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Knowledge, Attitude, and Practices for Preventive Resin Restoration among General Dental Practitioners in Dhule District - A Cross-Sectional Study

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Abstract

Background: Preventive resin restoration (PRR) emerged from clinical experience with sealants in the early 1970s, and was initially described by Simonsen and Stallard in 1977. Embracing minimally invasive treatment options appropriate for conserving tooth structure is essential [1].

Aim & Objectives: This study aimed to evaluate the knowledge, attitudes, and practices towards preventive resin restoration among general dental practitioners in Dhule districts.

Material and Methods: A cross-sectional web-based survey was conducted between December 2023 and January 2024 among general dental practitioners in the Dhule district using a self-administered validated questionnaire consisting of 20 questions. A total of 110 general dental practitioners participated in the present study. The data were analyzed and subjected to statistical analysis.

Results: In this study, all participants (100%) were aware of pit and fissure sealants, with 92% knowledgeable about pit and fissure anatomy. 96% of

participants preferred the PRR as a treatment, and approximately 46% of participants performed the PRR in their clinic. Although 96.07% of participants believed that the PRR should be performed, no resin sealants were applied to the occlusal surface of the molars. Comparative analysis of knowledge among dental practitioners based on their qualifications and years of experience revealed significant differences.

Conclusion: The present study concludes that while dental practitioners possess theoretical knowledge about preventive resin restoration, such as pit and fissure sealants, they do not routinely apply the procedure in practice. Thus, there is a need to sensitize dentists about the PRR technique to mitigate caries progression on occlusal surfaces and prevent microleakage.

Keywords: Knowledge, Attitude, Practice, Dentist, Pit and Fissure Sealant.

Introduction

Pits and fissures on the tooth surface are the most common sites for caries. Fissure sealants are materials that block the pits and fissures of teeth to prevent and control caries.[2]Preventive resin restoration involves applying a thin resin coating to the chewing surfaces of molars, premolars, and any deep grooves on teeth. This treatment combines an enamel sealant with resin filling. The concept of preventive resin restoration was first introduced in the 1970s and represented a major development in treating minimal pit and fissure caries.[2] It is a conservative form of treatment involving the removal of carious dental tissue, replacement of the lost tooth structure with adhesive restorative material, and sealing of the remaining unaffected fissures; hence**,** it combines both preventive and conservative approaches [2].Preventive resin restorations represent an evolution in the use of dental resins on posterior teeth that began with studies of pit and fissure sealants in 1960 [3].

Cueto and Buonocore conducted the initial clinical investigation of sealants, observing an 86.3% decrease in caries incidence one-year post-application. Buonocore reported a 99% reduction in caries in permanent teeth and an 87% reduction in caries in primary teeth 2 years after the application of asealant.[4] Simonsen reported a total retention of 27.6% and partial retention of 35.4%, 15 years after sealant application, and no clinical evidence of caries in either partially or filled teeth. Although sealant shows excellent efficacy, some dentists doubt its effectiveness and durability and fear the sealing of carious lesions.[4] Simonsen and Stallard's invasive placement technique (preventive resin restoration) not only results in higher retention rates of sealants but also gives dentists more self-confidence during their manipulation, especially when the clinical evaluation of caries is difficult. When the presence of caries is questionable, the invasive placement technique should be followed by restoration with sealant [4]. Sealants are indicated for teeth with caries-free pit fissures, whereas the PRR is used for pits and fissures with diagnosed caries. Therefore, regular monitoring based on caries risk is essential for a long-term prognosis [2]. Hence, the present study was conducted to evaluate the knowledge, attitudes, and practices of general dental practitioners regarding PRR.

Material Methodology

The present study is a cross-sectional study directed at dentists (BDSs and MDSs) across Dhule city. The protocol of the intended study was submitted to the Institutional Review Committee, and ethical approval was obtained (EC/NEW/INST/2022/2959/2022/067). Each participant was provided with an explanation of the study's purpose, and informed consent was obtained.

Duration: The present study was conducted over 1 month.

Target population: General dental practitioners in the Dhule district.

Preparation of Questionnaire

After approval from the ethical review committee, a structured and self-administered questionnaire consisting of 20 closed-ended, multiple-choice questions was prepared out of 20 questions, 16 questions were knowledge-based, and 4 questions were attitude- and practice-based and assessing assessed knowledge, attitudes, and practices of general dental practitioners about preventive resin restoration. In the present pilot study,10 subjects were selected by a simple random technique through an online platform. The reliability of the questionnaire was obtained by giving it to the subject matter experts, obtaining an overall kappa value of 0.922**.** The list of dentists in Dhule city was obtained from the local branch of the Indian Dental Association. All the dentists (n=110) practicing in Dhule were considered, and demographic data (age, gender, profession, degree, specialty branch) were collected. The online questionnaire was created by Google Drive. The questionnaire, along with the informed consent and participant information sheet, was distributed to 100 (73-BDS, 27-MDS) practitioners who were selected by a simple random technique through an online platform. Two weeks after the initial mailing, the non-respondents were reminded by phone calls and email. The responses obtained were tabulated and subjected to statistical analysis.

Statistical analysis

The reliability of the questionnaire was obtained by giving it to the subject matter experts, obtaining an overall kappa value of 0.922. A chi-square test was used to compare knowledge among dental practitioners according to their qualifications, and the results indicated a significant difference ($p \leq 0.05$) (Table 1). The Spearman rank correlation test revealed that the correlation between knowledge and years of experience of dental practitioners was significant ($p \leq 0.05$) (Table2).

Result-

In the present study, questions 1-4 and 9-20 were considered for the assessment of knowledge. The number of correct responses for each question was determined, and the total number of correct responses for each subject was determined. Total correct responses were converted into percentages and were categorized into good (>75% correct responses), fair (50-75% correct responses), and poor (<50% correct responses) (Table 1). A comparison of knowledge among dental practitioners and their qualifications revealed a significant difference in knowledge. The majority of the MDS practitioners had good knowledge (70.4%), whereas the majority of the BDS practitioners had fair knowledge (65.8%). (Table 1). A comparison of knowledge among dental practitioners and their years of experience in dental practice revealed a significant difference in knowledge. Approximately 52% of the practitioners with less than five years of experience had good knowledge, whereas only 21.9% of the practitioners with 5-10 years of experience had good knowledge. The majority of the dental practitioners with 5-10 years of experience (65.6%) had fair knowledge. The majority of the dental practitioners with more than ten years of experience (61.1%) had poor knowledge. (Table 2).

In the present study, 100% of the participants knew about pits and fissures, and 92% were aware of pits fissure sealants. Among all the participants, 70% responded that both resins and glass ionomers can be used as pit and fissure sealant materials. Overall, 86% of the participants knew the full form of the PRR, i.e. preventive resin restoration. A total of 53.3% of the

information that was found was from posters and books, 19.06% from publications, 9.08% from information from the internet, and 8.07% from conferences. Ninety-six percent of participants favoured PRR as a treatment, and approximately 46% of participants performed PRR in their clinic; however, 44% of participants performed PRR at some point. A total of 96.07% of participants thought that the PRR should be measured in the clinic. Regarding the type of resin material used in the PRR, approximately 49.05% of the participants agreed that micro fill composites should be used, followed by 30.0% who were not familiar, 12.01% who were unfilled, and 7.6% who were macro fill composites.

Of all participants, 50.05% responded that both minimal tooth structures were removed and that the sealant covered the entire occlusal surface to prevent further decay and filling restricted to the cavity only. A total of 69.06% of participants knew that low-speed hand pieces were used in the PRR, for carious tissue removal. approximately 67.08% of the participants were aware that type 1 PRRs are based on the extent and depth of carious lesions, suspicious pits, and fissures where caries removal is limited to enamel, and approximately 70% of participants knew that an incipient lesion in dentin that is small and confined, called a type 2 PRR, and approximately 86%. Eighty-eight percent of participants knew that the type 3 PRR is characterized by the need for greater exploratory preparation in dentin. A total of 74.02% of participants responded that anaesthesia is required for type 3 PRR, and approximately 62% responded that the PRR is effective for both primary and secondary dentition. Among all participants, 70% responded that no specific dental equipment is required for the PRR, and 96% agreed that the PRR is not used for teeth with exposed pulp. Sixty-nine percent of participants were aware that PRR is the definitive treatment, and approximately 39% of participants responded that preventive resin restoration is based on both minimally invasive treatment and extension for prevention.

Table 1: Comparison of knowledge among dental practitioner's a/c their qualifications

Group		Good	Fair	Poor	p-value
BDS	n	14	48	11	<0.001*
	%	19.20	65.80	15.10	
MDS	n	19	4	4	
	%	70.40	14.80	14.80	

Chi-square test; * indicates a significant difference at $p \leq 0.05$

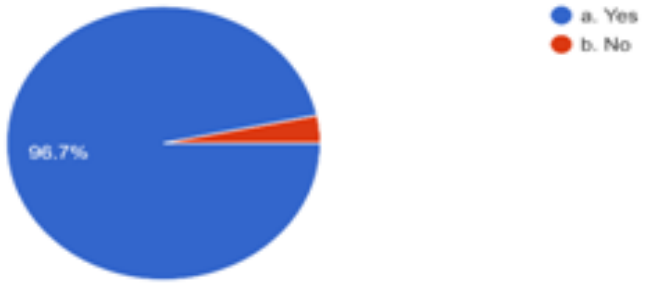
Table 2: Correlation of knowledge with years of experience of dental practitioners

Group		Good	Fair	Poor	R-value	p-value
Less than 5 years	n	26	24	0	-0.645	<0.001*
	%	52.00	48.00	0.00		
5 – 10 years	n	7	21	4		
	%	21.90	65.60	12.50		
More than 10 years	n	0	7	11		
	%	0.00	38.90	61.10		

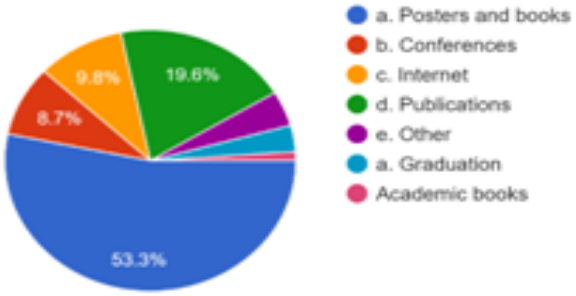
Spearman rank correlation test; * indicates a significant difference at $p \leq 0.05$

Pie Diagram

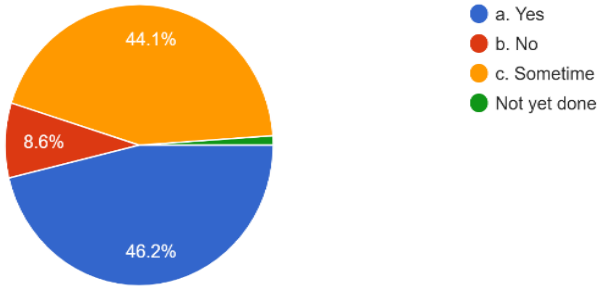
1. Do you favour PRR as a treatment?



2. Source of information for PRR treatment ?



3. Do you perform PRR in your clinic?



4. Do you think the PRR should be performed in your clinic?

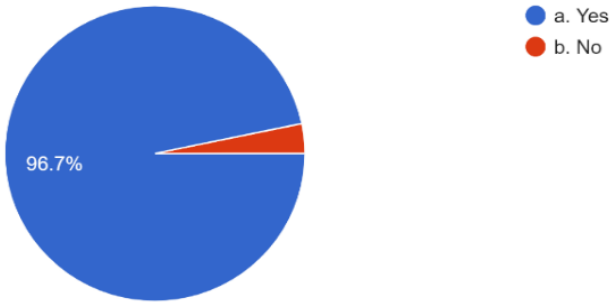


Table 3: Questionnaire regarding knowledge, attitudes, and practices related to preventive resin restoration among general dental practitioners.

Questions	Response	Percentage
1. What are pit and fissures?	a. A pit is a small depression on the surface of the tooth while fissures are the groove	100%
	b. The small bumps on your four front teeth	00
	c. A shallow rounded or angular depression	00
2. What is pit & fissures sealant?	A thin, resin coating applied to the chewing surface of molars, premolars, and any deep pits and grooves of teeth.	92.05%
	A clear or opaque plastic material that is applied to the pits and fissures of teeth where caries is present	7.5%
3. Pit and fissures material usually filled by which material**?**	a. Resin material	21.07%
	b. Glass ionomers cement	4.42%
	c. Both A and B	70.07%
	d. None	4.44%
4. What is the full form of PRR?	a. Preventive restorative resins	12.09%

	b. Preventive resin restoration	86.00%
	c. Preventive retentive resin	1.1%
5. Source of information for PRR?	a. Posters and books	53.03%
	b. Conferences	8.07%
	c. Internet	9.08%
	d. Publications	19.06%
	e. Other	8.6%
6. Do you favour PRR as a treatment?	a. Yes	96.07%
	b. No	3.3%
7. Do you perform PRR in your clinic?	a. Yes	46.02%
	b. No	08.06%
	c. Sometime	44.01%
8. Do you think PRR should be performed in your clinic?	a. Yes	96.07%
	b. No	3.3%
9. Which type of composite resin material is used in PRR?	a. Unfilled Composite	12.01%
	b. Macro fill Composite	7.6
	c. Micro fill Composite	49.05%
	d. Don't know	30.08%
10. What are the advantages of preventive resin restoration?	a. Minimal tooth structure is removed, and sealant covers the entire occlusal surface to prevent further decay	40.07%
	b. Filling restricted to the cavity only	8.8%
	c. Both A and B	50.05%
11. In PRR, carious tissue is removed using?	a. High-speed hand piece.	8.07%
	b. Low-speed hand piece	69.06%
	c. Sharp excavator	21.07%

Questions	Response	Percentage
12. Based on the extent and depth of the carious lesion what is type 1 PRR?	a. Incipient lesion in dentin that is small and confined	32.02%
	b. Suspicious pits and fissures where caries removal is limited to enamel	67.08%
	c. Characterized by the need for greater exploratory preparation in	00
13. Based on the extent and depth of the carious lesion what is type 2	a. Incipient lesion in dentin that is small and confined	70.00%

PRR?	b. Suspicious pits and fissures where caries removal is limited to enamel	28.09%
	c. Characterized by the need for greater exploratory preparation in dentin	1.1%
14. Based on the extent and depth of the carious lesion what is type 3 PRR?	a. Incipient lesion in dentin that is small and confined	6.6%
	b. Suspicious pits and fissures where caries removal is limited to enamel	6.6%
	c. Characterized by the need for greater exploratory preparation in dentin	86.08%
15. Anaesthesia is required for which type of PRR?	a. Type 1	19.01%
	b. Type 2	6.97%
	c. Type 3	74.02%
16. PRR is effective in which type of dentition?	a. Primary	13%
	b. Secondary	19.06%
	c. Both	62%
	d. None	5.4%
17. No specific dental equipment is required in PRR?	a. Correct	70.7%
	b. Incorrect	29.03%
18. PRR is not used in teeth with exposed pulp.	a. Correct	96.07%
	b. Incorrect	3.3%
19. PPR is a definitive restorative treatment?	a. Correct	29%
	b. Incorrect	69.9%
20. Preventive resin restoration is based on the principles of?	1. Minimal Invasive treatment	30.01%
	2. Extension for prevention	28%
	3. Both of the above	39.08%
	4. None of the above	4.92%

Discussion

PRR is a minimally invasive procedure that should be the treatment of choice for small carious lesions in posterior teeth as a preventive approach. Our main goal was to prevent and conserve the tooth structure in incipient lesions and small carious lesions rather than placing class 1 amalgam restorative material, and the placement of pit and fissure sealant and preventive resin restoration is more beneficial. In the present study, dental practitioners showed a decent adequate response rate and knowledge about preventive resin restoration.

Similarly, Zhe W Chin et. Al. reported a positive response from dentists toward pit and fissure sealants [2]. In the present study, approximately, 100% of the participants knew about pit and fissure sealant, 92% were aware of pit fissure sealant, and approximately 7.05% were unaware of pit and fissure sealant. This result was found similar, to that of a study conducted by Sadeq Ali Al-Maweri1[5], which showed that 8.4% of dentists reported that they never heard of fissure sealant, followed by Kranti Kiran Reddy Eallaet al., who similarly reported that 8.4% of the undergraduate dental students suffered from a lack of information about the fissure sealant, indicating that a considerable percentage of the students were unaware of the fissure sealant [6].

In the present study, 53.3% of the general dental practitioners in the Dhule district obtained information on the PRR mainly from graduation, 19.06% from other sources such as dental publications, 9.06% from the internet, and 8.07% from conferences. These findings are in agreement with a study conducted bySadeq Ali Al-Maweet al., where education at college (85.3%) was the main source of information [5]. Similarly, information regarding FS and PRR was obtained mainly from undergraduate courses by 70% of Malaysian dentists, with other sources being dental journals and continuing education programs. However, a majority of dentists in England obtained information through dental journals (70%), and only 20% obtained this information from undergraduate courses. This causes concern that knowledge from undergraduate courses may be limited and, at some point, outdated. A study in Finland reported that 59% (1991) and 48% (2001) of the respondents used specific guidelines for sealing molar fissures [2].

In the present study of all participants, 96.7% of practitioners agreed that PRR should be performed in private clinics, and 70% of dental practitioners believe that both resin and glass ionomers cement materials should be used for filling pits and fissures. These findings are similar to those of a study conducted by Astha Bramhecha, approximately 82.8% of dentists believe that pit and fissure sealants can be used in cases of initial enamel margin breakdown [7]. The most commonly used pit and fissure sealants among dentists were resin-based cement (51.6%), followed by GIC (39.1%).

In the present study, approximately 46.2% of practitioners performed PRR in their private clinic; however, 44.1% of practitioners sometimes performed PRR. Similarly, a study conducted by Raju umajiPatilet al.[8]reported that 42.99% of dental practitioners performed PRR in their daily routine practice. Similarly, a study conducted by Michalskiet al.[9]reported that only 35.8% of practitioners used PRR routinely. These findings are in agreement with the findings of a study carried out by, Zhe W. et al. in Malaysia, which assessed the comprehensive use of PRR and FS among dentists and reported a low response rate (36%). Additionally, a previous study in Malaysia revealed that only 52.6% of practitioners used sealants [2]. This encouraging trend reflects an increase in preventive and minimal-intervention philosophies among Malaysian dentists. Similar results were reported elsewhere, where a majority (87.6%) utilized FS, but only 35.8% used them regularly.Seventy-five percent of dentists in England claimed to practice PRR, while only 47% placed them.

In the present study,approximately 60% of the dentists preferred resin-based FS with fluoride, which is probably due to its anti-cariogenic effect. In Greece, only 22.1% of dentists preferred fluoride-containing FS material, possibly because the effectiveness of fluoride release has not been proven. Similarly, among the 45.1% of respondents who rarely or never used FS/PRR in their

daily practice in the Malaysian study, the primary reasons were 'difficulties in placement due to lack of patient cooperation' and 'unrelated to dentists' specialty'. This is possible because FS/PRR is characteristically indicated in children, where cooperation is a challenge. Only 20.9% of the respondents used them for adults in this study. However, FS/PRR is currently recommended for all age groups at high risk of caries. Finnish dentists who did not use FS/PRRs considered it less cost-effective. The private dentists in this Malaysian study stated that 'low parental acceptance and unwillingness to pay for preventive measures' was the main reason for low usage [2].

In the present study, 62% of practitioners believe that the PRR is effective for both primary and secondary dentition, 19.6% of practitioners believe that it is effective for secondary dentition, 13% of practitioners believe that it is effective for only primary dentition, and 96.7% of practitioners believe that the PRR is not effective for teeth with exposed pulp. Similarly, most respondents in the Malaysian study considered therisk of caries before placing FSs. Since caries risk and plaque accumulation are greatest during eruption, FS should be applied regardless of eruption status. In the USA, approximately 25% of the respondents did not consider the eruption status before placing the FS. Similarly, in a Malaysian survey, less than 30% of the dentists did not consider eruption status, and more than half of the dentists chose to seal only completely erupted teeth. Most dentists in the Malaysian study sealed permanent molars and premolars, while a small percentage of dentists sealed primary teeth, as also documented in other studies. Almost all respondents visually inspected a tooth before placing the FS, and a high percentage of dentists also used tactile examination, as did dentists elsewhere [2].

The present study showed that 69.6% of respondents' carious tissue was removed by using a low-speed hand piece, 21.7% of respondents used a sharp excavator, and 8.7% of respondents used a high-speed hand piece. In the Malaysian study, nearly half of the respondents prepared the tooth indicated for FS either by a slow-speed bur, high-speed bur, or air abrasion, similar to the USA [2].A 15- to 20-s etch is adequate for sealant retention, since varying etching times did not alter retention rates. Regardless of the duration, the results of rinsing and drying should reveal a frosty white appearance. The present study showed that a comparison of knowledge among dental practitioners and their qualifications and years of experience showed a significant difference. These findings were in agreement with those of a study conducted by Rajeev Mahajan [10], which revealed that there was a statistically significant relationship between qualifications and 5-10 years of work experience and the knowledge, attitudes, and practices of dental practitioners regarding pit and fissure sealant use.

Conclusion

Hence, the present study revealed that dental practitioners have theoretical knowledge about preventive resin restoration, such as pit and fissure sealants, the type of composite material used in preventive resin restoration and preventive resin restoration, as a definitive treatment, and carious tissue removal by a low-speed hand piece. Preventive resin restoration is not the treatment of choice for exposed pulp, but they do not apply this procedure in their daily practices**,** therefore, all dentists need to be sensitized to the PRR technique to avoid further reduction of caries on the occlusal surface and to prevent microleakage.

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