultrasonic scaling has a mode of **10**. The highest quota for manual scaling is **40**, while the lowest is **2**. For ultrasonic scaling, the highest is **40**, and the lowest is **3** (Figure 6).

History taking analyses:

A statistical evaluation of clinical history-taking quotas was conducted to determine the adequacy of current training. The mean number of history-taking encounters varies by specialty, with OMFS averaging 37, operative dentistry 43, orthodontics 8, Prosthodontics 10 and periodontology 8. These findings suggest that while certain specialties offer adequate clinical exposure, others particularly Orthodontics and Periodontology, may require curricular adjustments to ensure students meet competency standards. Detailed results on history-taking requirements are presented in Figure 7.

Comparison Between Public and Private Colleges

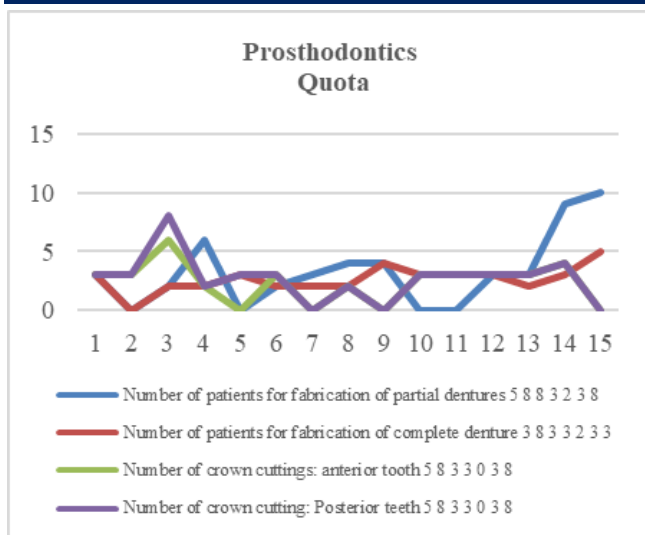


Figure 4: Prosthodontics quota for fabrication of partial and complete dentures and crown cutting

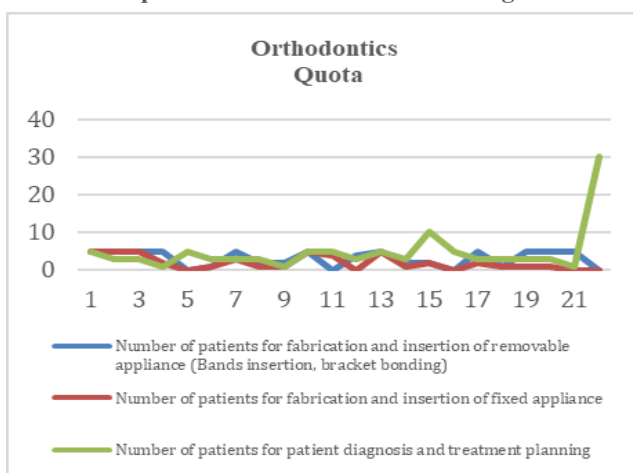


Figure 5: Orthodontics quota for diagnosis & treatment planning and fabrication of removable & fixed

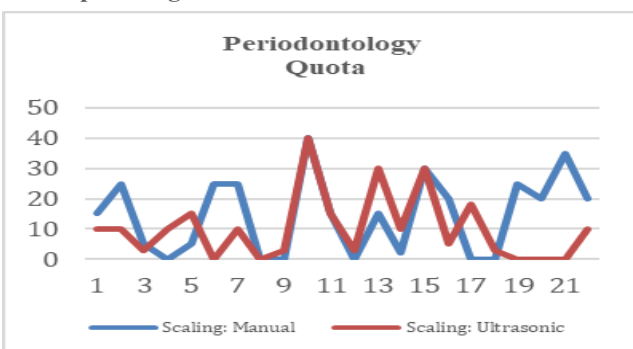


Figure 6: Periodontology quota for manual and ultrasonic scaling

A comparison of clinical quotas between private and public dental colleges reveals notable variations in training requirements. While the mode for most procedures remains comparable across both sectors, significant differences emerge in median and mean values. For example, simple exodontia exhibits a mode of 75 in both private and public institutions; however, the mean is substantially higher in public colleges (93) compared to private ones (66), suggesting that public sector institutions provide greater clinical exposure. Similarly, in operative dentistry, public colleges report higher mean values for amalgam restorations (64) and composite restorations (44) relative to private colleges (27 and 24, respectively), indicating a stronger emphasis

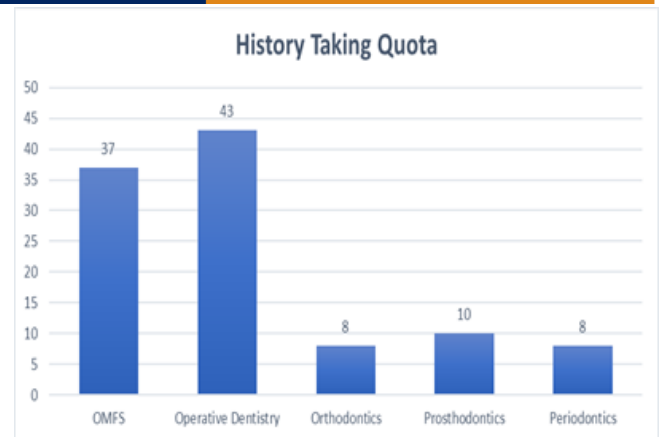


Figure 7: History taking quota analysis for OMFS, operative dentistry, orthodontics, prosthodontics and periodontology

phases on restorative procedures in public sector. Conversely, root canal treatment quotas for both single- and multi-rooted teeth show minimal variation. Orthodontic and prosthodontic training also demonstrate minor variations, except in patient diagnosis and treatment planning, where public institutions report a higher mean (7) compared to private ones (4). Scaling procedures exhibit a higher median in public institutions, implying greater emphasis on periodontal training. These findings suggest that while private and public institutions maintain similar baseline training requirements, public colleges generally reported higher mean procedural quotas, which may better prepare students for independent practice. These observations describe institutional procedural requirements only and should not be interpreted as differences in graduate competence or educational quality. Given the exploratory design, purposive sampling strategy, and limited number of participating public institutions, these findings are descriptive and no hypothesis testing was undertaken.

Discussion

This pilot study offers the initial nationwide look at documented clinical procedure demands within dental colleges across Pakistan, revealing notable differences in what students are required to perform during training. Although expectations exist everywhere, how they're applied shifts widely from one institute to another. Differences appear clearly when comparing core dental specialties. Public sector colleges follow patterns distinct from those seen in private ones, creating an uneven landscape. Since skill-building depends heavily on hands-on experience, such gaps might affect how ready new dentists are for practice. Without consistent targets, student exposure can vary too much to guarantee equal outcomes. Setting shared minimums for procedures would help level the playing field. Currently, the lack of alignment risks undermining fairness in graduate preparedness. Although procedural quotas have traditionally been used to monitor students' clinical experience, they should not be interpreted as direct measures of clinical competence. Competency-based dental education emphasizes demonstrated clinical performance, clinical reasoning, professionalism, communication skills, and workplace-based assessment rather than completion of predetermined numerical targets alone. Procedural quotas therefore represent opportunities for clinical exposure that may facilitate competency development but do not independently establish competence. These results emphasize the introduction of uniform benchmarks that could anchor future curricula, making sure every BDS candidate meets comparable thresholds by graduation.

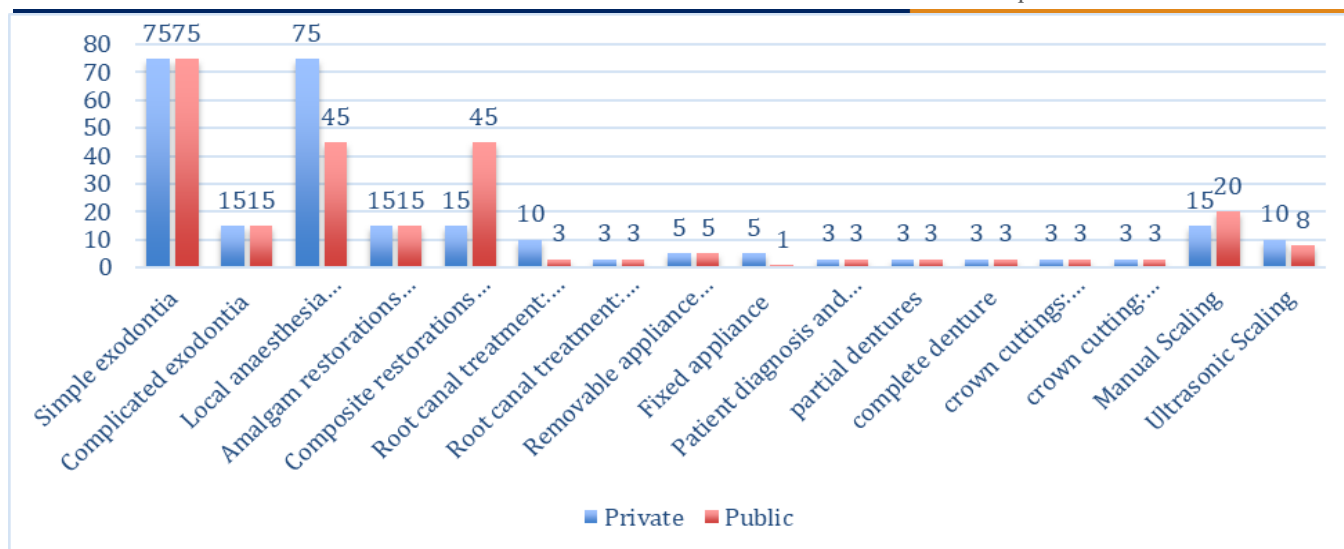


Figure 8: Comparison of clinical procedures quota requirements among public and private dental institutes

One key result here shows how much clinical targets differ across essential tasks - simple tooth extraction, filling placements, scaling and root canals. Take extractions: some programs ask for just ten; others require one hundred fifty. The low quotas for root canal treatments were specifically noteworthy, with most requirements concentrated near the lower end of the range. This inconsistency indicates that the needs of clinical training are not determined by the standardized national guidelines, but rather by the institutional characteristics of the needs, like capacity, inflow and available resources, of the patients. These patterns are consistent with international trends where quantitative case requirements in most cases are taken as a proxy to determine clinical competence, but not quantifying skill acquisition directly. Contemporary competency-based curricula increasingly combine clinical exposure requirements with workplace-based assessments, direct observation, structured clinical examinations and longitudinal assessment strategies.¹⁹

This is compared to international standards and there is a significant difference. Australian Dental Council (ADC), American Dental Education Association (ADEA) and the General Dental Council (GDC) specify competency areas in entry-level practitioners but specifically not prescribe any minimum requirements in number of clinical encounters. Although the skill areas expected are comprehensively mapped, the quotas are not specified.²⁰⁻²² International frameworks on the other hand focus on the manifestation of core competencies like clinical judgement, precision, communication, professionalism and evidence based decision making. However, in situations where there are high population demographic differences, institutional capacity and volumes of patients, as in the case of Pakistan, minimum clinical exposure standards can be a viable transitory solution to achieving foundational experience especially where more objective competency-based evaluations are lacking.^{6,23} The inconsistency reported in this study highlights the importance of the critical analysis of the use and interpretation of numerical requirements in undergraduate dental education.

Differences emerged when comparing clinical training requirements between public and private dental colleges in comparing the clinical training requirements as reported by the public and the private dental colleges. Higher mean quotas of simple procedures like tooth extractions, restorations and scaling were more often reported in the public institutions. These numbers probably indicate unequal opportunities of patient care based on the type of institution, as opposed to the differences in the real student preparedness. On the other

hand, those procedures that had greater material expenses like fixed orthodontic appliances fabrication were more prevalent in quotas by the private colleges indicating that institutional funding frameworks might impact the kind of clinical skills to focus on during training. These observations indicate differences in structure of the training setting, and not one sector being superior to the other.

Although there is an emerging trend of using simulation-based methodologies and virtual training tools in high income countries, it has been demonstrated that it is not used as an alternative to direct interaction with the patient, especially in the aspects of developing competencies of clinical reasoning, communication and comprehensive patient care.²⁴⁻²⁶ In low-resource environments like Pakistan, where high fidelity simulation is still unavailable, real clinical exposure still remains a key factor in undergraduate education. In turn, the systematic recording of the expectations of the institutions concerning the clinical interactions gives a necessary basis to define the present-day educational environment.

The findings have serious implications to policymakers, regulatory bodies and dental education institutions. With more and more dental colleges being set up in Pakistan, due to lack of standards in country concerning clinical encounter in the medical fraternity, it is possible that the gap between the clinical exposure of the students will ever increase and that the public's confidence in the dental profession may diminish significantly. It may be possible through defining national standards of core clinical practices based on institutional data including those available in this paper to promote more consistency in training and accreditation across facilities. In addition, a combination of competency-based measurement and procedural stipulations would make the assessment of graduate preparedness more impartial and holistic.

This research will be a valuable first step towards recording national disparity in clinical training expectation and also to establish the significant voids in current competency development models. However, there are a number of weaknesses that should be considered. Being a cross sectional, institute level study, which is using self-reported data, the findings represent proclaimed training requirements as opposed to reality clinical experiences of the students, or quantifiable competency outcomes. There were also other disciplines not covered in this pilot phase such as pediatric dentistry, oral medicine, radiology and professional ethics hence narrowing down the scope of

findings. Although participating institutions represented diverse geographical regions and institutional characteristics, the response rate of 44% may have introduced non-response bias, as institutions declining participation could differ in their clinical training policies. Therefore, the findings should be interpreted as exploratory rather than nationally representative.

Conclusion

This nationwide pilot study demonstrates substantial variability in institutional clinical encounter requirements across undergraduate dental programs in Pakistan. While these findings highlight the need for greater standardization of clinical training expectations, they should not be

interpreted as defining competency thresholds. Future multicenter studies incorporating competency-based assessments are needed to determine the relationship between clinical exposure and graduate competence.

CONFLICT OF INTEREST: None

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Author Contributions

1. **Sana Iqbal:** Conceptualization, study design, data collection, analysis, literature review, and manuscript drafting.
2. **Seema Shafiq:** Conceptualization, study design, supervision, analysis, manuscript drafting, and critical review.
3. **Momina Zahra:** Data collection, analysis, literature review, and critical review.
4. **Ulfat Bashir:** Supervision, interpretation of results, and final manuscript review.