

Confidence in Conducting Endodontic Procedures and Views on the Effectiveness of Endodontic Education

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Abstract

In recent years, there have been significant changes in undergraduate endodontic education, resulting from changes in knowledge, techniques, materials, and teaching approaches. It seems that the more root canal treatments students perform on patients, the higher their self-efficacy upon graduation. However, dealing with complex cases may hurt their self-efficacy and confidence. This study aimed to assess the level of confidence of dental students in performing endodontic treatments and their perceptions of their undergraduate endodontic education. This cross-sectional study was conducted among dental students in Riyadh through an online survey. Dental schools in Riyadh were contacted, and students were invited to participate. A total of 500 clinical-level students participated in the survey. The results showed that 73.1% of students felt that the time allocated for endodontic education was sufficient, 69.5% regarded the quality of lectures as satisfactory, and 23.2% felt that there was not enough time for laboratory sessions. Statistically significant differences were observed when assessing gender differences in confidence in performing anterior root canal treatments (P-value = .001), posterior root canal treatments (P-value = .009), and determining the restorability of teeth (P-value = .001). Overall, students were satisfied with the quality of their endodontic education, although their confidence levels were slightly above average, which did not align perfectly with their satisfaction.

Keywords: Confidence, Endodontic education, Dental students' perception, Root canal treatment

Introduction

Recent years have seen significant shifts in undergraduate endodontic education, driven by changes in knowledge, techniques, materials, and teaching approaches. It is expected that newly graduated dentists possess the skills and understanding necessary to manage most cases they will encounter in private practice. This includes performing root canal treatment on simple single- and multi-rooted teeth, diagnosing and managing dental emergencies, including those of pulpal origin, and

addressing trauma in both deciduous and permanent dentition [1, 2].

Traditionally, a student's preparedness to graduate was measured through written and oral exams, along with the completion of a required number of clinical cases. However, this assessment model is increasingly being replaced by competency-based systems where students must demonstrate their achievement of various learning outcomes set by university accreditation bodies. It is widely believed that repeated practice of a procedure enhances both skill and confidence. However, experience alone might not lead to improved performance unless it is structured [3, 4].

A study conducted in the UK found that students' confidence and competence in performing basic root canal treatments increased over time. Nevertheless, many students still felt uncertain and lacked sufficient knowledge, indicating that there is potential for further

Access this article online

Website: <https://smerpub.com/>

E-ISSN: 3108-4850

Received: 16 September 2021; Revised: 25 November 2021; Accepted: 02 December 2021

How to cite this article: AlHamoudi SS, AlRashidi SN, AlHarbi HA, AlNaji NJ, AlMohammed MA, Ansari SH. Confidence in Conducting Endodontic Procedures and Views on the Effectiveness of Endodontic Education. Ann Pharm Educ Saf Public Health Advocacy Spec. 2021;1:47-52. <https://doi.org/10.51847/16T27LkUoT>

improvement in endodontic education. Students suggested several strategies to enhance the teaching experience, such as implementing diverse learning methods, increasing the number of brief laboratory sessions, organizing more structured practical classes, incorporating self-assessment, and offering refresher laboratory sessions [5].

A similar study conducted among Turkish dental students showed that their lower confidence in handling complex dental cases may be linked to dental schools' practice of referring such patients to more advanced students, as well as teaching these cases primarily through theoretical instruction. Although students seem inclined to refer challenging cases to specialists in the future, educators should focus on improving how information related to various aspects of endodontic treatment is conveyed [6].

A study in the Netherlands found that dental students' self-efficacy was largely influenced by their clinical exposure and experience in performing root canal treatments. The more root canal procedures students completed on patients, the higher their competency upon graduation. However, handling more complex cases appeared to diminish their self-efficacy and confidence [7]. In a similar investigation among Brazilian dental students, it was noted that anxiety decreased as students gained more experience with endodontic procedures. However, as they approached the end of their studies, stress levels increased. Offering more elective courses in endodontics may provide students with additional opportunities to gain experience with these cases [8].

A study in Norway concluded that most participants felt their undergraduate education in endodontics was inadequate. Gender differences were observed in confidence and security when performing root canal treatments. Students who rated their treatments as good or very good had higher levels of self-confidence. The results suggest that undergraduate endodontic training should address gender differences and work to boost students' self-efficacy during clinical practice. Hands-on training, with an emphasis on problem-solving, was identified as the most effective way to support continuous learning [9].

Study objectives

- To assess the confidence levels of dental students in performing endodontic procedures.

- To evaluate their perceptions of undergraduate endodontic education and training.
- To analyze the results about gender and academic years/levels in dentistry.

Materials and Methods

This research was questionnaire-based and carried out among dental students in Riyadh through an online survey. Dental schools in the city were contacted, and students were invited to participate by completing the survey. A total of five hundred students from clinical levels participated in the study.

The survey, created using Google Forms, included questions about personal and demographic information, followed by questions assessing confidence levels in treating endodontic cases and perceptions of training.

The collected data were analyzed using SPSS version 22. Descriptive and inferential statistical methods were applied. A normality test was performed, which indicated that the data were not normally distributed. As a result, the Mann-Whitney U test was used to compare the means, and Spearman's correlation test was employed to determine correlations.

Results and Discussion

A total of five hundred dental students participated in this research, with a sample power calculated at 0.81 (**Table 1**). In terms of gender distribution, 35% of participants were male, and 65% were female (**Figure 1**). Regarding the academic year, 10.8% were in the fourth year, 29.9% in the fifth year, and 59.3% in the sixth year. **Table 2** outlines the students' perceptions of their undergraduate endodontic education. Among them, 73.1% believed the time allocated for endodontic education was sufficient, 69.5% rated the quality of lectures as good, and 23.2% felt that the laboratory sessions were too short.

Table 3 presents the comparison of mean confidence scores given by students for each question. Statistically significant differences were found in gender-based confidence when asked about performing anterior RCT (P-value = .001), performing posterior RCT (P-value = .009), determining the restorability of a tooth (P-value = .001), assessing the quality of root fillings (P-value = .000), providing analgesia (P-value = .000), giving post-operative instructions (P-value = .030), being aware of

how to restore a tooth after RCT (P-value = .003), and being aware of when a post is needed (P-value = .020).

Table 4 displays the correlation between dental years and confidence levels, represented by Spearman's correlation values. Statistically significant positive correlations were found with performing anterior RCT (P-value = .000), isolating a tooth (P-value = .015), interpreting radiographs (P-value = .001), giving post-operative instructions (P-value = .001), determining the correct recall period (P-value = .004), knowing how to restore a tooth after RCT (P-value = .000), and knowing when a post is required (P-value = .011). A statistically significant negative correlation was found in placing an inter-appointment dressing (P-value = .019). No significant correlations were observed for the other questions.

Power of sample

Table 1. Power of sample

Mean	5.96
Std. deviation	2.39
Sample size	500
Alpha	0.05
Sample mean	6.23
Standard error of the mean	0.11
Critical value	6.14
Beta	0.19
Power	0.81

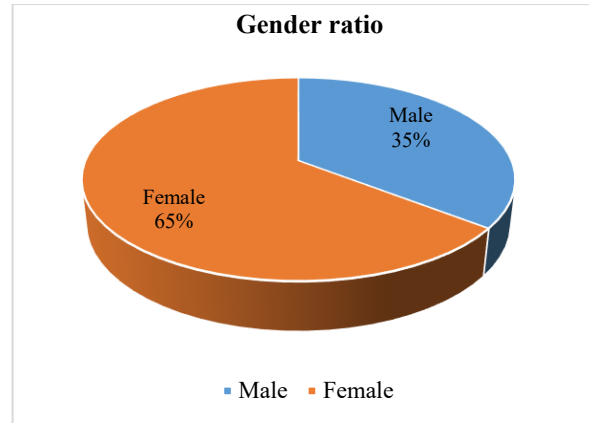


Figure 1. Gender ratio of study participants

The distribution of study participants across different dentistry years is presented in **Figure 2**.

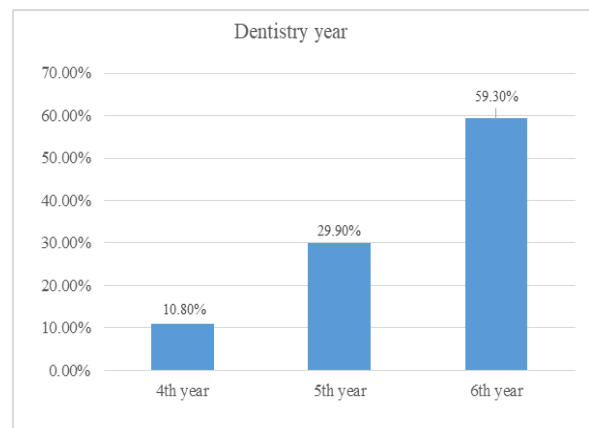


Figure 2. The distribution of study participants across different dentistry years

Table 2. Perception of students toward endodontic education

Perception toward endodontic education	Responses (%)
Time allocated for endodontic education	Less than adequate: 13.2% Adequate: 73.1% More than adequate: 13.8%
Quality of lecture	Less than adequate: 11.6% Adequate: 70.7% More than adequate: 17.8%
Practical laboratory session quality	Less than adequate: 23.8% Adequate: 58.5% More than adequate: 17.8%
Perception of lectures	Good: 69.5% Too long: 8.2% Not clear: 6.4% Repetitive: 16%

Perception of labs/practical sessions	Good: 61.1%
	Poorly organized: 8.4%
	Not enough time: 23.2%
	Not enough attention from supervisor: 7.4%

Table 3. Comparison of confidence scores between females and males

Questions to assess confidence	Males	Females	Total	P-value
Confidence in:	Mean score (1 to 10)			
Performing root canal treatment on anterior teeth	7.65	6.81	7.11	.001*
Performing root canal treatment on posterior teeth	6.08	5.59	5.76	.009*
Assessing the restorability of a tooth	6.62	5.92	6.17	.001*
Deciding when to refer patients	6.34	6.14	6.21	.152
Managing related risks	6.16	5.84	5.96	.062
Evaluating postoperative outcomes	7.43	6.65	6.93	.000*
Administering anesthesia	7.46	6.52	6.86	.000*
Isolating the tooth	7.52	7.49	7.50	.977
Preparing the access cavity	6.89	6.75	6.80	.461
Determining working length	7.26	7.03	7.11	.378
shaping and Cleaning the root canal	7.42	7.03	7.17	.079
Selecting the appropriate irrigation method	7.31	7.30	7.30	.992
Applying an inter-appointment dressing	6.80	6.46	6.58	.210
Filling the root canal	7.07	6.53	6.73	.050
Taking radiographs	7.71	7.42	7.53	.320
Interpreting radiographs	7.58	7.13	7.29	.087
Providing patient instructions	7.61	7.01	7.22	.030*
Determining when to recall the patient	6.69	6.41	6.51	.318
Knowing how to restore the tooth	7.67	6.92	7.19	.003*
Recognizing when post-placement is needed	7.19	6.64	6.84	.020*
Understanding post-retention care	6.79	6.71	6.74	.946

Table 4. The relationship between confidence levels in performing various procedures and the years of study in dentistry

Questions to assess confidence	Spearman's correlation	P-value
Conducting root canal treatment on anterior teeth	.293	.000*
Conducting root canal treatment on posterior teeth	-.021	.646
Assessing the restorability of a tooth	.052	.249
Deciding when to refer patients to specialists	.004	.923
Managing related risks	-.027	.551
Evaluating postoperative outcomes	-.070	.118
Administering anesthesia	-.016	.714
Isolating the tooth	.109	.015*
Preparing the access cavity	-.004	.922

Determining working length	.043	.338
shaping and Cleaning the root canal	.058	.194
Selecting the appropriate irrigation method	.072	.105
Applying an inter-appointment dressing	-.105	.019*
Filling the root canal	.008	.861
Taking radiographs	.179	.000*
Interpreting radiographs	.154	.001*
Providing patient instructions	.151	.001*
Determining when to recall the patient	.128	.004*
Knowing how to restore the tooth	.163	.000*
Recognizing when post-placement is needed	.114	.011*
Understanding post-retention care	.052	.245

This research aimed to assess dental students' confidence levels in performing endodontic treatments and their perceptions of their undergraduate endodontic education. Overall, students expressed satisfactory views regarding the time allocated to endodontic education, the quality of lectures, and laboratory sessions, and their general perception of both lectures and practical sessions.

In a study at Taibah University, dental students reported varying levels of confidence in different stages of root canal treatment, such as taking and interpreting radiographs, determining working length, evaluating root canal obturation quality, and recalling patients appropriately. Fourth-year students demonstrated more confidence in these practical aspects than their fifth-year counterparts [10]. In contrast, our study found no significant relationship between dentistry year and confidence in determining working length or assessing the quality of root canal obturation. However, final-year students reported higher confidence in taking and interpreting radiographs and in recalling patients.

A study conducted in the UK found that confidence in performing root canal treatments, both anterior and posterior, increased with each year of dental education. Many students expressed the belief that adequate time and quality of instruction were essential for effective learning. Suggested improvements included more staff supervision and additional endodontic practice on extracted teeth before treating patients. The study found a significant link between students' clinical experience and their confidence in completing RCT [11]. While the findings from the UK study align with our observations, our study did not show an important relationship between confidence in performing posterior RCT and the year of

dental study, unlike the UK-based study. But, other results were consistent with the previous research.

Upon completing their studies, dental graduates are expected to possess the ability to make accurate diagnoses. While some studies have indicated that general practitioners feel confident in performing root canal treatments, numerous other investigations highlight a concerning trend of suboptimal RCTs, where periradicular disease often goes undiagnosed and untreated. Several factors may contribute to this issue, such as the complexity of the procedures, insufficient understanding of treatment objectives and principles, inadequate undergraduate training, and limited financial compensation for the time spent. As a result, it is essential to enhance the strategies for teaching endodontics at the undergraduate level and to focus on improving both the knowledge and confidence of dental students [12].

Conclusion

- The overall student feedback on the quality of endodontic education is positive.
- However, the students' confidence levels are somewhat above average, which is not entirely consistent with their satisfaction with the education received in endodontics.
- Male students reported slightly higher confidence in performing root canal treatments compared to female students.
- Confidence levels generally improve as students progress through their dental education, moving from lower to higher academic levels.

- It is essential to ensure that students possess both solid knowledge and the confidence to apply it effectively.

Acknowledgments: The authors would like to express their gratitude to the research center at Riyadh Elm University for their support and collaboration.

Conflict of Interest: None

Financial Support: None

Ethics Statement: None

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