

Treatment Patterns of Deep Occlusal Caries among Dentists in Saudi Arabia

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Abstract

Introduction: Dental caries is a multifactorial microbial infectious disease that causes demineralization of the inorganic and destruction of the organic tooth material. There are different options for dentists when they have to deal with deep occlusal caries. There are no data focused on managing Deep Occlusal Caries (DCLs) on mildly inflamed teeth and pulp are healthy enough to be rescued in Saudi Arabia. Thus, it is also unknown if dentists practice minimally invasive protocols to remove decayed tissue in their usual clinical procedures. **Methods:** It's cross-sectional observational research with a high degree of confidence based on web-survey questions created by the author. The sample size was 479 estimated using the qualtrics calculator with a confidence level of 95% and a margin of error of 5%. The questionnaire is divided into four categories. We started the questioner with demographic factors including age, nationality, dental degree date, country, work setting, and cariology course attendance. Second, it was about three clinical scenarios. Google forms were used to gather data, and microsoft excel was used to prepare the data for analysis. Statistical analysis was performed using the SPSS software. **Results:** A total of 479 participants responded, dental students and interns, students (N=220, 41.8%), dental interns (N=121, 25.3%), general practitioner (N=128, 26.7%) and specialists (N=30, 6.3%). Participants was predominantly males (N=263, 54.9%) while females (N=216, 45.1%). Concerning the nationality Saudi-Arabian participants (N=456, 95.2%) and non-Saudi-Arabian (N=23, 4.8%). 66.2% had attend and undergo educational courses in the cardiology field in the last 5 years. Most of the respondents worked in private practice (N=75, 26.9%). **Conclusion:** Dentists still had no consented treatment approach for deep caries lesion teeth. The most chosen therapy in the case of deep caries lesion with reversible pulpitis is total caries excavation.

Keywords: Deep occlusal caries; Reversible pulpitis; Caries lesion

Introduction

Dental caries is a multifactorial microbial infectious disease that causes demineralization of the inorganic and destruction of the organic tooth material there are different options for dentists when they have to deal with deep occlusal caries. First of all, indirect pulp capping (selective caries removal) and leave a thin layer of caries above the pulp to prevent exposure and cover it with a protective liner. Second, direct pulp capping (non-selective caries removal) complete removal of caries and apply protective dressing directly over the exposure. Instead, proceeds with the endodontic-related procedure. [1] All essential pulp treatment techniques aim to generate a condition that allows for the creation of a hard tissue barrier and tissue healing, ensuring that the crucial tooth stays in the mouth. As a result, calcium hydroxide aids in the creation of hard tissues and the repair of the pulp. [2]

Mechanical instabilities and material absorption over time are

disadvantages. [3] Porosities ("tunnel defects") in the reparative dentin are seen after calcium hydroxide application, which might serve as an entrance route for bacteria. [4] Despite the fact that further long-term clinical research on vital pulp treatment using hydraulic calcium silicate-based cement (MTA) would be preferred, they appear to be more suitable for pulp capping than calcium hydroxide. The conditions for vital pulp therapies after carious pulp exposure appear unfavorable compared to trauma-induced exposure, it's still feasible to have a fair success rate. Indirect pulp capping with calcium hydroxide preparations had rates of 62% and 98% after 3 to 10 years. [5] There are just a

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few studies in the literature on MTA and indirect pulp capping, thus more research appears to be needed. [6] Direct pulp capping with calcium hydroxide can achieve almost 60% success rates after ten years if proper indication and technical implementation are followed. Success rates are greater at 80% when utilizing hydraulic calcium silicate-based cement, such as Mineral Trioxide Aggregate (MTA). [7] In Saudi Arabia, there are no data focused on the management of DCLs on teeth with reversible pulpitis. Thus, it is also unknown if dentists are practicing minimally invasive protocols to remove decayed tissue in their usual clinical procedures. This goal of this study to conduct a questionnaire to carry out dentists knowledge, practice patterns, and factors regarding the conservative approach to DCLs in teeth with reversible pulpitis.

Our study aims to measure and estimate practice patterns of treatment of occlusal carious with deep lesions among dentists and distinguish between dentists' decisions to choose either an indirect pulp capping, direct pulp capping, or proceeds with endodontic related procedures in Saudi Arabia. However, when looking at the previous research, we found a few samples of the same idea, but nothing similar was discovered in Saudi Arabia. The institutional review board of King Khalid University in Asir, Saudi Arabia, approved this study (reference: IRB/REG/2019-2020/27).

Materials and Methods

It's cross-sectional observational research. The questionnaires were developed originally by the author with a high confidence level. The sample size was 479 estimated using the qualtrics calculator with a confidence level of 95% and a margin of error of 5%.

Respondent has been included in the study, a dental practitioner in a private or government clinic agreed to participate.

The survey was made up of four categories. We started the questioner with demographic factors including age, nationality, dental degree date, country, work setting, and cariology course attendance. The second was about three clinical scenarios: Included patients with age ranges (25 for case A, 11 for case B, and 14 for case C) there is no medical history of allergy nor medication usage. Their chief complaint was a pain in posterior teeth provoked by chewing or cold. Each case includes a clinical occlusal view, periapical view, and clinical occlusal view after opening the lesion, as well as details on the patient's age, general and dental history, oral hygiene habits, and the reason for the consultation and clinical radiograph examination. The respondents had to choose the most likely diagnosis and which treatment would be indicated. The third was one case of an asymptomatic vital tooth with deep caries of a 20 years old female patient. The questions were about the procedure and material to be used. The fourth category is about the dentist's opinion about the main reasons for choosing the treatment's main factors base. Rating some of the statements was the 5th category. We wrote four statements and asked the dentists to answer with (strongly disagree, disagree, no opinion, agree, strongly agree). Respondents were also asked concerning common approaches to treating DCLs. [8] developed originally by Schwendicke et al. [9] and questions concerning the respondents' reasons for their

treatment preferences and knowledge-related attitudinal items [8] developed initially by Schwendicke et al. [9] and Stangvaltaite et al. [10] The data collected using the "Microsoft Office Excel Software" program (2019) for windows. Will then be transferred to the Statistical Package of Social Science Software (SPSS) program, version 20 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp). This research was approved by the institutional review board at King Khalid University, Asir, Saudi Arabia, reference: IRB/REG/2019-2020/27.

Results

A total of 479 participants were The responses was obtained by 479 dentists, dental students and interns, students (N=220, 41.8%), dental interns (N=121, 25.3%), general practitioner (N=128, 26.7%) and specialists (N=30, 6.3%). Participants was predominantly males (N=263, 54.9%) while females (N=216, 45.1%). The participants with Saudi-Arabian nationality (N=456, 95.2%) and non-Saudi-Arabian (N=23, 4.8%). 66.2% had attended undergone educational courses in the cardiology field in the last five years. The majority of the respondents worked in private practice (N=75, 26.9%) [Table 1]. For pulpal diagnosis and treatment options, three clinical cases are shown in the Figure 1.

Regarding the pulpal diagnosis in case, the most frequent diagnosis was reversible pulpitis (N=408, 85.2%). Total caries excavation in 1 step was answered as the best treatment (N=232, 48.4%). The most selected in case 2 diagnosis was reversible pulpitis (N=270, 56.4%) and (N=192, 40.1%) selected healthy pulp. (N=360, 75.2%) had select total caries excavation in 1 step as the best treatment. For case 3, the Most chosen diagnosis was reversible pulpitis by (N=269, 56.2%), while irreversible pulpitis was selected by (N=135, 28.2%). The majority of the respondents selected root canal excavation as the best treatment (N=139, 29%), total caries excavation in 1 step was selected by (N=126, 26.3%), and total caries excavation in 2 steps by (N=115, 24%) [Figure 1].

Regarding the participants' response to the clinical situation of an asymptomatic vital tooth with deep caries lesion on 20 years old patient, The majority by (N=195, 41.1%) would proceed with caries removal by two steps (stepwise excavation), (N=158, 33.3%) selected total caries removal, direct pulp cap if there is a small pulpal exposure, and (N=82, 17.3 %) chose total caries removal, direct pulp cap if there is a small pulpal exposure, and root canal therapy if there is a small pulpal exposure. It appeared

Table 1: demographic data for participants of the survey.

Variant	N
Position	
Students	220
Dental Intern	121
General Practitioner	128
Specialists	30
Gender	
Male	263
Female	216
Nationality	
Saudi-Arabian	456
Non-Saudi-Arabian	23

that the option “Total caries excavation in 1 stepwise greater chosen by participants who received cardiology courses in the last five years. Participants who selected (stepwise excavation) if pulp exposure is a concern, leave some carious dentin near to the pulp and complete the caries eradication process a few weeks or months later. (N=185, 38.6%) Chose to remove caries two weeks to three months, (N=90, 18%) chose to remove caries after three to six months, and only (N=20, 4.2%) chose caries removal more than six months.

The major filling material would be placed between 2 appointments of 2 steps (stepwise excavation) 48% of the participants selected glass ionomer, 35.7% chose composite, 9% who chose 9%, and only 4% chose cavitec. In contrast, the least chosen material is amalgam filling by 0.8%. Good clinical results showed the main reasons and factors influencing particular treatment decisions of dental practitioners treating deep caries lesions by 26.2%. Clinical research was recommended by 18.4%, 17.3% chose proven efficacy, 14.2% recommended in textbooks, 12.1% Ease of use and familiarity with the technique, 6.8% recommended by a colleague, and the least selected was profitability by 5% only [Figure 2]. Treatment choice is based on the main factors multiple selected per respondent.

Patient oral health was the most selected by 21.7%, patient age by 18.2%, Patient general health by 14.6%, patient attitude and preference by 14%, further restorations needs of the tooth by 11.5%, Type of the tooth (anterior, premolar, molar) by 11.4%,

and only 8.6% duration of the total treatment. Four statements were included in the inquiry on knowledge and attitude about caries lesions care, for which respondents had to choose agreement or disagreement on a 5-point scale [Table 2]. The first question was about removing cariogenic microorganisms is a must, or the carious will progress; 8.8% strongly disagree, 21.1% disagree, 13.6% no opinion, 37.8% agree, 18.8% strongly agree 14 percent strongly disagree, 21.5 percent disagree, 16.7 percent no view, 36.5 percent agree, 11.3 percent strongly agree that a certain quantity of microbe can be left under the restoration since the carious lesion would not progress if it is sealed. Complete removal of the carious lesion as it considers a danger to the pulp’s vitality, 3.5% strongly disagree, 12.5% disagree, 14% no opinion, 45.9% agree, 24% strongly agree.

To avoid pulp exposure in the case of a deep carious lesion, dental tissue near to the pulp must be protected. 8.1 percent disagree strongly, 25.7 percent disagree, 12.3 percent have no view, 37.4% agree, and 16.5% strongly agree [Figure 3].

Discussion

The study aims to evaluate the pattern of treatment of deep caries lesions among Saudi Arabian dentists. Participants were predominantly males by 54.9%, where females were 45.1%. Most of the participants were Saudis by 95.2%. The findings showed a significant preference in diagnoses, and most of the participants were students and interns. That may contribute to

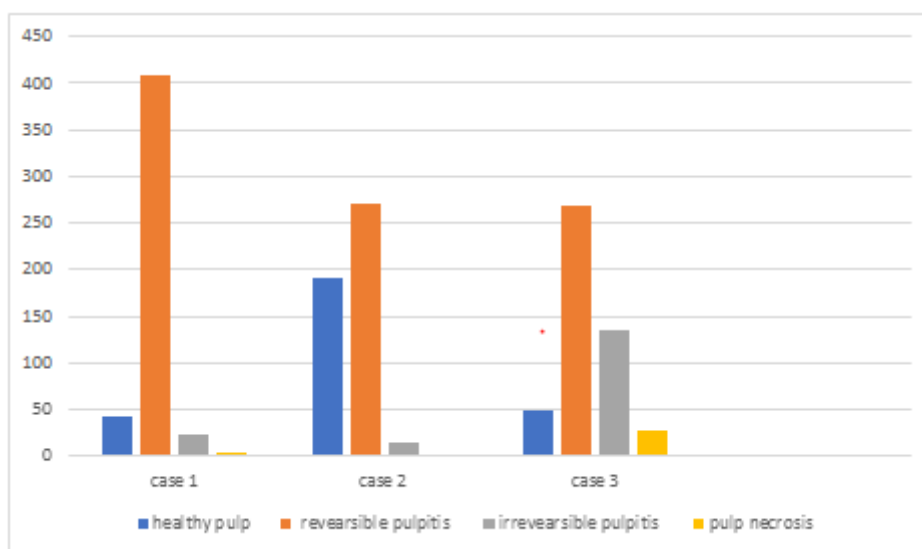


Figure 1: Chosen diagnosis by respondents.

Table 2: Main factors you base your choice.

Question	Variables			
	N	Percent	Percent of Cases	
Main factors you base your choice?	Patient's general health	242	14.60%	50.70%
	Patent's age	302	18.20%	63.30%
	Patient's oral health	360	21.70%	75.50%
	Patient's attitude and preferences	232	14.00%	48.60%
	Type of tooth (Anterior, Premolar, Molar)	189	11.40%	39.60%
	Further restoration needs of the tooth	190	11.50%	39.80%
	Duration of the total treatment	142	8.60%	29.80%

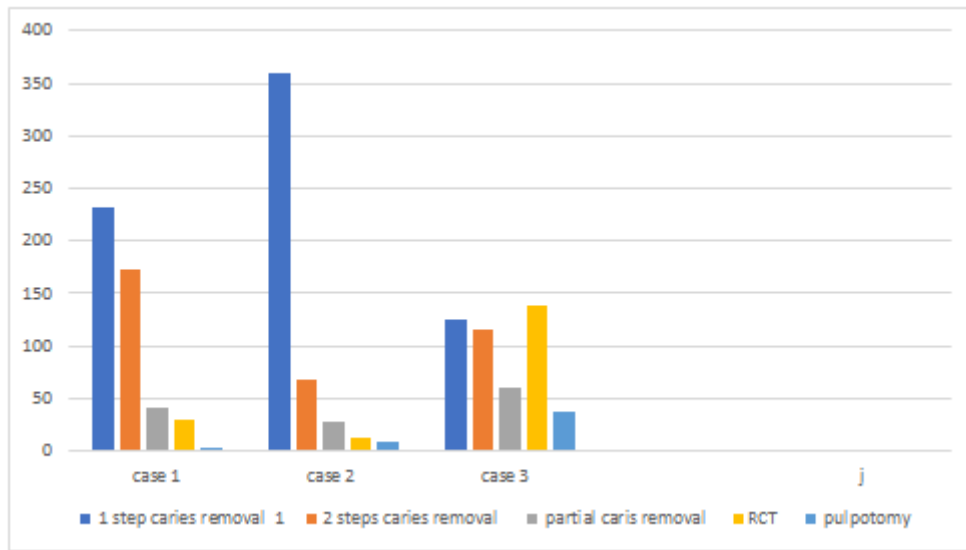


Figure 2: The best treatment regarding the respondents' choice.

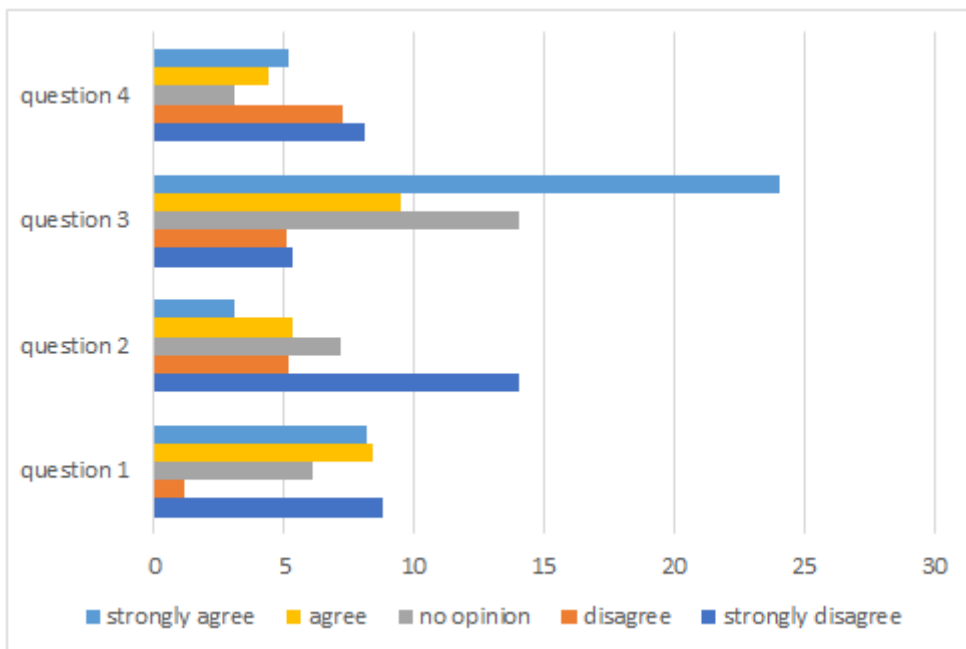


Figure 3: Scale represents the 4 statements of agreement and disagreement in percentage.

why most participants had educational courses in cardiology in the last five years. Many participants chose their answers from experience with good results, but most had their other reasons for selecting these answers for treatment. The same survey was used in many countries to investigate the dentist's knowledge, attitudes, and decisions regarding deep caries lesions, and the three cases were used too.

Regarding all case scenarios in the survey, most of the participants' answers (case 1: 85.2%, case 2: 56.4%, and case 3: 56.2%) were referred to the cases as Reversible Pulpitis since caries did not reach the pulp, and the thermal tests on the cases were not prolonged pain due to stimuli, Compared with same case scenarios, a survey was conducted in Spain,^[1] and diagnoses of the same cases mostly were reversible pulpitis. Also, most participants (48.4% case 1 and 75.2% case 2) preferred total caries removal in 1 step as the best treatment for

both. However, for case 3, the majority (29%) preferred root canal excavation as the best treatment option, next to it at 26.3% comes to total caries removal 1 step, in the same case, 35% of American dentist^[8] chose endodontic therapy.

The participants had a clinical situation in the survey about what to do in case of Asymptomatic vital tooth with deep caries on 20 years old patient. The majority of them (41.1%) preferred to do "stepwise excavation." In a study at Michigan's School of Dentistry,^[8] the pediatric dentists were more likely to do the "stepwise excavation" than endodontists and general practitioners. Cases like these can be managed and observed in follow-up appointments and reduce the probability of pulp exposure. On the other hand 33.3% of the participants would do a full caries removal and if there is a pulp exposure, perform direct pulp capping. A study was done between French, German, and Norwegian dentist;^[11] the majority of French and German

practitioners (>66%) would perform complete excavation even for deep lesions, while most Norwegian dentists (84%) opted for stepwise excavation, to eliminate any carious progression. Including the studies done with MTA on direct pulp capping, pulp exposure became a lesser situation because of its effectiveness in pulp protection and favorable outcomes. [12] Lastly, only 17.3% of the participants would do RCT in pulp exposure on a case of asymptomatic pulp exposure, and 5% of the participants might find this profitable. In the same case, 35% of American dentists would go to RCT. [8]

The option “Total caries excavation in 1 step” was greater chosen by participants who received courses in cardiology in the last five years, since courses now prefer removing all cariogenic organisms in the DCL and students and interns in this study are the majority of the participants. The ones who selected (stepwise excavation) “if there is a risk of pulp exposure, leave some carious dentin close to the pulp and then finish the caries removal a few weeks or months later” 38.6% chose to remove caries two weeks to 3 months, 18% chose to remove caries after 3 to 6 months, and only 4.2% chose caries removal more than six months. That is why it is recommended to do full caries excavation in recent courses in cardiology, because as a study suggested, [13] “those treated by stepwise excavation was 17.5%. The difference was statistically significant. The teeth with no pulp exposure after direct or stepwise excavation showed normal clinical and radiographic conditions at the last check-up (=43 mouths)”.

The major filling material would be placed between 2 appointments of 2 step (stepwise excavation) is glass ionomer selected by 48% of the participants, since it has more benefits in DCL as a full restoration or base material, with its alkaline PH to prevent any caries progression and release of fluoride. 35.7% chose composite, it is best to be used in full caries removal because microleakage and caries progression will resume if left under composite. Only 4% chose cavity, this material is contraindicated in the vital tooth as temporary restoration and not to be used. The least chosen material is amalgam filling by 0.8%, as the composite is placed in case of caries left under the filling.

The most selected choice regarding the reasons and factors influencing the treatment decisions of dental practitioners treating deep caries lesions was “good clinical results” by 26.2%, compared with different studies Gallardo et al. [1] (82%) and Stangvaltaite et al. [10] (85%) had “good clinical results” as their most reported as the selection of treatment of deep caries lesion. Moreover, patient-related factors, patient oral health was the most selected by 21.7%, compared with Gallardo et al., the same patient oral health was the most selected factor by 84%.

Regarding the questionnaire of scale for five from strongly agree to strongly disagree, when asked if cariogenic microorganisms must be removed or caries would progress, 37.8% agreed, followed by 35.5% of total disagreement to question if a certain amount of microorganisms could be left during caries removal.

Conclusion

There is no consistent treatment method of deep caries lesion teeth among dentists. The most chosen treatment in case of deep

caries lesion with reversible pulpitis is total caries excavation.

The answers given by the respondents conclude that some Saudi Arabian dentists and students have not incorporated the new knowledge and concepts about caries lesions and a more conservative approach towards deep caries lesion into their usual clinical practice. Although there is plenty of scientific knowledge, this knowledge is not being performed into daily practice.

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