

Knowledge, Attitude, and Practice Behavior of Pediatric Dental Postgraduate Students on Non-restorative Cavity Control Technique: A Cross-sectional Study

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ABSTRACT

Background: In the last few decades, the non-restorative treatment approach had been labeled by different names. The term non-restorative cavity control (NRCC) was recently established in 2016. The study aimed to evaluate the knowledge, attitude, and practice behavior about this technique among pediatric dental postgraduate students in India.

Materials and methods: An 18-item questionnaire was prepared from the previously established literature. The sample size was calculated as 234 responses based on the pilot study. The questionnaires were sent to 1,200 participants through the registered email address and WhatsApp as a Google form link. The online responses were received for a period of 4 weeks from July to August of 2020. The data from the responses were collected and descriptive analysis was done using a Microsoft Excel sheet (Version 2016).

Results: A total of 380 responses were received and 35 duplicate responses were eliminated. Among the 345 respondents, 61 (17.7%) were males and 284 (82.3%) were females. The average age of the participants is 27.43 years. About 78.6% ($n = 271$), 17.1% ($n = 59$), and 4.3% ($n = 15$) of the participants were third-year, second-year, and first-year postgraduate students, respectively. The responses were received from 21 out of 24 states' colleges which were conducting pediatric dental postgraduate course. About 271 (76.8%) participants knew this technique with a maximum positive attitude and fewer practice behavior.

Conclusion: The knowledge and attitude about NRCC were good among the pediatric dental postgraduate students but implementing that in practice was relatively less.

Keywords: Non-operative cavity treatment programme, Non-restorative cavity treatment, Sodium fluoride.

International Journal of Clinical Pediatric Dentistry (2021): 10.5005/jp-journals-10005-1908

INTRODUCTION

Dental caries, a dynamic process happening in close association with the dental biofilm, is dependent on the metabolic activity of the biofilm's ecosystem. This metabolic activity makes the carious lesion to progress or arrest over a period of time.¹ Clinical observation suggests that the carious teeth which are free from plaque/biofilm can get arrested at any stage of lesion development.² There is a paradigm shift in the management of carious teeth in recent years, from the conventional restorative or surgical approach to the non-invasive or minimally invasive approach. This shift has greatly emphasized the importance of biofilm alteration in arresting the caries progress.³ These approaches extend from partial caries removal to no caries removal techniques, from stepwise caries removal to non-restorative caries treatment (NRCT). This NRCT treatment approach was first put forward by G.V. Black in 1908 based on his belief in the management of caries by plaque control.⁴

The International Caries Consensus Collaboration (ICCC) in 2016 created a consensus among the recommendations for managing carious lesions and suggested the term called non-restorative cavity control (NRCC).⁵ Non-restorative cavity control has been considered as a causal therapy because it fights against the cause of the disease and not its symptoms.⁶ The treatment approach in NRCC includes the following steps: (1) Gaining consent from parent's/caretaker's about the technique and acceptance to promote plaque control in children, (2) Cavities made accessible for plaque removal by cutting off the undermining enamel in occlusal cavities/slicing the proximal cavities, (3) Application of anticariogenic agents [silver diamine

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How to cite this article: Balasubramani K, Asokan S, Geetha Priya PR. Knowledge, Attitude, and Practice Behavior of Pediatric Dental Postgraduate Students on Non-restorative Cavity Control Technique: A Cross-sectional Study. *Int J Clin Pediatr Dent* 2021;14(2):217-221.

Source of support: Nil

Conflict of interest: None

fluoride (SDF)/varnish/glass-ionomer-layer], (4) Communicate with carers about twice-daily brushing of the shallow/sliced area with fluoride toothpaste, and (5) Recall appointment to monitor the carer's brushing and caries activity of the lesion. The lesion is expected to arrest over weeks or months.⁴ Two types of treatment modalities in NRCC are (1) daily biofilm removal with a toothbrush and fluoride toothpaste, supported by 3-monthly fluoride varnish application or application of a glass-ionomer layer; (2) application of SDF followed by daily biofilm removal with a toothbrush and fluoride toothpaste.⁶ The success of NRCC mainly depends on the parent's/caretaker's ability and preparedness to maintain children oral hygiene, especially in cleansing cavities.⁶ The advantage of NRCC is periodic monitoring of the activity of carious lesions. It can

buy time for a child to develop the cognition to understand and cope with more invasive treatment options.⁷

Non-restorative cavity control is relatively a new approach in caries management and has not been popular due to a lack of awareness among dentists. Some pediatric dentists favor the use of the restorative approach over the biological NRCC approach.⁴ India is the world's second most populated country with a high caries prevalence of about 48.9 and 69.1% in children aged 2–5 and 6–10 years, respectively.⁸ This minimally invasive NRCC technique practice in a developing country like India can be a game-changer in treating carious lesions in a child-friendly and very economical way. So, the present cross-sectional study aimed to assess the knowledge, attitude, and practice behavior on the NRCC technique among pediatric dental postgraduate students in India.

MATERIALS AND METHODS

An online cross-sectional survey using Google forms was planned during the COVID-19 pandemic lockdown. Institutional review board approval and ethical committee clearance were obtained through virtual meetings. The study was conducted based on the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines over a period of 4 weeks from July to August of 2020. The list of students pursuing postgraduation in pediatric dentistry specialty was obtained from the head office of the Indian Society of Pedodontics and Preventive Dentistry (ISPPD). A pilot study was conducted among 70 students to estimate the desired sample size. Based on the prevalence of knowledge (77.47%) obtained, the estimated sample size was 234 with an alpha error of 5% and a power set at 80%. The results of the pilot study were not included in the final analysis.

Questionnaire

The questions used in this study were developed from the information in two previously published articles on NRCC.^{5,6} The questions were framed in the English language. The content and language validations of the questionnaire were done by five experts in pediatric dentistry. The initial questionnaire had 25 items. Following item generation and reduction by the experts, the final questionnaire was reduced to 18 items. The questionnaire consists of five parts: (1) Demographic data, (2) Awareness questions, (3) Knowledge questions, (4) Attitude questions, and (5) Practice questions. The first part included their name, age, gender, year of study, type of college (private or government), and email address. The second part included three questions on their awareness of NRCC, when and how they came to know about this technique. There were nine knowledge-based questions, two attitude-based, and four practice-based questions. All the questions formulated under the awareness, knowledge, and attitude category were closed-ended questions with multiple choices. The practice-based questions comprised of two closed-ended and two open-ended questions. Thus, totally the questionnaire had 16 closed-ended questions and 2 open-ended questions. The knowledge questions were based on the treatment protocol, indications, consequences, and success of NRCC. The attitude questions were constructed to know whether postgraduate students have a positive or negative attitude toward the NRCC technique. The practice questions included the methods and materials used in their clinical practice. The questionnaire (Google form link) was sent through WhatsApp and e-mail (registered in ISPPD) to all postgraduate students

individually and in all accessible WhatsApp groups. The responses were collected from those who were willing to participate in the study. This survey considered the willingness of postgraduates to participate as their consent. The questionnaire was sent to a total of 1,200 postgraduate students across the country and a reminder was sent every week. One hundred and sixty-nine forms were received at the end of 2 weeks and finally, 380 forms were received at the end of 4 weeks. Responses from the participants who were aware of NRCC were statistically analyzed and others were excluded. Care was taken to avoid repetition of responses from the same postgraduate student, by asking them to fill the questionnaire using their registered ISPPD email address. If more than one response was received from the same email address, the first response from that particular email address was included and other responses were excluded from the analysis.

Scoring Criteria

The responses to the awareness questions were calculated in percentages. For the knowledge and attitude questions, the correct/preferred answer for each question was scored as 1 and the wrong answer was scored as 0. The two closed-ended answers for practice questions were scored with 1 for yes and 0 for no. For the open-ended questions, each answer from an individual respondent was noted. If similar answers were given by two or more students they were added and the percentage was calculated. If a single non-similar answer was received, it was numbered and the percentage value was obtained.

Statistical Analysis

The descriptive statistical analysis of the study was done based on the data obtained, using a Microsoft Excel sheet (Microsoft office version-2016). The percentage of correct/wrong answers and analogous answers were provided by Google form summary of responses. It was again cross-checked using a Microsoft Excel sheet.

RESULTS

A total of 380 responses were received within a period of 4 weeks. Repeated responses ($n = 35$) were excluded and the final analysis was done using the 345 responses. The results of the demographic data (Table 1) show that 78.6% ($n = 271$), 17.1% ($n = 59$), and 4.3% ($n = 15$) of the participants were third-year, second-year, and first-year postgraduate students, respectively. The average age of the participants was 27.43 years. The responses were received from students belonging to 19 states and 2 union territories across the country. Maximum responses were obtained from Karnataka state and the minimum response was from Chandigarh.

Table 2 shows the awareness of NRCC among the pediatric dental postgraduate students. Among the 345 participants, 78.6% ($n = 271$) had awareness about the term NRCC. Out of them, 43.2% ($n = 117$) came to know about it from books/journals followed by conferences/conventions/online search, webinars, and faculty/friends. Before COVID-19 lockdown, 60.9% ($n = 165$) and during COVID-19 lockdown, 39.1% ($n = 106$) of participants had acquired knowledge on NRCC.

Table 3 depicts the questions assessing the knowledge on NRCC. About 67.2% ($n = 182$) of participants answered that NRCC can be used to treat both enamel and dental lesions. Non-operative cavity treatment programme (NOCTP) is the procedure used for treating enamel lesions according to 30.6% ($n = 83$) of participants. For the question on the indication of NRCC, only 28%

Table 1: Demographic characteristic of postgraduate students

Demographic data	Distribution		
			III MDS 78.3% (n = 271)
Year of study	I MDS 4.4% (n = 15)	II MDS 17.3% (n = 59)	
Age	Mean: 27.43 years Range: 24–40 years		
Sex	Male 17.7% (n = 61)	Female 82.3% (n = 284)	
College	Government 5.2% (n = 18)	Private 94.8% (n = 327)	
State-wise distribution	Karnataka-21.15% (n = 73), Tamil Nadu-12.17% (n = 42), Maharashtra-11.88% (n = 41), Uttar Pradesh-9.85% (n = 34), Kerala-9.56% (n = 33), Gujarat-6.66% (n = 23), Andhra Pradesh-6.08% (n = 21), Telangana-5.21% (n = 18), Haryana-3.18% (n = 11), Rajasthan-2.89% (n = 10), Chhattisgarh-1.73% (n = 6), Madhya Pradesh-1.44% (n = 5), West Bengal-1.44% (n = 5), Punjab-1.44% (n = 5), Puducherry-0.8% (n = 3), Jharkhand-0.8% (n = 3), Himachal Pradesh-0.8% (n = 3), Jammu and Kashmir-0.8% (n = 3), Odisha-0.8% (n = 3), New Delhi-0.57% (n = 2), and Chandigarh-0.28% (n = 1)		
Total number of students' responses	345		

Table 2: Comparison of responses on the awareness of NRCC

Awareness questions	Yes	No	Total
Are you aware of a term called non-restorative cavity control (NRCC)?	78.6% (n = 271)	21.4% (n = 74)	345
If yes, how did you know about NRCC?	<ul style="list-style-type: none"> Books/journals-43.2% (n = 117) Conferences/conventions/online search-19.9% (n = 54) Webinars-19.6% (n = 53) Faculty/friends-17.3% (n = 47) 		271
When did you come to know about NRCC?	<ul style="list-style-type: none"> Before COVID-19 lockdown—60.9% (n = 165) During COVID-19 lockdown—39.1% (n = 106) 		271

(n = 76) replied right answer. Non-restorative cavity control makes the cavity self-cleansable and this was understood by 69.7% (n = 189) of participants. Slicing of proximal caries makes the cavity V-shaped and prevents food impaction was answered correctly by 41.3% (n = 112) and 37.26% (n = 101) of participants, respectively. No space loss after NRCC, when the contact between the teeth are maintained at the cervical region was replied by 27.67% (n = 75) of the students. About 38.7% (n = 105) of students responded that SDF was applied to prevent sensitivity after slicing of the tooth and 22.5% (n = 61) chose acidulated phosphate fluoride (APF) gel as their response. In treating the children with high caries risk, the order of success was Hall technique > NRCC > Compomer and about 39.9% (n = 108) of the participants had chosen this option. About 190 students (70.1%) presented precisely that success of NRCC is

Table 3: Comparison of responses on the knowledge about NRCC

Knowledge about NRCC	Correct answers	Wrong answers
Can NRCC be used to treat both enamel and dentinal lesions?	67.2% (n = 182)	32.8% (n = 89)
In NRCC, treating the enamel lesions is called as _____	30.6% (n = 83)	69.4% (n = 188)
Which among the following is an indication of NRCC?	28% (n = 76)	72% (n = 195)
Does NRCC make the area of decay self-cleansable?	69.7% (n = 189)	29.3% (n = 82)
Slicing of proximal caries makes the cavity into _____ shape	41.3% (n = 112)	58.7% (n = 159)
Slicing of the tooth in NRCC causes space loss/food impaction	37.26% (n = 101)	62.74% (n = 170)
To prevent sensitivity after slicing of tooth _____ can be applied	SDF-37.26% (n = 101) APF-22.5% (n = 61)	40.24% (n = 109)
Order of success rate found while treating children with high caries risk	39.9% (n = 108)	60.1% (n = 163)
The success of the NRCC is mainly based on	70.1% (n = 190)	29.9% (n = 81)

Table 4: Comparison of responses on the attitude about NRCC

Attitude on NRCC	Agree	Disagree
Restorative treatment of carious lesions in a child with neglected oral hygiene masks the lack of oral health care	60.1% (n = 163)	39.9% (n = 108)
NRCC can be an alternative to the conventional restorative technique	47.2% (n = 128)	52.8% (n = 143)

mainly based on the caretakers'/parents' ability and responsibility to maintain oral hygiene.

Table 4 describes the attitude of these students on NRCC and Table 5 represents their practice behavior. The positive attitude toward NRCC was shown by 60.1% (n = 163) of the participants, as they agreed that restorative treatment masks the lack of oral health care. For the question of whether NRCC can be used as an alternative to conventional treatment, 47.2% (n = 128) of students accepted it. Among 271 students who were aware of NRCC, only 36.9% (n = 100) were practicing NRCC in their college/clinic. Most of the students use SDF (51%, n = 51) for caries control. Among the 100 students who were practicing NRCC, only 51% (n = 51) restore the teeth after NRCC. Most of the students use glass-ionomer cement (GIC) (70.58%, n = 36) as the restorative material.

DISCUSSION

The elementary approach for the management of carious lesions includes restorative and non-restorative approaches.⁶ A systematic review by Chisini et al. demonstrated that the annual failure rate of restorations in primary teeth was 0–29.9%, secondary caries

Table 5: Comparison of responses assessing practice behavior on NRCC

Practice on NRCC	Yes	No
Are you practicing the NRCC technique in college/clinic?	36.9% (n = 100)	63.1% (n = 171)
What material do you use after removal of undermined enamel, for caries control?	<ul style="list-style-type: none"> • SDF-51% (n = 51) • GIC-14% (n = 14) • Sodium fluoride (NaF) varnish-9% (n = 9) • Composite-5% (n = 5) • Pit and fissure sealant-5% (n = 5) • APF gel-3% (n = 3) • GIC/composite-4% (n = 4) • NaF varnish/SDF-4% (n = 4) • Irrelevant-5% (n = 5) 	
Do you restore the teeth after NRCC?	51% (n = 51)	49% (n = 49)
What type of restorative material do you use after the NRCC technique?	<ul style="list-style-type: none"> • GIC-70.58% (n = 36) • Composite-5.8% (n = 3) • Fluoride-releasing agent-5.8% (n = 3) • Pit and fissure sealant-1.96% (n = 1) • Stainless steel (SSC)-1.96% (n = 1) • Cention-1.96% (n = 1) GIC/composite-1.96% (n = 1) • GIC/SSC-5.8% (n = 3) • SDF-1.96% (n = 1) • Zinc oxide Eugenol-1.96% (n = 1) 	

(36.5%) being the main reason for failure. To avoid further sequelae/pulpal pathologies, failed restoration must be re-restored.⁹ But a futile or detrimental repetitive restorative cycle must be avoided to make the dental treatment comfortable to the children and parents.⁶ Nainar concluded that in a child with occluso-proximal carious lesions in the dentin of primary molars it is not ethical to withhold restorative treatment.¹⁰ In 2010, the Denmark community dental services changed treatment strategy from operative to non-operative treatment for caries lesions in the primary dentition.⁶

The non-restorative treatment approach for managing caries lesions had been in practice since the pre-fluoride era. Anderson in 1938 showed that after making the occlusal cavitated lesion accessible for cleaning, the carious lesion was arrested in primary teeth.¹¹ Non-restorative cavity control approach should not be considered as "no caries treatment," since the protocol included oral hygiene and dietary instructions, fluoride varnish applications, and recall visits to monitor lesion activity.¹² But various terms were used to represent the same treatment approach such as NRCT, non-operative caries treatment, prevention, slicing technique, and ultraconservative treatment.^{5,12} In 2016, to achieve consensus on using a single term for the same treatment approach, ICCD recommended the term NRCC.⁵ As this is a recently established expression, its knowledge among pediatric postgraduate students might be less. Hence, this study was conducted among pediatric postgraduate students across the entire Indian nation.

In the present study, the maximum responses were given by the third-year postgraduates compared with second- and first-year postgraduates. It may be due to the fact that third-year students have gained more awareness/knowledge about new concepts from conferences/journals/books compared with second- and first-year

students. The lack of awareness among the second- and first-year students might have been the reason for the reduced response rate in this survey. First-year students might not have registered themselves with the ISPPD as student members and this might also contribute to their reduced participation. Only a few responses were received from the government college students. This is because, in India, there are only 21 government colleges among the 195 pediatric dental postgraduate teaching colleges.¹³ The maximum pediatric dental postgraduate course teaching colleges, i.e., 32 colleges are located in Karnataka state and this could be the reason for the maximum responses received from that state.¹³

As NRCC is a newer terminology, it was presumed that the webinars conducted during this COVID-19 lockdown might have provided the knowledge to students. But surprisingly, the majority of students were aware of this term before lockdown from the books/journals. As this study is the first of its kind, comparison of the study results with other studies is limited.

Among the right answers provided for knowledge questions, the maximum percentage of the right answer was given for the question regarding success of NRCC which was mainly based on parents/caretaker's cooperation and the minimum for the indication of the NRCC. This reveals that the majority of students have understood the basic concept about this procedure but their knowledge of its indications is limited. Many students understood that NRCC could be used for treating both enamel and dentinal lesions but only a smaller number of students knew about the procedures involved in treating those enamel lesions. The above results show that either there might be some luck prediction involved in the choice they made or they were unaware of the term NOCTP, even though it is a part of NRCC.⁴ These answers made the authors feel that most students were aware of the theoretical aspects of this new concept but were not putting them into practice.

The question on tooth sensitivity had more correct responses. The reason might be attributed more to the practice of dental hypersensitivity treatment protocols followed in conservative dentistry than the practice of NRCC. Both these concepts use the same desensitizing agents. According to the protocol described by Gruythuysen, proximal slicing of occluso-proximal caries makes the cavity into V-shape and reduces the space loss and food impaction provided that the contact must not be lost with the neighboring teeth.⁷ In the present study, lots of students responded that NRCC makes the area of decay self-cleansable. Controversially, almost the same percentage of students replied that there will be space loss or food impaction following NRCC. This established the lack of practical knowledge among these students.

Santamaria et al. reported that 89% of dentists found the NRCC approach was easy to practice.¹⁴ Gruythuysen and Santamaria et al. stated that NRCC was not favored by many pediatric dentists in Netherland and Germany, respectively.^{4,12} Only 7% of the dentists considered NRCC as a treatment option for managing primary teeth.¹² Contrary to these results, in the present study, around 50% of students had a positive attitude toward NRCC and favored it as an alternate treatment for conventional restoration. Even though the attitude about NRCC is good, the practice of this technique in their college/clinic is questionable. This study showed that only 36% of the postgraduates were practicing NRCC. The barrier to practice might be that this technique is not included in their postgraduate syllabus/curriculum or lack of interest or this technique may not be favored by their guides/teaching faculty.

As this study was conducted as an online survey, there is a possibility that students could have obtained the correct answers through online search or from friends which could be a limitation for this study. This could have altered the number of correct responses and hence the results of this survey. The advantages of this study include the large and representative sample accessed across the country through email and WhatsApp. Accessing postgraduates across India is not feasible by a one-to-one survey as it requires more time, larger manpower, and money. Responses were received from students belonging to 21 out of the 24 states, which have colleges conducting pediatric dental postgraduate courses across the country.

CONCLUSION

Based on the results of this study, it would be possible to conclude that the knowledge and attitude regarding NRCC among pediatric dental postgraduate students were good but implementing it in their clinical practice was limited. The more clinical practice added to this positive attitude could enhance the usage of this technique and provide an economical treatment option to a lot of children in a country like India.

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