

Endodontic–Periodontal Lesions: A Cross-Sectional Study Assessing Knowledge and Diagnostic Proficiency among Senior Undergraduate Dental Students at Qassim University

Diagnostic proficiency in endodontic-periodontal lesions (EPLs)

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ABSTRACT

Objective: To assess the knowledge and diagnostic proficiency of senior undergraduate dental students regarding endodontic–periodontal lesions (EPLs) at the College of Dentistry, Qassim University.

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted at the College of Dentistry, Qassim University, Saudi Arabia, September-October 2025.

Methods: A structured 17-item survey was distributed to the 4th- and 5th-year Bachelor of Dental Surgery (BDS) students. Fourteen items assessed knowledge (classification, routes of communication, diagnostic tests, prognosis, microbiology, and treatment principles), and three case-based scenarios assessed diagnostic proficiency. Data were analyzed using SPSS Version 25. Differences between academic years were evaluated using the chi-square test. Binary logistic regression was performed for case-based scenarios to estimate odds ratios (OR) with 95% confidence intervals (CI). A p-value <0.05 was considered statistically significant.

Results: 54 students participated (4th-year: 28 [51.9%]; 5th-year: 26 [48.1%]). 5th-year students achieved higher correct responses than 4th-year students for key knowledge items. Significant differences were observed in recognition of dentinal tubule exposure as a communication pathway (81.3% vs 46.4%; p=0.020) and extraction preference in periodontal-origin combined lesions (87.3% vs 53.2%; p=0.012). Logistic regression showed that 5th-year students had higher odds of correctly diagnosing an endodontic–periodontal lesion (OR=4.05; 95% CI: 1.30–12.62; p=0.016) and a periodontal–endodontic lesion (OR=3.33; 95% CI: 1.03–10.80; p=0.044). No significant difference was observed for the true combined lesion (p=0.530).

Conclusion: Senior undergraduate dental students demonstrated moderate knowledge and variable diagnostic proficiency regarding EPLs, with significantly better performance among 5th-year students in selected domains. Enhanced case-based teaching and structured clinical exposure are recommended.

Key Words: Cross-sectional study, diagnostic proficiency, endodontic–periodontal lesions, knowledge, dental students.

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INTRODUCTION

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Accurate clinical assessment and professional communication in dentistry require standardized diagnostic terminology that links the underlying biological status with clinical and radiographic findings.¹ Simring and Goldberg originally reported the link between pulpal and periodontal disease in 1964. Because the pulp and periodontium share developmental and anatomical connections, disease in one compartment may influence the other, resulting in endodontic–periodontal lesions (EPLs). These lesions remain a therapeutic challenge and require accurate identification of the primary source of infection and the extent of periodontal involvement to plan appropriate treatment.²

EPLs are primarily microbial in origin,³ and cross-infection between the root canal system and periodontium can occur through several pathways: the apical foramen, lateral/accessory canals, dentinal

tubules, developmental grooves, root fractures, and iatrogenic perforations. In general, periodontal destruction progresses from coronal to apical areas, whereas endodontic lesions typically originate at the apex and may extend coronally along the periodontal ligament.⁴

The categorization of EPLs by Simon et al. has provided significant help for making informed clinical decisions.⁵ The primary criteria to consider in treatment choices are pulp vitality and the kind and size of the periodontal defect. A multidisciplinary approach is necessitated by the similarities in the pathophysiology of the two diseases and the several routes linking them. The differential findings of endodontic and periodontal diseases can be complex; yet an accurate diagnosis is crucial to ensure the provision of appropriate therapy.

According to previous research, practitioners in academic institutions demonstrate greater understanding and awareness of endodontic–periodontal lesions (EPLs) than those in hospitals and private dental clinics.⁶ Evidence suggests that undergraduate dental students exhibit limited knowledge of the microbial etiology underlying EPLs.⁶ Which lesions need to be treated initially is unclear.⁶⁻⁷ These lesions are challenging to treat, and the pulpal and periodontal components must be considered in treatment planning.

Undergraduate students play a crucial role in the diagnosis and management of EPLs, and treatment outcomes and prognosis are directly influenced by their knowledge and attitudes.

Given the limited research in Saudi Arabia, this cross-sectional study aimed to evaluate the knowledge, case-based diagnostic proficiency, and treatment decision-making abilities of senior undergraduate dental students regarding EPLs.

METHODS

After obtaining approval from the Committee of Research Ethics, Deanship of Graduate Studies and Scientific Research, Qassim University, Saudi Arabia (registration no. 25-44-01, dated 22-07-2025) the current cross-sectional study was conducted in College of Dentistry, Qassim University, from September to October 2025. A convenience sample of 4th- and 5th-year Bachelor of Dental Surgery (BDS) students was invited to participate. Students in years 1–3, interns, postgraduate trainees, and those who did not provide electronic informed consent were excluded.

These criteria ensured inclusion of students with appropriate clinical exposure to both endodontics and periodontology for evaluating knowledge and diagnostic decision-making regarding EPLs. The criteria were designed to minimize any potential bias and ensure the relevance of the study results to the target population of dental students.

Data Collection: An online close-ended questionnaire in English containing 17 items was administered. The knowledge section comprised 14 items addressing EPL classification, routes of communication, diagnostic tests, microbiology, prognosis, and basic treatment principles. The diagnostic section included three case-based scenarios (brief history with clinical and radiographic images) requiring selection of the most appropriate diagnosis: Case 1 (endodontic–periodontal lesion), Case 2 (periodontal–endodontic lesion), and Case 3 (true combined lesion). The scenarios were adapted from previously published case reports. The questionnaire link was circulated through official university email.

Statistical Analysis: Statistical analysis was performed using SPSS software version 25 (IBM Corp., Armonk, NY, USA). Frequencies and percentages were calculated. Differences in knowledge items were assessed using the chi-square test. For diagnostic scenarios, binary logistic regression analysis was conducted with correct diagnosis (Yes=1, No=0) as the dependent variable and academic year as the independent variable. Odds ratios (OR) with 95% confidence intervals (CI) were calculated. A p-value <0.05 was considered statistically significant.

RESULTS

Fifty-four students completed the survey (4th-year: n=28 [51.9%]; 5th-year: n=26 [48.1%]). Most participants (n=39 [73.2%]) reported having seen EPLs in their clinics, and among these respondents, (n=25 [63.3%]) were 5th-year students. Overall, (n=31 [57.3%]) reported confidence in diagnosing EPLs. 5th-year students more frequently reported awareness of the 2018 periodontal classification, which includes a distinct category for periodontal-endodontic lesions.

Knowledge about EPLs among 5th- and 4th-year students: 53.1% of 5th-year students and 45.7% of 4th-year students correctly identified the direct communication pathway between periodontal tissues and the pulp. 49.22% of 5th-year students identified *Actinomyces comitans* as the most shared bacteria related to EPLs, while 46.54% of 4th-year students marked *T. denticola*. When asked about the prognosis of a true combined lesion, 63.88% of 5th-year students selected the correct answer, whereas 47.98% of 4th-year students responded correctly. More 5th-year students (78.22%) correctly identified the predisposing risk factors for EPLs than 4th-year students (52.54%). Additionally, 63.55% of 5th-year students have reported that vitality test is the most used type of evaluation for identifying a primary endodontic lesion, on the other hand 57.39% chose percussion test. 81.33% of the 5th-year students correctly indicated that exposure of dentinal tubules allows bacterial byproducts and toxins to enter the pulp. Extraction of teeth with periodontal-

origin combined lesions was preferred by 87.34% of 5th-year students compared with 53.22% of 4th-year students. 76.65% of the 5th-year students correctly marked that persistent infection within the root canal system is the chief reason for treatment failure of periodontal-endodontic combined lesions, while 65.54% of 4th-year students chose recurrence of periodontal inflammation as treatment failure of periodontal-origin combined lesions. Chi-square analysis demonstrated statistically significant differences between academic years for recognition of dentinal tubule exposure as a communication pathway ($p = 0.020$) and extraction preference in periodontal-origin combined lesions ($p = 0.012$). No significant differences were observed for the remaining knowledge items (Table 1).

Table No.1: Comparison of knowledge of EPLs between both groups (Chi-Square test of independence)

Item	4 th - Year(%)	5 th - Year(%)	p-value
Bacteria most frequently related to EPLs	38.33%	55.65%	0.424
Direct pathway between periodontal tissue and pulp	45.7%	53.1%	0.785
Prognosis of true combined lesion	47.98%	63.88%	0.260
Predisposing risk factors for EPL	52.54%	78.22%	0.131
Most used evaluation for primary endodontic lesion	57.39%	63.55%	0.733
Exposure of dentinal tubules allows pulp entry	46.39%	81.33%	0.020*
Extraction more beneficial in periodontal-origin combined lesions	53.22%	87.34%	0.012*
Primary reason for treatment failure	65.54%	76.65%	0.473

*Statistically significant value

Comparison of case-based diagnostic proficiency between 5th- and 4th-year students: Students were presented with three clinical cases with varying degrees of EPLs accompanied by clinical and radiographic images and were asked to select the correct diagnosis. In the first scenario, most 5th-year students (69.22%) answered correctly, whereas only 35.56% of 4th-year students did. In the case involving a periodontal-endodontic lesion, 76.78% of 5th-year students selected the correct answer compared with only 48.55% of 4th-

year students. In the final scenario, 65.43% of 5th-year students correctly diagnosed it, while 58.73% of 4th-year students provided the correct diagnosis. Logistic regression analysis revealed that 5th-year students were significantly more likely to correctly diagnose Case 1 (OR = 4.05; $p = 0.016$) and Case 2 (OR = 3.33; $p = 0.044$) compared with 4th-year students. No statistically significant association was found for Case 3 ($p = 0.530$) (Table 2).

Table No.2: Diagnostic proficiency and logistic regression analysis [Comparison of correct diagnoses between 4th- and 5th-year students. Odds Ratios (OR) represent the likelihood of correct diagnosis among 5th-year students compared with 4th-year students (reference group)].

Clinical Scenario	4 th - Year Correct (%)	5 th - Year Correct (%)	Odds Ratio (OR)	95% CI	p-value
Case 1. Endodontic-periodontal lesion	35.56	69.22	4.05	1.30 – 12.62	0.016*
Case 2. Periodontal-endodontic lesion	48.55	76.78	3.33	1.03 – 10.80	0.044*
Case 3. Combined lesion	58.73	65.43	1.42	0.47 – 4.27	0.530

*Statistically significant value

Model: Binary logistic regression with correct diagnosis (Yes=1, No=0) as dependent variable and academic year as independent variable. Reference category: 4th-year students.

DISCUSSION

When pulpal and periodontal inflammatory diseases coexist, they can complicate diagnosis and treatment planning and alter the order in which care should be provided.⁷ EPLs can be either acute or chronic, affecting both pulp and periodontal tissues. It has been stated that endodontic infections increase the formation of periodontal pockets and are a risk factor for periodontitis, whereas periodontitis, trauma, and iatrogenic conditions are considered the main risk groups for EPLs. The development of mixed periodontal-pulpal diseases might result from the bidirectional nature of infection between both tissues, making diagnosis and treatment more difficult.^{8,9} To effectively diagnose the primary source of infection and assess the extent of periodontal and pulpal involvement, students must have a thorough understanding of the endodontic-periodontal relationship. The decision-making process is further complicated by overlapping clinical symptoms and

inconclusive radiographic findings, leading to inconsistent treatment outcomes.

In this context, an online survey was conducted among senior undergraduate dental students to assess their level of knowledge and diagnostic proficiency regarding EPLs. A total of 54 students participated in the study. Most 5th-year students had encountered EPLs in the clinic, and the majority reported being confident in diagnosing such cases. Predictable prognosis is crucial when EPLs are clinically diagnosed. An appropriate treatment strategy is also necessary for the right prognosis.^{10,11} The 2018 revised classification of periodontal disorders includes an additional subsection on EPLs. To facilitate the diagnostic process for medical professionals, the categorization was created based on the symptoms.¹²

When compared to 4th-year students, the majority of 5th-year students had a strong understanding of EPLs. The current results are consistent with those of Almadi et al.,¹³ who also found that senior undergraduate students had a higher level of knowledge about the relationship between EPLs. In the current survey, the majority of 5th-year students identified the bacteria associated with the EPLs as well as the communication pathway between periodontal and pulpal tissue. This finding may be attributed to the undergraduate curriculum's emphasis on theoretical instruction regarding endodontic-periodontal relationships through lectures and seminars. The etiology and pathophysiology of pulpal and apical periodontitis are well recognized; therefore, students should aim to achieve the highest possible success rate. The course of endodontic treatment and the necessary interventions are largely determined by the pulpal and periodontal diagnosis of a tooth.¹⁴ Using the incorrect diagnostic terms may have clinical ramifications and impact the tooth's prognosis. Accurate characterization and diagnosis require a comprehensive clinical and radiographic examination, along with detailed medical and dental history.

In the present survey, three clinical scenarios were used to evaluate students' diagnostic competence in identifying EPLs. 5th-year students demonstrated a higher rate of correct diagnoses compared with 4th-year students, reflecting superior overall diagnostic performance. The comparatively limited exposure of 4th-year students to endodontic-periodontal cases—often allocated to senior students—may explain their lower level of diagnostic abilities. Effective management of EPLs requires a comprehensive understanding of the interrelationship between pulpal and periodontal pathologies. Therefore, undergraduate dental students should remain updated on current evidence and advancements in endodontic-periodontal disease to enhance both their theoretical knowledge and clinical proficiency.¹⁵ The undergraduate curricula should incorporate targeted teaching modules to

overcome these shortcomings. Additionally, interactive, case-based learning may be a useful tactic for closing the knowledge gap between theory and practice.^{16,17} Furthermore, improving undergraduate students' diagnostic abilities is essential. The high rate of overlooked or misdiagnosed cases suggests that more thorough instruction on diagnostic criteria is required, perhaps by including decision-making algorithms or standardized diagnostic checklists in the curriculum. The use of simulation-based training, which allows students to practice diagnosing and treating EPLs in a controlled setting, could also greatly improve diagnostic proficiency and treatment outcomes.¹⁸ The implementation of specialist workshops or training sessions focused on endodontic-periodontal disease management is another important recommendation.

The statistically significant differences observed in selected knowledge items and in two of the three diagnostic scenarios indicate that clinical experience may influence both theoretical understanding and applied diagnostic reasoning. The higher odds of correct diagnosis among 5th-year students suggest that increased clinical exposure enhances decision-making skills in complex endodontic-periodontal cases. However, the absence of a significant difference in the true combined lesion scenario reflects the inherent diagnostic complexity of such cases and highlights an area requiring strengthened educational emphasis.

The primary limitation of this study is the lack of comparable prior research, which restricts the ability to contextualize the present findings. Additionally, cross-sectional design limits the capacity to establish causal relationships between knowledge, attitudes, and practices. Finally, the use of a self-administered questionnaire may have introduced response bias, as participants could have overestimated their level of expertise.

CONCLUSION

The findings of this study indicate that senior undergraduate dental students—particularly those in their fourth year—demonstrate a moderate level of knowledge and awareness regarding endodontic-periodontal diseases. These results underscore the importance of a comprehensive understanding of the endodontic-periodontal relationship to ensure accurate diagnosis and appropriate management of such lesions. Greater engagement in clinical case discussions, structured training programs, and focused educational interventions is recommended to enhance students' clinical competence and strengthen their ability to manage endodontic-periodontal cases effectively.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Rakan Almutawa, Nubesh Khan Syed, Hanan Alharbi
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