

The diagnosis and therapeutic protocols of approximal caries by final-year dental students at Al-Quds University, Palestine

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ABSTRACT

Introduction: In this study, the major criterion used by 69 final-year dental students of Al-Quds University, Palestine, to ascertain the presence of approximal carious lesions through radiographs, and their subsequent treatment plan is outlined. **Methods:** This study was designed to be cross-sectional, whereby a questionnaire containing schematic radiographic diagrams of approximal carious lesions in molars of deciduous and permanent dentition were depicted. The extent of caries was divided into five groups indicating different levels of enamel and dentin involvement: Caries extending to the external one-third of enamel, external two-thirds of enamel, up to the dentino-enamel junction (DEJ), external one-third of dentin, and two-thirds of dentin. **Results:** The absolute and relative frequencies of the study group's responses were recorded. The treatment decisions taken for caries in deciduous and permanent dentition were neither affected by age nor gender. Of the 69 subjects, 26.1% (18/69) chose to treat the approximal caries when it had spread to the DEJ in the deciduous dentition and 39.1% (27/69) chose to treat caries at the DEJ in the permanent dentition, showing a significant statistical variation in response. When studying the difference in response to treating deciduous and permanent dentitions, treating a lesion at the DEJ and within the outer third of dentin in deciduous dentition was lower than the latter in permanent dentition, with a treatment response of 26.1% (18/69) for deciduous and 39.1% (27/69) for permanent dentition for a lesion at the DEJ, and 24.3% (17/69) in deciduous and 33.3% (23/69) for permanent dentition for a lesion in the outer third of dentin. **Conclusion:** These results show a significant difference in the choice to treat approximal caries in deciduous and permanent dentitions, indicating a greater preference for treating caries within dentin in permanent dentition than in deciduous dentition.

Key words:

Approximal caries, dental students, Palestinian dental students, therapeutic protocol

INTRODUCTION

In dentistry, the diagnosis of approximal carious lesions is a combination of radiographic and clinical assessment and has been the same for many years.^[1] Radiographic examination of any approximal lesion is crucial to determining its extent. The progression of any carious lesion in dentin can be unexpectedly rapid, and treatment protocols are reflected in the knowledge of the same.^[2] It is possible, however, for the progression of caries to be slow or even reversible in enamel^[3-5] and that the treatment of any lesion limited to radiolucency in enamel alone may be deemed

unnecessary.^[6,7] Any dental professional must have a thorough understanding of the caries process, the different methods of its diagnosis and the various treatment options available, especially those treating pediatric dental patients.^[8] Each dental professional must be trained and competent to make an accurate diagnosis of any dental disease and form a suitable treatment plan in each case in order to achieve optimum dental health.^[9] It is understood that a dentist can accurately diagnose and treat any carious lesion, and many studies have been conducted on this matter. Focus is now being brought to final-year dental students, who are reaching the end of their dental studies and training, to examine their judgment and level of understanding of accurate diagnosis and treatment planning of carious lesions.^[10-12]

The purpose of this study is to examine the treatment protocols selected by final-year dental students when presented with schematic radiographic diagrams of approximal carious lesions in deciduous and permanent dentitions.

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MATERIALS AND METHODS

The study design was cross-sectional, using a questionnaire to collect the required data that were distributed among final-year dental students. The questionnaire was adopted from the study “Evaluation of final-year dental students concerning therapeutic decision making for proximal caries” by Bervian *et al.*, carried out in the state of Rio Grande do Sul, Southern

Brazil. Each student signed a form of free informed consent in order to validate the findings of the study.

Study group

The subjects were students of dentistry in their last semester of final-year of dental school (2013–2014), having received theoretical and clinical knowledge in dental radiology, operative dentistry, and pediatric dentistry.

The questionnaire

The questionnaire [Figure 1] asked for the age and gender of each final-year dental student to record for statistical analysis. Names were not necessary to mention. They were given radiographic images of approximal carious lesions spread over five levels of enamel and dentin, one for each, deciduous, and permanent dentition. The five levels of caries were as follows:

- Lesion involving the external third of enamel
- Lesion involving two-thirds of enamel
- Lesion up to the dentino-enamel junction (DEJ)
- Lesion involving the external third of the dentin
- Lesion involving two-thirds of the dentin.

The image of the deciduous molar was that of a 6-year-old patient with decayed, missing, and filled deciduous infant teeth (dmft) =1, and the permanent molar was that of a 15-year-old patient with decayed, missing, filled, tooth (DMFT) =1. The same question was asked for each image:

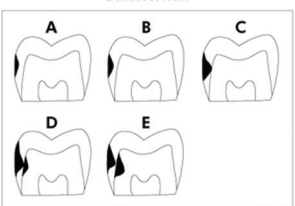
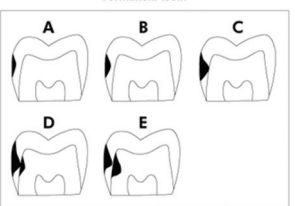
Questionnaire concerning therapeutic decision	
Number:	Gender: (1) Male (2) Female Age: years-old
Dental school:	
Diagram of the stages of interproximal radiographic image from a six year-old patient / dmft = 1 and a 15-year-old patient / DMFT = 1.	
Deciduous teeth	Permanent teeth
	
<p>A - lesion involving the external third of the enamel; B - lesion involving two thirds of the enamel; C - lesion up to the dentino-enamel junction;</p>	<p>D - lesion involving the external third of the dentine; E - lesion involving two thirds of the dentine.</p>
<p>Question 1: From which stage onward do you believe immediate restorative treatment is required in the deciduous dentition? () A () B () C () D () E</p>	
<p>Question 2: From which stage onward do you believe immediate restorative treatment is required in the permanent dentition? () A () B () C () D () E</p>	

Figure 1: Questionnaire administered to the final-year dental students

- Question 1: From which stage onward do you believe immediate restorative treatment is required in the deciduous dentition?
- Question 2: From which stage onward do you believe immediate restorative treatment is required in the permanent dentition?

The students simply have to answer at which level of caries they would decide to restore the approximal carious lesion in each of the two cases.

The results were then collected and analyzed as statistical data.

Data analysis

The restorative treatment decisions made by the 69 dental students were recorded as relative and absolute frequencies. There was a complete dichotomy of the resultant answers; therefore the five levels of caries extension within the molars in question were categorized as:

- Lesions extending up to the DEJ
- Lesions penetrating from the external third of the dentin onward.

The Chi-square and McNemar tests were carried out to determine differences in restorative choice between age groups and the gender of the dental students. Results were then tabulated.

RESULTS

The responses of 69 final-year dental students were analyzed, with a response rate of 100%. Of the total of 69 students, 78.2% (n = 54) were females and 21.7% (n = 15) were males. The ages of the subjects ranged between 21 and 26 years, with a mean age of 22.35 years and a standard deviation of 1.012. Figure 2 and Table 1 show the age range of all the 69 subjects and their respective responses.

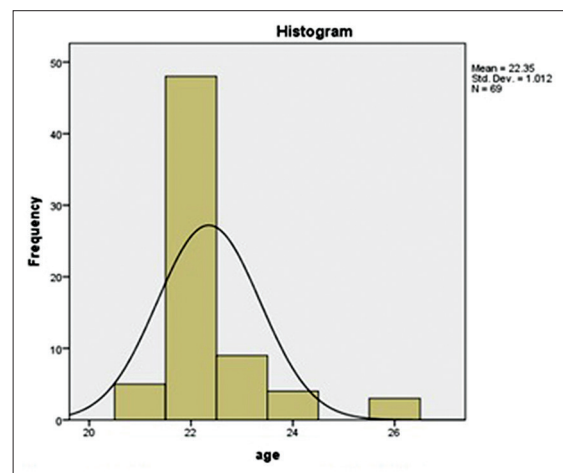


Figure 2: The age range of the 69 final-year dental students

When examining at what level each of the 69 students chose to opt for restorative treatment of the deciduous dentition, the results were as follows: External 1/3rd of enamel: $n = 9$ (13%); 2/3rd of enamel $n = 12$ (17.4%); DEJ: $n = 18$ (26.1%); external 1/3rd of dentin $n = 17$ (24.6%); 2/3rd of dentin $n = 13$ (18.8%).

The results of the permanent dentition responses were as follows: External 1/3rd of enamel: $n = 3$ (4.3%); 2/3rd of enamel $n = 6$ (8.7%); DEJ: $n = 27$ (39.1%); external 1/3rd of dentin $n = 23$ (33.3%); 2/3rd of dentin $n = 10$ (14.5%) [Tables 2 and 3].

There was no difference in response to the age and gender of the subjects. Tables 4 and 5 show the responses of the 54 females and 15 males along with their respective treatment decisions.

DISCUSSION

The variations that exist between the diagnosis and treatment planning of carious lesions can be attributed to

distinctive diagnostic and treatment aids used by different dental practitioners.^[13,14] Using a clinical scenario as in this study, it is absolutely possible to examine what therapeutic measure a final-year dental student would choose to treat approximal caries in both, the deciduous and permanent dentitions. The study conducted was thus to ascertain the responses of final-year dental students in relation to their therapeutic decision-making abilities. The questionnaire clearly specified the age and location of caries of each patient along with their respective dmft and DMFT of the deciduous and permanent cases. This information alone was deemed sufficient to enable any dental student to determine an appropriate restorative treatment plan. When studying the difference in response to treating deciduous and permanent dentitions, the choice to restore two-thirds of enamel caries in deciduous dentition was higher than the latter in permanent dentition, with a treatment response of 17.4% (12/69) and 8.7% (6/69) in deciduous and permanent dentitions, respectively. These results show a greater preference for treating deciduous caries limited to enamel and permanent dentition caries within dentin. On the other hand, the response to treating a lesion at the DEJ and within the outer third of dentin in deciduous dentition was lower than the latter in permanent dentition, with a preference of 26.1% (18/69) for deciduous and 39.1% (27/69) for permanent dentition for a lesion at the DEJ, and 24.3% (17/69) in deciduous and 33.3% (23/69) for permanent dentition for a lesion in the outer third of dentin. These results show a significant difference in the choice to treat approximal caries in deciduous and permanent dentitions, indicating a greater preference for treating caries within dentin in permanent dentition than in deciduous dentition, and a higher preference for treating enamel caries in deciduous dentition than in permanent dentition.

These findings indicate a generalized preference for treating caries within enamel in deciduous dentition among final-year dental students and a greater preference for treating caries within dentin in permanent dentition.

Although most demineralized tissue shows on radiographs, this diagnostic criterion is not sufficient. Other clinical symptoms need to be taken into account in order to further validate the results of the study.^[4,15] A larger sample would give more accurate results, involving subjects from various dental schools. Consideration may be given to including patients over a wider range of ages, with or without systemic conditions, and even those with caries on occlusal and labial/buccal or lingual/palatal surfaces. The need for improving diagnosis and setting a basic diagnostic guideline^[16] for students is apparent, aiming to reduce biases produced clinically.

No single study can be deductive of any given result, and further improvements in study design and sample

Table 1: Ages

Valid	Frequency	Percentage	Valid percentage	Cumulative percentage
21	5	7.2	7.2	7.2
22	48	69.6	69.6	76.8
23	9	13.0	13.0	89.9
24	4	5.8	5.8	95.7
26	3	4.3	4.3	100.0
Total	69	100.0	100.0	

Table 2: According to the attached picture from which stage onward do you believe immediate restorative treatment is required in deciduous dentition?

Valid	Frequency	Percentage	Valid percentage
A-External third	9	13.0	13.0
B-Enamel	12	17.4	17.4
C-DEJ	18	26.1	26.1
D-External third dentin	17	24.6	24.6
E-2/3 dentin	13	18.8	18.8
Total	69	100.0	100.0

DEJ – Dentino-enamel junction

Table 3: According to the attached picture from which stage onward do you believe immediate restorative treatment is required in permanent dentition?

Valid	Frequency	Percentage	Valid percentage
A	3	4.3	4.3
B	6	8.7	8.7
C	27	39.1	39.1
D	23	33.3	33.3
E	10	14.5	14.5
Total	69	100.0	100.0

Table 4: Responses to treatment of approximal lesions of the male and female subjects

Gender	According to the attached picture from which stage onward do you believe immediate restorative treatment is required in deciduous dentition?														
	A			B			C			D			E		
	Count	Row n (%)	Column n (%)	Count	Row n (%)	Column n (%)	Count	Row n (%)	Column n (%)	Count	Row n (%)	Column n (%)	Count	Row n (%)	Column n (%)
Female	8	14.8	66.7	10	18.5	66.7	14	25.9	73.7	15	27.8	100.0	7	13.0	87.5
Male	4	26.7	33.3	5	33.3	33.3	5	33.3	26.3	0	0.0	0.0	1	6.7	12.5

Table 5: Responses to treatment of approximal lesions of the male and female subjects

Gender	According to the attached picture from which stage onward do you believe immediate restorative treatment is required in permanent dentition?														
	A			B			C			D			E		
	Count	Row n (%)	Column n (%)	Count	Row n (%)	Column n (%)	Count	Row n (%)	Column n (%)	Count	Row n (%)	Column n (%)	Count	Row n (%)	Column n (%)
Female	2	3.7	100.0	5	9.3	83.3	15	27.8	93.8	24	44.4	72.7	8	14.8	66.7
Male	0	0.0	0.0	1	6.7	16.7	1	6.7	6.3	9	60.0	27.3	4	26.7	33.3

selection may lead to more definitive results in future studies of a similar nature.

CONCLUSION

The current study showed that final-year dental students were capable of diagnosing approximal caries from radiographic images and were independently able to determine at what stage to treat caries in both deciduous and permanent dentitions. Fewer preferred treating the lesion early when it was limited to the enamel alone while the majority of the subjects opted to treat caries when it had reached and surpassed the DEJ in permanent dentitions.

Further education needs to be provided as to whether improved diagnostic aids and treatment protocols need to be implemented for final-year dental students in the process of their diagnostic and radiological training.

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