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Management of deep carious lesions among Syrian dentists: a cross-sectional study

Rashad Alghorani¹, MHD Bahaa Aldin Alhaffar², Hussam Milly^{1*} and Avijit Banerjee³

Abstract

Background Deep carious lesions present significant challenges in dental practice, requiring effective management strategies to preserve tooth sensibility and function. This study aimed to assess Syrian dentists' practices related to deep carious lesions and managing exposed pulps in teeth with reversible pulpitis in permanent teeth. It also examined the impact of dentists' experience and specialization on their choice of techniques and diagnostic tools.

Methods A cross-sectional study was conducted using a self-administered paper-based questionnaire distributed to dentists in Damascus. The questionnaire collected 1- demographic data, 2- clinical decisions before the start of the treatment, and 3- clinical decisions to treat deep carious lesions in different clinical cases and the management of exposed pulps. Data were analyzed to identify trends and differences in practices based on experience and specialization. Data were coded into excel and analyzed using SPSS V.25.

Results The study included responses from 252 dentists. The majority of dentists chose to take radiographs before treatment (69.4%), or do a sensibility test (70.6%). A strong preference for minimally invasive techniques was observed, such as partial caries removal to avoid pulp exposure (71.7%) and the use of hand excavators (53.2%). Dentists with more than 10 years of experience were more likely to work without rubber dam ($p < 0.001$), while endodontists tended to apply rubber dam more than other clinicians ($p < 0.001$). Experienced and specialist dentists were more likely to use rubber dam ($p = 0.001$) and perform sensibility tests ($p = 0.000$). The unique context of practicing in Syria, marked by conflict and political sanctions, significantly influenced decision-making of the biomaterials used, with the majority using calcium hydroxide (60.7%) and avoiding other materials, such as MTA and Biodentine, due to cost (31.5%) and availability (9.2%).

Conclusions This study documented the clinical decision among Syrian dentist before and during the treatment of deep carious lesions. Clinical decisions and practices are significantly affected by years of experience and whether the dentist is specialized or not. General dentists and other specialists were less likely to perform vital pulp therapies when pulp exposed in teeth with reversible pulpitis than endodontists. Complementary education of Syrian dentists in the domain of pulps exposed management appears necessary regarding current recommendations.

Keywords Caries, Selective caries removal, Minimally invasive dentistry, Syrian dentists, Cross-sectional survey

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Background

Deep carious lesions are defined as those that are cavi- tated and penetrate into the inner third of dentin, approaching the pulp. These lesions are clinically signifi- cant due to their potential to cause pulp inflammation, severe pain and ultimately, pulp necrosis if not managed promptly and effectively [1, 2]. The prevalence of deep carious lesions is high globally, particularly in popula- tions with limited access to preventive dental care and oral health education [2]. These lesions significantly impact dental health by increasing the likelihood of tooth loss, which affects mastication, aesthetics and overall quality of life. Different strategies for managing deep carious lesions are used to preserve tooth structure and maintaining pulp sensibility (vitality) whenever possible [3]. Understanding the prevalence and impact of these lesions underscores the importance of early detection, appropriate clinical decision-making, and the implemen- tation of evidence-based treatment protocols [2, 3].

The management of deep carious lesions involves vari- ous techniques. Minimally invasive dentistry (MID) rep- resents a shift towards conservative approaches that prioritize the preservation of tooth structure and pulp sensibility. Banerjee et al. advocate for a minimally inva- sive approach to caries removal, promoting selective techniques to preserve tooth structure and maintain pulp vitality [4]. Complete caries removal in deep caries man- agement is now regarded as overtreatment due to the risk of unnecessary pulp exposure [5, 6]. This has been supported by multiple clinical studies of clinical effec- tiveness in maintaining tooth health while avoiding pulp exposure [3, 7]. Studies also highlight that dentists' deci- sion-making protocols vary significantly based on their background and specialty. General dental practitioners, pediatric dentists and endodontists often have different preferences and approaches to managing deep carious lesions, influenced by their training, perspectives and clinical experience [1, 8].

Syria faces unique challenges in oral health and den- tistry. The prevalence of dental caries is notably high, often progressing to deep lesions due to limited access to preventive care and oral health education [9]. The pub- lic dental care system is largely restricted to emergency dentistry, offering only basic services with no access to advanced procedures or materials [9]. Conversely, pri- vate dental care provides more comprehensive treatment options, however at costs that are prohibitively high for the average Syrian [10]. This economic disparity forces both dentists and patients to choose more affordable options, often relying on cheaper, less advanced materi- als. The prolonged Syrian conflict has exacerbated these issues, limiting the availability of biomaterials, damag- ing infrastructure, and disrupting supply chains. These socioeconomic challenges significantly impact both the

delivery of dental care and patients' access to essential services [10].

Dental education in Syria also reflects these chal- lenges. The country has several public and private den- tal schools distributed across different regions, offering curricula focused on restorative and preventive dentistry [11]. However, recent political and economic turmoil has strained educational infrastructure, reducing access to materials and limiting hands-on training opportuni- ties. The weak dental education environment, as high- lighted in previous studies, may contribute to differences in clinical decision-making between general dentists and those with greater specialization or experience. This emphasizes the importance of understanding how Syrian dentists manage deep carious lesions in a constrained, resource-limited context.

Despite numerous studies on the management of deep carious lesions, there is a notable lack of research documenting the clinical decision-making processes among Syrian dentists when treating these lesions. This gap highlights the need for localized studies to under- stand the specific factors influencing clinical decisions in this context and to develop guidelines that address the unique challenges faced by dentists in Syria. There- fore, the aim of this study was to investigate and docu- ment the decision-making processes of Syrian dentists in Damascus regarding the management of deep carious lesions, identifying the factors influencing their clinical decisions, preferred treatment methods, and materials used to develop context-specific guidelines and improve management practices in Syria. This study tested two null hypotheses: 1- No differences exist in deep caries man- agement in regard to the decision-making process and materials used. 2- No differences exist in decision-mak- ing based on dentists' experience and specialization.

Methods

Ethics

Ethical approval for this study was obtained from the Damascus University Higher Committee for Medical Research (reference number 12245-b-45, June 2023). This study was conducted as part of the main researcher's graduation thesis for his master's degree in endodontics. Informed consent was obtained from all participants prior to their inclusion in the study. Participants signed paper-based consent forms to indicate their willingness to participate. To ensure confidentiality, no identifying infor- mation was collected, and each participant was assigned a unique number to anonymize the data.

Study design

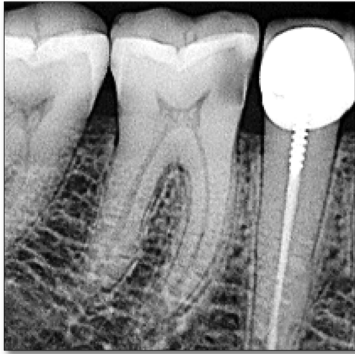

This cross-sectional study targeted Syrian dentists work- ing in Damascus city. A paper-based questionnaire, specifically developed and validated in Arabic for use

among Syrian dentists, was employed, the questionnaire was developed and validated in formal Arabic language, ensuring its alignment with the educational and linguistic context in Syria. Given that the Syrian dialect is one of the closest to formal Arabic, participants had no difficulty understanding the tool. The validation process confirmed the clarity and appropriateness of the questionnaire for the target population. The questionnaire demonstrated good validity and has been previously published [12]. Further questions regarding two clinical cases

were added to the questionnaire (Table 1). The questionnaire comprised three main sections: demographic variables, clinical decisions before starting treatment and clinical decisions regarding the cases (Additional file 1). The questionnaire was piloted and tested for internal and external consistency to ensure reliability.

The study adhered to the PROBE (Preferred Reporting of Observational Studies in Endodontics) checklist, which ensures comprehensive and transparent reporting of observational studies in endodontics. The PROBE

Table 1 Clinical cases presented in the questionnaire in this study

<p>Clinical case 1</p> <p>In this case, the patient is complaining of symptoms that indicate reversible pulpitis, and when conducting caries excavation the pulp was exposed. How do you behave?</p> <p>(x-ray of a mature lower molar with deep caries)</p> 	<p>A. You conduct pulp capping and keep the patient under surveillance</p>
	<p>B. You conduct vital pulpotomy with MTA taking in consideration some factors (size of exposure, isolation, bleeding control.)</p>
	<p>C. You conduct root canal treatment</p>
<p>Clinical case 2</p> <p>In this case, the patient is complaining of symptoms that indicate reversible pulpitis, and when conducting caries excavation the pulp was exposed. How do you behave?</p> <p>(x-ray of an immature lower molar with deep caries)</p> 	<p>A. You conduct pulp capping and keep the patient under surveillance</p>
	<p>B. You conduct vital pulpotomy with MTA taking in consideration some factors (size of exposure, isolation, bleeding control.)</p>
	<p>C. You conduct root canal treatment</p>

checklist includes guidelines on study design, participant selection, data collection and analysis, aiming to enhance the quality and reproducibility of research findings.

Participants were selected using simple random sampling. The paper-based questionnaires were delivered by hand to a random number of dental practices and distributed within the outpatient clinic of Damascus University. The total population of dentists in Damascus city is approximately 4111. Using G-power, the sample size was calculated to be representative of this population. To determine the appropriate sample size for the study, the standard sample size calculation formula for proportions was utilized:

$$n = \frac{Z^2 \cdot P \cdot (1 - P)}{E^2}$$

Given the absence of a specific prevalence rate, a conservative estimate of 50% ($P=0.50$) was employed. With a desired confidence level of 95% ($Z=1.96$) and a margin of error (E) of 5%, the initial sample size was calculated. Considering the finite population of 4111 dentists, applied the finite population correction:

$$n_{adj} = \frac{n}{1 + \left(\frac{n-1}{N}\right)}$$

The adjusted sample size was determined to be approximately 209. An additional 15% was included to accommodate for the potential dropouts during the data collection, making the minimum required sample size 240 participants.

Participants included in this study were Syrian dentists working in Damascus city, who were educated as dentists at one of the universities in Syria and agreed to participate in the study. Participants were recruited using a simple random sampling method. distributed within the outpatient clinic of Damascus University. This approach ensured a representative sample of dentists practicing in Damascus city.

Data collection and variables

The questionnaire used in this study consisted of three sections: demographic variables, clinical decisions before starting treatment (including the use of images, sensibility tests and rubber dam) and clinical decisions regarding the cases (including the type of treatment, materials used, and factors affecting the dentist's decision). The questionnaire was consisted of 21 questions in Arabic language developed and validated [12]. The questionnaire consisted of 21 closed-ended questions. Where the participants allowed to choose only one answer. This was clearly indicated in the questionnaire instructions. The participants were selected randomly by the researcher

and handed the paper-based questionnaire in hand. The paper-based questionnaires were then transferred and coded into an Excel file for data management and analysis.

The primary outcomes measured were the types of treatments chosen by the dentists and the materials used. Secondary outcomes included the factors influencing clinical decision-making, such as diagnostic tests performed and use of moisture control measures like rubber dam. Exposures and predictors were defined as the demographic characteristics of the dentists, including their years of experience and place of education. Potential confounders, such as the type of dental practice (private or public) and patient demographics, were also considered to understand their impact on decision-making processes.

Bias

To address potential sources of bias, several strategies were implemented in this study. Selection bias was minimized by using simple random sampling to ensure a representative sample of practicing dentists in Damascus. To reduce response bias, participants were assured of anonymity and confidentiality, encouraging honest and accurate responses. Additionally, recall bias was mitigated by focusing questions on recent clinical practices and decisions, thereby reducing the reliance on long-term memory.

Statistical analysis

All paper-based questionnaires were transferred to an Excel file, where the database was coded and cleaned to ensure accuracy and consistency. The cleaned data were then imported into SPSS version 25 (IBM Corp., Armonk, NY, USA) for analysis. Quantitative variables, such as the frequency of specific treatments and materials used, were categorized and analyzed using descriptive and inferential statistical methods to identify patterns and associations in the decision-making processes of Syrian dentists in Damascus. The chi-square test, Kruskal-wallis, and Mann-Whitney U tests were employed to assess significant differences between demographic variables and clinical decisions made by the dentists. This test helped identify associations and patterns in the data regarding treatment choices and materials used based on different demographic backgrounds. A p-value of less than 0.05 was considered statistically significant.

Results

Demographic variables

The questionnaire was sent to 290 dentists of them 38 rejected to participate making the dropout rate 13%, and the study included a sample of 252 Syrian dentists practicing in Damascus who completed the questionnaire.

Table 2 Demographic variables

Variables	Categories	Frequency	Percentage
Gender	Male	186	73.8%
	Female	66	26.2%
Age	23–29	119	47.2%
	30–39	61	24.2%
	40–49	30	11.9%
	50–59	28	11.1%
	60+	14	5.6%
Clinical Experience	< 5 years	97	38.5%
	5–10 years	66	26.2%
	> 10 years	89	35.3%
Specialty	General Dentist	118	46.8%
	Endodontist	45	17.9%
	Other	89	35.3%
Restorations per Day	< 5	188	74.6%
	5+	64	25.4%

The sample was composed of 186 males (73.8%) and 66 females (26.2%). The age distribution of participants was as follows: 119 (47.2%) were between 23 and 29 years old, 61 (24.2%) were between 30 and 39 years old, 30 (11.9%) were between 40 and 49 years old, 28 (11.1%) were between 50 and 59 years old, and 14 (5.6%) were over 60 years old. Regarding clinical experience, 97 (38.5%) had less than 5 years, 66 (26.2%) had between 5 and 10 years, and 89 (35.3%) had more than 10 years of experience. The

sample included 118 general dentists (46.8%), 45 endodontists (17.9%) and 89 dentists within other specialties (35.3%). Most participants (188, 74.6%) performed restorations on fewer than 5 teeth daily, while 64 (25.4%) restored more than 5 teeth daily (Table 2).

The clinical decisions made before initiating treatment are summarized in Table 3. Radiographs were regularly used by 175 participants (69.4%), while 24 (9.5%) did not use them and 53 (21%) used them rarely. When asked about the type of radiograph they would use if needed, the responses included bitewing (4.8%, $n=12$), panoramic (39.3%, $n=99$), and periapical (54.4%, $n=137$). Four dentists (1.6%) did not answer this question. Significant differences were observed between radiograph usage and the dentists' years of experience ($p < 0.05$).

Pulp sensibility testing was conducted regularly by 178 participants (70.6%), while 27 (10.7%) did not perform the test and 47 (18.7%) did rarely performed it. When asked about the methods they would use if conducting sensibility testing was needed, the most common responses included air syringe (59.1%), cold test (30.2%), heat test (8.3%), and electric pulp testing (2.4%). A significant difference was observed in the use of sensibility tests among dentists with different specialties ($p < 0.05$), and the number of reservations they perform per day ($p < 0.05$).

Rubber dam usage was reported by 84 (33.5%) participants, whereas 119 (47.4%) did not use it, and 48 (19.1%)

Table 3 Clinical decision before starting treatment

Variables	Categories	Frequency	Percentage	P-Value		
				Clinical experience	specialty	N of restorations
Regular use of Radiographs	Yes	175	69.4%	0.06*	0.000*	0.229
	No	24	9.5%			
	Rarely	53	21%			
Types of Radiographs when needed	Bitewing	12	4.8%	-		
	Panoramic	99	39.3%			
	Periapical	137	54.4%			
	None	4	1.6%			
Regular use of sensibility Testing	Yes	178	70.6%	0.133	0.001*	0.001*
	No	27	10.7%			
	Rarely	47	18.7%			
Methods of Sensibility Testing when needed	Air Syringe	76	30.20%	-		
	Cold Test	21	8.30%			
	Heat Test	149	59.10%			
	Electric Pulp Tester	6	2.40%			
Use of Rubber Dam	Yes	84	33.3%	0.000*	0.000*	0.940
	No	119	47.4%			
	Rarely	48	19.1%			
Reasons for Not Using Rubber Dam	High Cost	1	1.30%	-		
	Difficulty in Application	13	16.50%			
	Discomfort for Patients	40	50.60%			
	Increased Treatment Time	25	31.60%			

* Significant difference

used it rarely. The reasons for not using a rubber dam were only provided by 79 participants and the answers included: high cost (1.3%), difficulty in application (16.5%), discomfort for patients (50.6%), and increased treatment time (31.6%). Significant differences were found between rubber dam usage and the dentists' clinical experience and specialty ($p < 0.05$).

Clinical decision of the treatment and materials used

Table 4 showed the results of the clinical decisions regarding treatment and the materials used. For managing deep carious lesions, 26 (10.4%) participants stopped excavation at soft dentin, while 225 (89.2%) stopped at firm dentin, one participant (0.4%) didn't answer the question. The surface texture was assessed by participants using dental explorer. Significant differences were observed between the excavation depth and the dentists' specialties ($p < 0.05$). When dealing with discolored dentin near the pulp, 56 (22.3%) removed all discolored dentin even if pulp exposure occurred, 180 (71.7%) preferred to leave the discolored dentin and apply a liner and 15 (6%) left the discolored dentin without applying a liner, one participant (0.4%) didn't answer the question. The tools used for deep excavation included hand excavators (53.2%), carbide burs using slow-speed handpieces (41.3%), diamond burs using air-turbine handpieces (4.8%) and chemomechanical methods with Carisolv™ (0.8%). Caries detector dye usage during excavation was reported by 35 (13.9%) participants, while 217 (86.1%) did not use dyes. In treating clinical cases, 33.3% of participants performed direct pulp capping and monitored symptoms, 11.1% performed pulpotomy using materials like MTA with isolation and 55.6% opted for complete

root canal treatment in the first clinical instance. Significant differences were noted between treatment choices and the dentists' years of experience ($p < 0.05$). In the second clinical case, 27.4% performed direct pulp capping, 65.1% performed pulpotomy, and 7.5% opted for root canal treatment. The most commonly used materials were setting calcium hydroxide (60.7%) and MTA (36.5%), with only a few participants using Biodentine (0.4%) and Bioceramic putty (2.4%). There were significant differences in material choice based on the dentists' specialties and clinical experience ($p < 0.05$).

Comparison between specialists and general dentists

The results showed significant differences in treatment strategies between general dentists, endodontists and other specialists in managing such clinical cases. When treating deep caries in matured teeth, endodontists more frequently performed pulpotomy with MTA under isolation (26.7%) compared to general dentists (10.2%) and other specialists (4.5%), with a statistically significant difference ($p = 0.001$). However, complete root canal treatment (RCT) was more commonly performed by other specialists (68.5%) and general dentists (53.4%) as opposed to endodontists (35.6%). When treating deep caries in open apex teeth, endodontists tended to perform pulpotomy with MTA under isolation more frequently (77.8%) compared to general dentists (61%) and other specialists (64%), but with no significant difference ($p = 0.167$) (Table 5).

Table 4 Clinical decision of the treatment and materials used

Variables	Categories	N	%	Clinical experience	specialty	N of restorations
Depth of Excavation	Stop at Soft Dentin	26	10.4%	0.032*	0.481	0.890
	Stop at Firm Dentin	225	89.2%			
	No answer provided	1	0.4%			
Management of Discolored Dentin	Remove All Discolored Dentin	56	22.3%	-		
	Leave and Apply Liner	180	71.3%			
	Leave Without Liner	15	6.0%			
	No answer provided	1	0.4%			
Tools for Deep Excavation	Hand Excavators	134	53.2%	-		
	Carbide Burs	104	41.3%			
	Diamond Burs	12	4.8%			
	Chemomechanical	2	0.8%			
Use of Dye	Yes	35	13.9%	-		
	No	217	86.1%			
Materials Used	Calcium Hydroxide	153	60.7%	0.000*	0.000*	0.418
	MTA	92	36.5%			
	Biodentine	1	0.4%			
	Bioceramic Putty	6	2.4%			

* Significant difference

Table 5 Treatment strategy of the clinical cases between general dentist, endodontic, and other specialized dentist

		General dentist	Endodontic	Other specialty	P-value
Clinical case 1	Direct pulp capping	36.4%	37.8%	27%	0.001*
	Pulpotomy using MTA under isolation	10.2%	26.7%	4.5%	
	Complete root canal treatment (RCT)	53.4%	35.6%	68.5%	
	Total	100%	100%	100%	
Clinical case 2	Direct pulp capping	28.8%	22.2%	28.1%	0.167
	Pulpotomy using MTA under isolation	61%	77.8%	64%	
	Complete root canal treatment (RCT)	10.2%	0	7.9%	
	Total	100%	100%	100%	

* Significant difference

Discussion

The present study evaluated the preferences of Syrian dentists regarding the management of deep carious lesions and pulpal exposures using printed questionnaire that was answered by 252 respondents. This study is the first in Syria to examine the strategies employed by general and specialized dentists in treating deep carious lesions in permanent teeth. This study aimed to document the decision-making factors and outcomes of the Syrian dentists related to the management of the deep carious lesions. This study used a cross-sectional methodology using a paper-based validated questionnaire to collect the answers from dentists of different level of experience and from Damascus city.

The findings revealed a strong preference for minimally invasive techniques, with the majority of dentists favoring selective caries removal over complete excavation. This approach aligns with the current emphasis on preserving tooth structure and maintaining pulp sensibility, reducing the risk of pulp exposure and subsequent complications [2, 7]. A similar study was conducted in Finland showed that the majority of dentists preferred less invasive excavation techniques such as selective removal when treating deep lesion, and when dealing with an asymptomatic pulpal exposure 71% of the respondents went for vital pulp therapy like direct pulp capping or partial pulpotomy [13]. Most clinicians used calcium hydroxide to perform vital pulp treatments, while other study reported that Spanish dentists tended to use

hydraulic calcium silicate cement such as Biodentine when treating vital pulp [14].

When treating deep caries in matured teeth, endodontists were more likely to perform pulpotomy with MTA under isolation compared to general dentists and other specialists. However, complete root canal treatment (RCT) was more commonly performed by other specialists and general dentists as opposed to endodontists. In the study by Koopaei and colleagues, the majority of the clinicians considered endodontic treatment as their first choice when treating deep carious lesions in young patients, even endodontists [15]. Another study by Crespo-Gallardo and others showed that most respondents, 58% considered reversible pulpitis an indication to perform root canal treatment [16].

Given the unique challenges faced by Syrian dentists due to the ongoing political conflict and sanctions, documenting these practices is crucial for understanding and improving dental care in such complex contexts. Overall, these findings underscore the clinical use of minimally invasive techniques by clinicians in managing deep carious lesions in permanent teeth, enhancing patient comfort and compliance while preserving dental health.

The null hypotheses investigated in this study were rejected as the statistical analysis revealed significant differences in the approaches taken by dentists with varying levels of experience and specialization in managing deep carious lesions in permanent teeth. Specifically, dentists with higher experience and those with a specialty in endodontics were more likely to utilize rubber dam during procedures and to perform pulp sensibility tests on affected teeth. This trend highlights the importance of advanced training and accumulated clinical experience in adopting practices that enhance treatment outcomes and patient safety. These practices are less common among less experienced and general dentists, who may face limitations in resources or training. Given the challenging context in Syria, where access to materials and continuing education may be restricted, the adoption of such advanced techniques by more experienced and specialized practitioners underscores their commitment to maintaining high standards of care despite the constraints. This differentiation in practice patterns based on experience and specialization is crucial for understanding how to support and improve dental care in resource-limited settings.

The findings of this study are consistent with global trends in the management of deep carious lesions, particularly the preference for minimally invasive techniques. Studies by Duggal et al. (2022) and Banihani et al. (2021) emphasize the effectiveness of indirect pulp capping in preserving tooth structure and pulp sensibility, which aligns with the high prevalence of these techniques among Syrian dentists [7]. This suggests a broader shift

towards conservative treatments across different regions. Notably, the unique challenges faced by Syrian dentists, including limited access to materials and training due to ongoing conflict and sanctions, underscore the need to document and understand these practices in such complex contexts with increased need for dental care [17], and for public health in general [10]. This contextual nuance is less commonly addressed in other studies, highlighting the importance of this research.

The findings have significant implications for clinical practice, particularly in managing deep carious lesions in permanent teeth. The observed differences in decision-making between experienced dentists and general dentists underscore the need to support and improve the capabilities of the dental workforce. Working in a challenging context like Syria, where the quality of training and access to materials may be limited, can influence these differences [11]. Alfakhry G et al., highlights the weaknesses in the dental education environment in Syria, which could partly explain the variation in clinical decisions between general dentists and those with greater specialization or experience [11]. Most of the treatment decisions taken by the Syrian dentists through this study align with the current practice of minimally invasive dentistry, which aims to reduce patient discomfort and improve long-term outcomes [18–20]. The frequent use of advanced diagnostic tools, rubber dam and sensibility tests by experienced and specialized dentists may help in enhancing diagnostic accuracy and treatment quality, leading to better patient outcomes. Given the unique challenges faced by Syrian dentists, including limited access to materials and training due to conflict and sanctions, it is crucial to develop strategies that support these practitioners. This includes providing access to affordable, high-quality materials and continuing education opportunities, even in resource-limited settings.

One of the primary limitations of this study was the sample being drawn exclusively from Damascus. This geographic limitation may not fully represent the diverse practices and challenges faced by dentists across different regions of Syria, potentially affecting the generalizability of the findings. Cross-sectional studies are also prone to certain biases, including self-reporting bias, where participants may not accurately recall or report their practices. Furthermore, the study's reliance on self-administered questionnaires may introduce response biases, as participants who chose to respond may have different characteristics compared to those who did not participate. These factors could impact the overall validity and reliability of the study's findings.

Conclusions

In this cross-sectional study, Syrian dentists generally favored minimally invasive approaches to deep carious lesions, with selective caries removal and the use of liners to preserve pulp vitality. However, treatment varied significantly by experience and specialization. Endodontists more frequently performed vital pulp therapies, whereas general dentists and other specialists commonly opted for complete root canal treatments. Limited availability and cost of advanced biomaterials (e.g., MTA) influenced material choice. These findings underscore the need to improve training and access to modern biomaterials in resource-limited settings. Future studies should investigate how socioeconomic factors and educational infrastructures shape clinical decision-making, ultimately guiding better curriculum development and care strategies.

Recommendation

Dental schools should prioritize the implementation of a comprehensive, evidence-based cariology curriculum to close the gap between research and clinical application. This requires enhanced communication of research to educators, enabling effective curriculum integration. Dentists require continuing education to learn and apply evidence-based techniques for managing deep caries.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12903-025-05834-5>.

Supplementary Material 1

Acknowledgements

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Author contributions

A.B. and H.M. participated in designing the study. H.M. supervision (lead). R.G. conducted the study, collected the data and did the statistical analysis. A.B. and M.H. writing-review and editing. All authors read and approved the final manuscript before submission.

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Data availability

The data supporting this study's findings are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

This study complies with all relevant ethical standards including the principles outlined in the Declaration of Helsinki and applicable ethical guidelines. The study protocol received ethical approval from the Damascus University Higher Committee for Medical Research (reference number 12245-b-45, June 2023). Informed consent was obtained from all participants prior to their inclusion in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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