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Title:

**Self-perceived Preparedness of Final Year Dental Students in a Developing
Country- A multi-institution Study**

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Abstract

Aims: To evaluate the self-perceived preparedness to practice of final year dental undergraduate students in three dental institutions.

Methods: Dental undergraduate students in their final year from three dental institutions in Pakistan were invited to participate in an online study to assess self-perceived preparedness using a validated preparedness assessment scale.

Results: In total 134 students responded to the questionnaire yielding a response rate of 72%. Students felt adequately prepared to carry out several clinical procedures including clinical assessment, fillings, tooth extractions and communication skills. However, perceived preparedness was low in the students' ability to undertake intraoral radiographs, treatment planning, crowns, multi-rooted endodontics, research skills, referral for suspected oral cancer and raising concerns regarding inappropriate behaviour of colleagues.

Conclusions: This is the first study which investigates the self-perceived preparedness of final year undergraduate dental students in Pakistan. The results show that the self-perceived preparedness of final year students was satisfactory for a range of clinical and affective skills. However, several areas of weaknesses were identified which underscore the need for additional training and consolidation.

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Introduction

The ultimate goal of education and training of undergraduate dental students is to impart the knowledge, skills, and attitudes to prepare them for independent clinical practice in a safe and effective manner (1-3). Dental students are expected to demonstrate competence in range of clinical operative procedures as well as skills in communication, team-working, management, leadership and professionalism.

Preparedness of undergraduate students may be influenced by a variety of factors including: curriculum design; teaching methods; educational environment; clinical training model; and assessment methods (4-8). Previous studies on dental students show inconsistencies in the skill-set of undergraduate students and new graduates and it may not always be possible to demonstrate competence in all core skills expected from students at the point of graduation (4, 9-11). Longitudinal evaluation of students against the learning outcomes of an undergraduate dental programme may allow dental educators to identify areas of weaknesses and address them appropriately through additional education, training and consolidation (12).

Several studies exploring the skills and attributes of undergraduate dental students in Europe, the USA, and other countries are reported in the literature (12-15). However, little work has been published on the preparedness of dental graduates from developing countries. Given that overseas-qualified dentist contribute to the dental workforce in developed countries; it is important to develop an understanding of the preparedness of dental graduates from less developed countries (16-18). With this aim, this study was undertaken to investigate the self-perceived preparedness of final year dental undergraduate students in Pakistan.

Methods

Following approval by the institutional research ethics committee, dental undergraduate students from three institutions in Pakistan were invited to participate in an online study. Purposive sampling was used and final year dental students after completion of the first six months of the academic year were included in this study. A reminder was sent after two weeks along with the URL for the study.

Self-perceived preparedness of final year dental students was investigated using a previously validated scale, the Dental Undergraduates Preparedness Assessment Scale – DU-PAS (19). DU-PAS is a measurement tool that has been demonstrated to evaluate a broad range of skills and attributes expected from dental students at the time of graduation. The questionnaire consisted of two parts, with Part A investigating preparedness in clinical procedures (24 items) and Part B investigating preparedness relating to cognition, communication, and professionalism skills (26 items). The structure of the 50-item inventory as well as the scoring of response categories is shown in the Appendix.

Data Analysis

1. Analyses were conducted using the R statistical environment for Windows (R Core Team, 2015).
2. Responses of 'No experience' were allocated a score of zero; 'With verbal/practical help' or 'Mostly' a score of one and 'On my own, independently' or 'Always' a score of two.

Data collection and analysis were completed in approximately eight months.

Results

In total 134 final year dental students responded to the online questionnaire, yielding a response rate of 72%. All participants were in the 20-25 years age group. Complete responses were provided by 124 participants including 106 females (85.5%) and 18 males (14.5%). The remaining 10 participants with incomplete responses were excluded from the following analyses.

The total score for the preparedness scale ranged from 0 to 100. The mean score for the participants in this study was 65.60 (SD \pm 10.82) with a range of 39.00 to 94.00.

The responses to Part A of the questionnaire are shown as percentage proportions of each response type in Table 1; the items are ordered by the '*No experience*' column in a descending order. Across the 24 questions relating to clinical procedures, more than 10% of students felt they had no experience for six of the procedures, with more than 50% of the students feeling they had no experience for three of these (A5, A20, A22). All students felt they had some experience for six (25%) of the procedures (A1, A14, A16, A17, A18 and A24).

The responses to Part B of the questionnaire are shown as percentage proportions of each response type in Table 2; the items are ordered by the '*No experience*' column in a descending order. Across the 26 questions in Part B, more than 10% of students felt they had no experience for six of the skills, with more than 50% of the students feeling they had no experience for one of these (B30). All students felt they had some experience for four (15.4%) of the skills (B36, B40, B43 and B50).

Discussion

This is the first study aimed at investigating the cognitive attributes, clinical, and affective skills of undergraduate dental students from a developing Asian country. Dental graduates from South East Asia make a notable contribution to the dental workforce in the United Kingdom and beyond (17, 18). Little, if any, information is available in the published literature about Pakistani graduates and this study provides useful and timely insights into the teaching and training of dental graduates from this country.

The mean total score of the participants in this study was 65.60. A mean score of 74 was reported in previous work exploring perceived preparedness of final year dental undergraduate students from the UK (12). These results indicate that the Pakistani graduates feel less prepared than those in the UK.

Regarding the clinical skills, over 70% of the participants in this study reported competence in obtaining a medical history; obtaining a valid consent for treatment; administering inferior alveolar nerve blocks; caries removal; and providing tooth fillings using amalgam and tooth-coloured materials independently. These findings are similar to those reported in studies on graduates from Europe (4, 12 -14).

A high proportion of students (81.5%) perceived themselves to be prepared in undertaking tooth extractions. This may be explained by the availability of large numbers of patients requiring tooth extractions. Most dental institutions in Pakistan require each undergraduate student to perform approximately 100 extractions prior to graduation which accounts for this level of perceived preparedness.

The participants reported inadequate experience in undertaking intra-oral radiographs; only 7.3% students felt prepared in undertaking bitewing radiographs while 25% felt competent in undertaking periapical radiographs. In contrast, majority of students from UK reported competence in undertaking intra-oral radiographs (12). The lack of competence reported by the Pakistani graduates may be explained by deficient training in undertaking routine dental radiography. In most dental institutions, dental students have limited opportunities to undertake radiographs themselves and often rely on radiography department for the same. Moreover, a lack of consistent summative assessment of students on undertaking radiographs and this may contribute further to their lack of competence. Finally, financial constraints in developing countries may limit availability of teaching staff and equipment.

The participants in this study were less confident in comprehensive treatment planning to address all treatment needs of their patients and over 70% did not feel confident in independent treatment planning. Deficiencies in treatment planning skills are widely reported in studies on dental students and new graduates in Europe and the USA (12, 15). Perhaps, departmental model of clinical training limits the opportunities available to undergraduate students to carry out comprehensive treatment planning to address and prioritise multiple treatment needs of patients in an appropriate order. It may be helpful for dental educators in Pakistan to consider tailored courses in comprehensive dental care like those introduced in other dental schools to enhance students' competence in treatment planning (20).

Students felt least prepared to undertake endodontics in multi-rooted teeth and providing crowns. Deficiencies in endodontic skills of undergraduate students have been reported previously (12, 21, 22). Moreover, the students also felt under-prepared in the provision of partial dentures. These findings may be attributed to lack of adequate

experience in the design and delivery of cast partial dentures. Observations from the dental school settings in Pakistan suggest that the students' experience in partial dentures is largely limited to acrylic dentures and they may not receive adequate training in the construction of cast partial dentures.

This study has identified several areas of under-confidence in the clinical skills of final year students close to the point of graduation. However, it needs to be reiterated that competence of undergraduates only represents a point on a continuum and their preparedness needs to be measured using an appropriate "grain-size" (23, 24). It is widely reported that dental students may lack competence in complex clinical procedures such as multi-rooted endodontics and tooth preparations for extra-coronal restorations and they may need further consolidation after graduation to develop their skills (25, 26). However, it is unusual, relative to dental graduates in developed countries, that the participants reported lack of preparedness in undertaking radiographs and performing non-surgical periodontal treatments. It is hoped that the results reported here will be of use to dental educators in Pakistan, facilitating recognition of areas in the clinical training of their students in which additional support, reassurance, and where necessary, training, may be needed.

The participants generally felt prepared to communicate appropriately and effectively with their patients and colleagues. However, they felt under-prepared in raising concerns about inappropriate behaviour of colleagues. Anecdotal evidence from the dental school environments in Pakistan suggests written policies on raising concerns may not be available. This study highlights the need to have appropriate guidelines and training of students as well as academic staff. It is suggested that dental educators may use simulated scenarios to impart a broad-based structured training in affective skills.

The participants reported low scores on the ability to refer suspected oral cancer. Studies from the UK and USA also highlight a perceived lack of knowledge and skills among dental students to identify oral cancer (12, 27, 28). The results of this study reiterate the need to further improve the teaching and training of dental students in this domain. Regular placement of students on specialist clinics in maxillofacial surgery may serve to provide a structured exposure to cancer patients to improve their understanding of the clinical presentation, and management principles which underpin cancer care.

The participants felt under-prepared in using an evidence-informed approach in their clinical practice; evaluating new dental materials; and interpreting the results of research studies. Similar findings are reported in other studies and undergraduate dental students generally lack knowledge and skills in evidence-based practice (12, 29, 30). Given the rapid technological advancements and growing number of commercial stakeholders in dentistry, it is vital that dental educators identify effective learning strategies so that students are able to incorporate an evidence-based approach in their clinical practice.

One of the limitations of this study is that the sample includes participants from only three dental institutions in Pakistan and may not be representative of the entire country with over 50 dental schools. Moreover, the findings are based on self-perceived preparedness of the students and may potentially be biased by unrelated or extraneous experiences. Evidence from previous studies self-perceived competence scores by the students may have a low reliability (31, 32). Therefore, it is prudent for dental institutions to compare self-assessment by the students with the assessment by dental educators and use it to identify gaps in knowledge and skills. Nevertheless, feedback

from the students is vital to inform further curriculum development and refinement of teaching and training to enhance the educational experience of the students (33).

Conclusions

This is the first study which investigates the self-perceived preparedness of final year undergraduate dental students in Pakistan. The results show that the self-perceived preparedness of final year students was satisfactory for a range of clinical and affective skills. However, several areas of weaknesses were identified which underscore the need for additional training and consolidation. The study also provides a broad-based comparison between final year Pakistani students with dental students from developed countries.

Table 1: Summary of response proportions as percentages for Part A

*Items are ordered by the 'No experience' column in descending order.

Item	Question	No experience (%)	With help (%)	On my own (%)
A5	I am able to undertake bitewing radiographs	66.9	25.8	7.3
A20	I am able to perform endodontic treatment on multi rooted teeth appropriately	51.6	40.3	8.1
A22	I am able to provide mechanically sound partial dentures	50.8	24.2	25.0
A21	I am able to provide crowns using principles of tooth preservation	41.9	51.6	6.5
A4	I am able to undertake periapical radiographs	29.8	45.2	25.0
A15	I am able to perform non-surgical periodontal treatment using appropriate methods	10.5	23.4	66.1
A7	I am able to assess the treatment needs of patients requiring orthodontics	8.9	64.5	26.6
A8	I am able to formulate a comprehensive treatment plan which addresses all treatment needs of my patients	8.9	61.3	29.8
A12	I am able to carry out patients' treatment sessions in an appropriate order	8.1	47.6	44.4
A11	I am able to obtain a valid consent from my patients prior to undertaking any treatment.	7.3	19.4	73.4
A9	I am able to provide a range of treatment options to my patients based on their individual circumstances	6.5	58.9	34.7
A3	I am able to prescribe appropriate dental radiographs	4.0	45.2	50.8
A10	I am able to explain the merits and demerits of various treatment options to my patients	4.0	45.2	50.8
A13	I am able to prescribe drugs to my patients appropriately	3.2	61.3	35.5
A19	I am able to perform endodontic treatment on single rooted teeth appropriately	2.4	21.0	76.6
A2	I am able to undertake a comprehensive, clinical oral examination	1.6	37.1	61.3
A6	I am able to interpret common findings on dental radiographs	1.6	42.7	55.6
A23	I am able to provide mechanically sound full dentures	0.8	37.1	62.1
A1	I am able to obtain a complete medical history from my patients.	0.0	22.6	77.4
A14	I am able to administer inferior dental nerve blocks effectively	0.0	15.3	84.7
A16	I am able to remove dental caries effectively	0.0	17.7	82.3
A17	I am able to restore teeth with tooth coloured fillings appropriately	0.0	15.3	84.7
A18	I am able to restore teeth with amalgam fillings appropriately	0.0	14.5	85.5
A24	I am able to undertake non-surgical tooth extractions appropriately	0.0	18.5	81.5

Table 2: Summary of response proportions as percentages for Part B

Item	Question	No experience (%)	Mostly (%)	Always (%)
B30	I feel confident referring patients with suspected oral cancer	50.8	30.6	18.5
B33	I am confident to evaluate new dental materials and products using an evidence-based approach	48.4	45.2	6.5
B34	I am confident to interpret the results of research which may influence my practice	34.7	56.5	8.9
B49	I feel able to raise concerns about inappropriate behaviour of my colleagues	23.4	48.4	28.2
B35	I use an evidence-informed approach in my clinical practice.	22.6	60.5	16.9
B42	I am able to manage the behaviour of children to enable appropriate dental treatment	10.5	70.2	19.4
B32	I have sufficient knowledge of scientific principles which underpin my dental practice	8.1	81.5	10.5
B44	I maintain accurate records of my clinical notes	7.3	66.1	26.6
B39	I feel confident to communicate potential risks of operative procedures to patients	4.8	56.5	38.7
B41	I feel confident managing anxious patients with appropriate behavioural techniques	4.8	76.6	18.5
B47	I am aware of my legal responsibilities as a dental professional	4.8	41.9	53.2
B29	I am able to refer patients with complex treatment needs appropriately	4.0	52.4	43.5
B45	I am able to work within the constraints of clinical appointment schedules	4.0	62.9	33.1
B38	I feel confident to address barriers to effective communication with patients appropriately	3.2	68.5	28.2
B48	I restrict my relations with my patients to a professional level	2.4	29.0	68.5
B25	I feel I can manage people's expectations of their treatment	1.6	86.3	12.1
B27	I recognise my personal limitations in clinical practice	1.6	58.9	39.5
B31	I reflect on my clinical practice in order to address my learning needs	1.6	68.5	29.8
B37	I provide opportunities for my patients to express their expectations from dental treatment	1.6	49.2	49.2
B26	I feel able to motivate my patients to encourage self-care for their dental needs	0.8	79.8	19.4
B28	I feel comfortable asking for help from supervisor or colleague if needed	0.8	38.7	60.5
B46	I take responsibility for my continuing professional development	0.8	60.5	38.7
B36	I feel I can manage to communicate effectively with my patients	0.0	50.8	49.2
B40	I feel confident to communicate appropriately with my colleagues	0.0	30.6	69.4
B43	I am able to fulfil my responsibilities as an effective member of the dental team	0.0	65.3	34.7
B50	I take appropriate measures to protect patient confidentiality	0.0	46.0	54.0

*Items are ordered by the 'No experience' column in descending order.

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Appendix : Dental Undergraduates Preparedness Assessment Scale

Part A		
1.	I am able to obtain a complete medical history from my patients.	
2.	I am able to undertake a comprehensive, clinical oral examination	
3.	I am able to prescribe appropriate dental radiographs	
4.	I am able to undertake periapical radiographs	
5.	I am able to undertake bitewing radiographs	
6.	I am able to interpret common findings on dental radiographs	
7.	I am able to assess the treatment needs of patients requiring orthodontics	
8.	I am able to formulate a comprehensive treatment plan which addresses all treatment needs of my patients	
9.	I am able to provide a range of treatment options to my patients based on their individual circumstances	
10.	I am able to explain the merits and demerits of various treatment options to my patients	
11.	I am able to obtain a valid consent from my patients prior to undertaking any treatment.	
12.	I am able to carry out patients' treatment sessions in an appropriate order	
13.	I am able to prescribe drugs to my patients appropriately	
14.	I am able to administer inferior dental nerve blocks effectively	
15.	I am able to perform non-surgical periodontal treatment using appropriate methods	
16.	I am able to remove dental caries effectively	
17.	I am able to restore teeth with tooth coloured fillings appropriately	
18.	I am able to restore teeth with amalgam fillings appropriately	
19.	I am able to perform endodontic treatment on single rooted teeth appropriately	
20.	I am able to perform endodontic treatment on multi rooted teeth appropriately	
21.	I am able to provide crowns using principles of tooth preservation	
22.	I am able to provide mechanically sound partial dentures	
23.	I am able to provide mechanically sound full dentures	
24.	I am able to undertake non-surgical tooth extractions appropriately	
Part B		
25.	I feel I can manage peoples' expectations of their treatment	
26.	I feel able to motivate my patients to encourage self-care for their dental needs	
27.	I recognise my personal limitations in clinical practice	
28.	I feel comfortable asking for help from supervisor or colleague if needed	
29.	I am able to refer patients with complex treatment needs appropriately	
30.	I feel confident referring patients with suspected oral cancer	
31.	I reflect on my clinical practice in order to address my learning needs	
32.	I have sufficient knowledge of scientific principles which underpin my dental practice	
33.	I am confident to evaluate new dental materials and products using an evidence-based approach	
34.	I am confident to interpret the results of research which may influence my practice	
35.	I use an evidence-informed approach in my clinical practice.	
36.	I feel I can manage to communicate effectively with my patients	
37.	I provide opportunities for my patients to express their expectations from dental treatment	
38.	I feel confident to address barriers to effective communication with patients appropriately	
39.	I feel confident to communicate potential risks of operative procedures to patients	
40.	I feel confident to communicate appropriately with my colleagues	
41.	I feel confident managing anxious patients with appropriate behavioural techniques	
42.	I am able to manage the behaviour of children to enable appropriate dental treatment	
43.	I am able to fulfil my responsibilities as an effective member of the dental team	
44.	I maintain accurate records of my clinical notes	
45.	I am able to work within the constraints of clinical appointment schedules	
46.	I take responsibility for my continuing professional development	
47.	I am aware of my legal responsibilities as a dental professional	
48.	I restrict my relations with my patients to a professional level	
49.	I feel able to raise concerns about inappropriate behaviour of my colleagues	
50.	I take appropriate measures to protect patient confidentiality	
Response Categories		Numerical Score
Part A	No Experience	0
	With verbal and / or practical input from a colleague	1
	On my own, independently	2
Part B	No Experience	0
	Mostly	1
	Always	2