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The Level of Knowledge Among Dentists and Dental Students in Saudi Arabia Regarding Repair versus Replacement of Composite Restorations

Research Article

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Abstract

Localized failures in resin composite restorations can be treated in three different ways: refurbishing, repairing, or replacing.
Objective: This study aimed to examine levels of knowledge among dentists and dental students in Saudi Arabia regarding repair versus replacement of composite restorations.
Methodology: Across-sectional convenience sampled study was completed with dentists and dental students from different regions of Saudi Arabia, and a modified, validated questionnaire was distributed electronically through social media. Linear regression, ANOVA, t-test, and chi-square were used for data analyses, andap-value of 0.05 was set for statistical significance.
Results: A total of 201 participants responded and had a total mean (m) knowledge score of 13.11,with a standard deviation (SD) of 4.34. T-test and ANOVA revealed that participants with previous experience of replacing composite restorationshad significantly higher scores (m = 13.53, SD = 4.09, p = 0.005) than those who did not (m = 10.44, SD = 5.01). Per ANOVA, there was a significant difference in total knowledge scores by region (p = 0.003), withwestern region participants (m = 14.12, SD = 3.58) scoring significantly better (p = 0.042) than southern region participants (m = 11.20, SD = 4.45) and alsosignificantly (p = 0.030) better than northern region participants (m = 10.00, SD = 4.34).
Conclusion: Our results indicate that Saudi Arabian dental professionals have moderate levels of knowledge about repair versus replacement for failing composite restorations. To increase theselevels,more practical sessions, lectures, mandatory readings, and educational videos should be provided.

Keywords: Knowledge; Awareness; Repair; Replacement; Composite; Restoration; Failure; Dentist; Dental Students; Saudi Arabia.

Introduction

One of the most common procedures dental practitioners perform is the restoration of carious lesions. With theincreasing demand for tooth-colored restorations, composite materials havebeen used more extensively than other dental materials [1, 2]. In the last 30 years, composites havebeen the aesthetic material of choice as a substitute for amalgam restoration of posterior teeth [3]. An interesting advantage of resin composites is the low annual failure rate (1%–4%) [4-6].

When there is a localized failure of a composite restoration, there are three treatment options to fix the failure: refurbishing, repairing, or replacing [3, 7-10]. Adding restorative material to perform the restoration without removing any part of the original restoration or tooth structure is called refurbishing [11], which is different from repair; repairing of a restoration is the partial removal of defective parts of a restoration that does not yet have any radiographic or clinical signs of failure and then adding a new restoration to complete the process [2, 11, 12]. Repair and refurbishing are considered the most conservative treatments [10], while restoration replacement involves the complete removal of prior failed restorative material, followed by a completely new restoration [2, 11, 12]. Many studies have indicated that when there is marginal staining or a superficial defect, most dental practitioners tend to completely replace the restoration [2, 13]. Yet replacement

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has several drawbacks, including the risk of pulp injury, leading to necessary root canal treatment. Additionally, there is a risk of tooth fracture because the remaining part is weakened by the enlargement of the cavity and excessive removal [13].

There are too many factors that influence the way a defective restoration should be handled [2]. However, dental practitioners should lean toward the reparative management of composite defects for cooperative patients who attend dental appointments regularly and maintain good oral hygiene [14, 15].

An earlier study indicated that there are no clear guidelines for techniques and indications to repair a composite defect [16]. Conversely, Blum stated that techniques, indications, and contraindications were evident [15-17]. Regardless, secondary caries is at the greatest risk for necessary repairs of a composite, while fractured restorations have the lowest risk [15]. Repair has many benefits, such as no need for local anesthesia during the procedure, thus reducing the time required and making it more cost-effective.As opposed to the total replacement of a restoration, repair has good acceptance among patients [15]. However, the repair of a defective composite requires that the right high-quality materials and correct application techniques are used to have the repair succeed [18].

A study in Pakistan indicated that dental clinicians who had prior experience with repairing defective composites scored significantly better than those who did not have such experience [7]. A recent Saudi study among dental students in Jazan and Najran indicated that the most common reason for choosing repair over replacement is cost, followed by increasing the composite's longevity, patient choice, and time savings [19]. Repair is also preferred in cases of secondary caries and when there is a risk of pulp injuries [19]. Two studies agreed that the decision to choose repair rather than replacement of a composite restoration is impacted by having an undergraduate dental education relevant to composite repair [7, 19].

Nevertheless, there is a lack of studies assessing composite repair rather than composite replacement, and most previous studies were conducted with some controversial guidelines. Therefore, the aim of the present study was to examine the levels of knowledge among dentists and dental students from various regions of Saudi Arabia with regard torepair versus replacement of composite restorations using the most recent guidelines [15].

Methods

This was a cross-sectional study that investigated levels of knowledge about repair versus replacement of composite restorations among a sample of dentists and dental students in Saudi Arabia. A convenience sampling method was used, and the inclusion criteria were dental students in their second through sixth academic years studying at a governmental or private dental college, dental interns, and dentists (general practitioners, specialists, and consultants) working in the government or private sector in Saudi Arabia.

Exclusions included dental hygienists and radiologists, all theoretical specialties, and participants who refused to sign the informed consent. The survey was carried out from March 2021to April 2021. Due to the COVID-19 pandemic and the importance of following the Saudi Ministry of Health's social distancing guidelines, the surveys were distributed through the internet on social media sites (WhatsApp, Twitter, and Telegram). Researchers contacted dental students and interns through their group leaders and continuing education groups. A self-administered questionnaire was used, with the time required for completion of about 4–6 minutes. The informed consent form was located at the beginning of the questionnaire so thatparticipants had to approve it by clicking Nextbefore they could complete the questionnaire. All personal information is kept confidential, and any recognizable data were destroyed.

A validated 35-item questionnaire [7] was modified based on a recently reviewed study [15]. The questionnaire was divided into two sections, withthe first section containing nine questions collecting demographic data (age, gender, nationality, qualifications, region of residency, marital status, years of experience, institution currently studying at or graduated from, and the name and city of the place of work or study). The second section comprised 22 questionsthatgatheredinformation about the levels of knowledge, attitudes, and practices for treating a defective composite restoration. All questions regarding composite repair and replacement were closed-ended. Each question had one correct answer, and only the correct answers received a score, whereatotal and perfect score of 22 indicated complete knowledge of the indications and contraindications of repairing or replacing a defective restoration,whilethe lowest level of knowledge was a score of zero. Two questions asked about previous clinical experience with repair and replacement, and one question asked whether the participant had learned about the indications and techniques of composite repair during studies for the bachelor of dental surgery. Another question asked about confidence in choosing treatment modalities for composites.

The survey had previouslybeentested to eliminate any equivocations. It was also tested for validity, clarity, and accuracy,andthere was verification that all information was being correctly assessed. The main goal was to assess the ability of Saudi dental students and practitioners to make sound decisions regarding whether to repair or replace a defective direct composite restoration.

The data analysis was managed with Microsoft Excel and SPSS version 21(IBM, Inc., Armonk, NY, USA). The analysis data areshownthrough descriptive statistics, using count, percentage, mean, and SD. For data analyses, linear regression, ANOVA, t-test, and chi-square were used, and thep-value for statistical significance was 0.05. Before conducting the study, ethical approval was obtained from the institutional review board (IRB) of Vision College of Dentistry and Nursing – Jeddah, with the number of 21-2/7.

Results

A total of 201 respondents participated in this study. Demographic data for the respondents are provided in Table 1. Participants had a mean (m) age of 28.57, with a standard deviation (SD) of 6.76. Also, the total years of experience was a median of 1,with a range of 0–38 and an interquartile range of 4.

When participants were asked about the indications for repair ver-

sus replacement, the answers were distributed as shown in Table 2. There was also variability in participant answers regarding consideration of repair versus replacement of a composite respiration, as displayed. The items in Table 2 and Table 3 were scored by giving one point for a correct answer and then adding them together for the total knowledge score. The mean total knowledge score was 13.11 (SD = 4.34). The t-test and ANOVA showed that total knowledge score was not significant when tested against gender, nationality, marital status, place of study or work, qualifications, or previous teaching about indications for repair versus replacement. However, participants who had experience replacing composite restorations (m = 13.53, SD = 4.09) had significantly (p = 0.005) higher scores than those who did not (m = 10.44, SD = 5.01).

ANOVA indicated a significant difference in total knowledge scores by region (p = 0.003), with participants from the western region (m = 14.12, SD = 3.58) scoring significantly (p = 0.042) higher than participants from the southern region (m = 11.20, SD = 4.45) and also significantly (p = 0.030) higher than participants from the northern region (m = 10.00, SD = 4.34). The other regional comparisons were not statistically significant.

Discussion

The results from the questionnaire evaluating the levels of knowledge about repair versus replacement of composite restorations showed that more than half of the total number of questions were answered correctly by the dentists and dental students in the present study. This means that the participants had moderate levels of knowledge about repair versus replacement of defective composite restorations.

Participants who had previously replaced a composite restoration had significantly higher scores than those who did not, and participants from the western region of Saudi Arabia had significantly higher scores than those from the southern or northern regions. There was no statistical significance with the other regions.

There were four questions in which the number of wrong responses exceeded the number of correct responses. These included questions in which participants most often chose repair rather than replacement, which was the wrong answer,with regard to patients with complex medical histories, patients with a limited capacity to cooperate, cases of an incorrect restoration shade, and cases where the distal wall fractured in a tooth that had occlusal restoration due to trauma or parafunctional habits.

All dental restorations have the potential to be defective due to exposure to the force of mastication and the oral environment [20, 22]. A study by Fayyaz et al. [7] reported that 82% ofdentists preferred replacement. In many other prior studies, dentists preferred to replace a composite restoration, even when there was superficial staining or small marginal defects [2, 13, 23]. More

Table 1. Participants' demographic data.

Variable		Number	%
Gender	Male	85	42.30%
	Female	116	57.70%
Nationality	Saudi	168	83.60%
	Non-Saudi	33	16.40%
Marital status	Married	64	31.80%
	Non-married	137	68.20%
Qualifications	Student/intern	97	48.26%
	General dentist	74	36.82%
	Specialist or consultant	30	14.93%
Region	Western	94	46.80%
	Central	54	26.90%
	Southern	20	10.00%
	Eastern	23	11.40%
	Northern	10	5.00%
College	Governmental college	71	35.30%
	Private college	130	64.70%
Were you taught about indications and techniquesforcomposite repair while studying for your bachelor of dental surgery?	Yes	160	79.60%
	No	41	20.40%
Have you ever replaced a defective composite restoration?	Yes	174	86.60%
	No	27	13.40%
Have you ever repaired a composite restoration?	Yes	150	74.60%
	No	51	25.40%
How confident are you in deciding whether to replace or repair a composite restoration?	Confident	107	53.20%
	Neutral	15	7.50%
	Not confident	79	39.30%

Table 2. Participant answers regarding indications for repair versus replacement.

Item	Repair. No. (%)	Replacement. No. (%)	I do not know. No. (%)
Irregular visits to a dental clinic	52 (25.90%)	126 (62.70%)*	23 (11.40%)
Maintaining a good standard of oral health	129 (64.20%)*	51 (25.40%)	21 (10.40%)
Regular monitoring of their restoration	146 (72.60%)*	35 (17.40%)	20 (10.00%)
A complex medical history	75 (37.30%)*	91 (45.30%)	35 (17.40%)
Patientswithlimited capacity to cooperate	82 (40.80%)*	88 (43.80%)	31 (15.40%)
Patients with high risk for caries	25 (12.40%)	163 (81.10%)*	13 (6.50%)
Presence of extensive caries	25 (12.40%)	162 (80.60%)*	14 (7.00%)
Patient reluctance to accept a repair as an alternative to replacement	74 (36.80%)	96 (47.80%)*	31 (15.40%)
Secondary caries only, adjacent to the margin of restoration	99 (49.30%)*	90 (44.80%)	12 (6.00%)
Secondary caries that extended under the composite restoration	30 (14.90%)	160 (79.60%)*	11 (5.50%)
Limited or minor marginal defects without caries	141 (70.10%)*	43 (21.40%)	17 (8.50%)
Marginal discoloration and staining	134 (66.70%)*	53 (26.40%)	14 (7.00%)
Incorrect shade of the restoration	65 (32.30%)*	121 (60.20%)	15 (7.50%)
Bulk fracture of the restoration (more than half)	31 (15.40%)	153 (76.10%)*	17 (8.50%)
Distal wall fracture in tooth 36 with occlusal restoration due to trauma or parafunction habit	48 (23.90%)*	137 (68.20%)	16 (8.00%)
Limited wear of the restoration in the occlusalsurface whenocclusal space permits	113 (56.20%)*	70 (34.80%)	18 (9.00%)

* Correct answer

Table 3. Participant responses regarding the best choice between repair orreplacement.

Item	Repair. No. (%)	Replacement. No. (%)	No difference. No. (%)
Cost effectiveness	122 (60.70%)	39 (19.40%)	40 (19.90%)
Time savings	145 (72.10%)	30 (14.90%)	26 (12.90%)
Reduction of pulpal damage	150 (74.60%)	30 (14.90%)	21 (10.40%)
Minimally invasive	152 (75.60%)	35 (17.40%)	14 (7.00%)
Longevity (survival)	48 (23.90%)	115 (57.20%)	38 (18.90%)
Requirestheuse of local anesthesia	47 (23.40%)	128 (63.70%)	26 (12.90%)

than 75% of 197 dentists in the United States and Scandinavia chose replacement over repair of a localized defect in a composite restoration [17, 24]. The results of the present study showedthat 86.60% of dental practitioners and dental students replaceda defective restoration rather than repair it.

Another group of prior studies agreed that among the factors influencing a dentist's decision to repair or replace a failing restoration were elements related to the dentist's skill, patient factors,and the properties of a failing restoration [22]. Using a good restorative material and the correct repair techniques are important for achieving excellent results [18]. As a result, dental practitioners should know more about the patient-based factors affecting decisions regarding whether to treat a defective composite restoration. Patients should be cooperative, practice good oral hygiene, and not miss regular dental appointments for the decision to repair a defective restoration [2, 14, 15]. A superficial defect can be rehabilitated through minor intervention and the repair of small, specific defective restorations [1, 25]. Alqarni reported that 65% of dental students chose repair for the treatment of a small defect in the composite surface [19], while in this study, 66.70% of the participants chose repair rather than replacement for marginal discoloration or staining of a composite restoration.

According to Blum's 2019 [19] and Blum et al.'s [17] results, the most common indication for repair of a composite restoration is secondary caries,and a fracture of the restoration was the least frequent indication. Both Alqarni et al. [19] and Fayyaz et al. [7] had the same results of secondary caries being the most common reason for repairing a composite restoration (37%). In contrast, in this study,alimited marginal defect without caries had the highest percentage of respondents choosing repair (70.10%).

Repairing a faulty composite is more often accepted by patients due to the lower cost and time savings, as well as the procedure being performed without local anesthesia [15]. The option of repairing rather than replacing a defective restoration can significantly preserve the tooth structure and avoid pulpal injuries, according to prior studies [19, 26]. Our findings are in agreement with prior studies, with 75.60% of the respondents agreeing that repair was

less invasive than replacement. Furthermore, studies have shown that the replacement of a composite restoration can lead to the destruction of an intact tooth structure by potentially causing pulpal damage and weakening or fracture of the remaining tooth structure [7, 13, 20]. In the present study, participants agreed that repair is less time-consuming (72.10%),savesmoney (60.70%), and reduces pulpal damage (74.60%). In the present study, as well, 53.20% of the dental students and practitioners were confident in their ability to decide to repair a defective composite.

In fact, one study showed that replacement of a defective resin-based composite restoration enlarges the cavity and uses more material, leading to a reduction inthe survival rate for restorations [27]. The conclusion of a 7-year review study reported that repairing and sealing defective margins resulted in a 0% failure rate and was significantly better when compared with untreated failed restorations [28]. Many of the latest studies have indicated the techniques that are more likely to result in success of the restoration repair and reach the desired results while also increasing the longevity of the restoration [16, 19]. In the present study, 23.90% of the respondents agreed that the longevity of the restoration was better with repair.

In one study, most dental students had not learnedabout or received training in repairing a defective composite restoration as a treatment option during their undergraduate courses [19]. Other studies revealed that most dental schools agreed that they should include the topic of repairing composite restorations in their curriculum for the bachelor of dental surgerydegree [20, 21, 29]. The results of our study showed that 79.60% of the participants claimed they were trained or taught about the indications and techniques for composite repair during their undergraduate studies in dental college, but the knowledge scores showed that their knowledge needs to be improved.

This study has strengths that include respondents from diverse centers in different cities. However, among the limitations encountered were the convenience sampling method, the use of a self-reported questionnaire, a small sample size, and the unequal strata distribution of the sample. Future studies are needed to investigate repair versus replacement of composite restoration in more depth, tracking changes that may occur in the teaching of dentistry. Also needed is an evaluation of the effects of a practitioner's skills and the use of the correct techniques for the success of a repaired composite restoration.

Conclusion

Based on the evidence collected in our survey's total knowledge scores, the levels of knowledge among dentists and undergraduate dental students are at an intermediate level when it comes to repair procedures.It was also found that participants who had experience replacing a composite restoration knew more about the indications of repair versus replacement, regardless of whether they had been taught about it during their studies. Once such a case has been encountered, and with proper practical training, one can become more vigilant about when to perform any of the repair or replacement procedures. Our study further demonstrated that there are certain areaswith a higher knowledge ratio than others, such as with the southern region scoring higher than the western and northern regions.

The teaching of theory and practical methods is of paramount importance in order to increase knowledge levels, and a variety of methods can lead to such an improvement, including more frequently implementing the procedures in undergraduate requirements and adding them to theoretical studies through lectures and educational videos. According to our results, dental practitioners need to improve their knowledge about repairs before handling a similar case in order to make the best choice for the line of treatment. Dental students can also benefit from the experiences of others shown in videos. Workshops and group work can also help to fill the gaps in this information more adequately than leaving it to the individual.

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