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Research Article

Knowledge of Dental Students' and Attitude Toward the Importance of Finishing and Polishing Composite Restorations: A Cross-sectional Study

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ABSTRACT

Background: Finishing and polishing composite restorations is a critical clinical procedure to improve their esthetics and longevity by achieving smooth and glossy surfaces. Moreover, surface roughness in dental restorations is still a significant issue related to the use of direct composite resins, which can be linked to discoloration, secondary caries, and gingival inflammation. Thus, the goal of this study is to assess the level of knowledge and clinical practices of dental students at Umm Al-Qura University regarding the importance of performing finishing and polishing procedures on composite restorations.

Methods: A cross-sectional survey was prepared and distributed to the dental students using an online self-administered questionnaire. The data were imported and analyzed using SPSS v. 20, and a Chi-square test was performed; a p-value < 0.05 was considered statistically significant.

Results: The majority of the students (94.2%) reported that color stability is associated directly with the type of composite and is influenced by polishing and finishing the final restoration (90.5%). The participants believed that it is not mandatory to use polishing paste (76.6%) or surface sealant (73.7%). More than 90% of the students indicated that a polished restoration plays a vital role in its esthetics and longevity and the maintenance of oral health.

Conclusions: The students' knowledge at Umm Al-Qura University was acceptable and reflected in their attitude toward performing the finishing and polishing procedure on composite resin restorations.

INTRODUCTION

Developing dental resin composites is an ongoing process, resulting in a restorative material with excellent properties today. These materials have transformed dental restorative treatments by allowing minimally invasive dentistry to preserve healthy tooth structure and achieve natural-looking esthetic results (Wilson, 2004). Further, dental composites are being enhanced to improve their long-term clinical performance and longevity. In general, they offer excellent cosmetic and mechanical properties, which makes them ideal to use as restorative materials for anterior and posterior areas in the oral cavity (Nicholson, 2000; Takahashi et al., 2011). Despite these merits, fractures and secondary caries are the most common reasons composite restorations require replacement (Da Rosa Rodolpho et al., 2011). Moreover, restorations' surface roughness is still a significant issue related to the use of direct composite resins, which can be associated with discoloration, secondary caries, and gingival inflammation (Yap et al., 1997). On the other hand, smooth, highly polished restorations have been demonstrated to be less prone to plaque accumulation and extrinsic discoloration and have better mechanical qualities (Bollen et al., 1997; Shintani et al., 1985; Weitman & Eames, 1975). Studies have proven that finishing and polishing dental restorations properly are critical clinical operations during tooth replacement and are particularly crucial for the restorations' esthetics and longevity (Dunkin & Chambers, 1983; Shintani et al., 1985; Yap et al., 2004). Further, most restorations must be modified to their final shape in clinical conditions. Therefore, it has been confirmed that finishing and polishing procedures are significant (Ryba et al., 2002). The desired effects of mimicking the natural

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tooth structure can be achieved through proper shape, smoothness, and high gloss. A rough surface texture can result in the material surface's diminished gloss and increased yellowing, which affects the restorations' quality and esthetics (Hoelscher et al., 1998; Reis et al., 2002). As a result, obtaining smooth and glossy surfaces is critical. In addition, such variables as resin composite type, resin monomer, concentration and type of filler particles, and the finishing/polishing technology used influence resin composites' ultimate surface polish (Avsar et al., 2015).

It has been claimed that the ability to polish composites differs among different types of composites based on particle size, in which micro-filled resin composites are easier to polish than hybrid forms (Reis et al., 2002). Commercially available finishing and polishing solutions come in various compositions, abrasives, and forms, and their effects may change amongst resin composites; further, there may be differences between systems that affect the final surface texture. When different processes are compared, it is crucial to determine their ability to maintain a smooth surface and achieve a glossy finish effectively. Measuring gloss is an extra parameter for measuring roughness when analyzing polishing's efficacy (O'Brien et al., 1984).

Assessing dental students' knowledge regarding obtaining proper composite restorations is crucial for several reasons. Firstly, composite restorations are one of the most performed dental procedures, making it essential for dental students to understand its application strongly (Yuan et al., 2020). The knowledge and attitude assessment ensures that students have acquired the necessary skills and expertise to perform composite restorations accurately and efficiently. This helps identify gaps in their understanding or training regarding finishing and polishing composite restorations. Additionally, this allows educators to provide targeted interventions and improve the quality of education, ensuring that students are adequately prepared for real-world dental practice (Al-Asmar et al., 2023). Therefore, several studies have been conducted to determine dental students' level of awareness of the numerous tools or auxiliary measures that improve diagnosis and treatment (Sheriff, 2020; Manohar & Sharma, 2018). This study aims to assess the level of knowledge and clinical practices in performing finishing and polishing procedures on composite restorations on the part of students at Umm Al-Qura University (UQU) College of Dental Medicine, Saudi Arabia.

MATERIALS AND METHODS

A cross-sectional study was designed to evaluate dental students' knowledge and attitude toward finishing and polishing composite restorations, and dental students from UQU were invited to participate. Using proportional stratified random sampling techniques, an equal number of male and female students were selected in the last four academic years of their clinical training. A total of 207 students were recruited.

The questionnaire was adopted from previous studies (Sheriff, 2020). The survey consisted of close-ended questions and was divided into three parts: questions on student demographics, questions on the student's knowledge of finishing and polishing composite restorations, their importance, tools, and techniques, and questions on the student's attitude toward treating patients using composite restorations and their finishing and polishing practices. Among the ten questions used to assess the student's knowledge about the importance of finishing and polishing composite resin restorations, 7 evaluated the students' practice in performing the finishing and polishing protocol on the composite resin restorations. Ethical approval was obtained from the UQU ethical committee before the study began (HAPO-02-K-012-2022-02-980). The students' consent was obtained at the beginning of the study. The questionnaires were piloted first with 20 students and were modified according to their feedback. Data were collected using an online self-administered questionnaire, and the questions were validated with a Cronbach's alpha of 0.8. After the data were collected, they were analyzed using SPSS v. 20. Descriptive statistics was used to calculate frequencies and percentages, and categorical data were analyzed using the Chi-square test. A p-value < 0.05 was considered statistically significant.

RESULTS

One hundred thirty-seven students returned completed questionnaires for a response rate of 65.6%. Of the 137, 65 (47.4%) were males and 72 (52.6 %) were females. Most of the students were 23-25 years old, and nearly equal numbers of students from all years participated. All the demographic data of the study group are presented in Table 1.

The participants indicated their knowledge of the importance of finishing and polishing composite restorations on their color stability and longevity Table 2. Most students assumed that color stability is associated directly with the composite type (94.2%) and is influenced by polishing and finishing the final restoration (90.5%). The participants believed it was not mandatory to use polishing paste (76.6%) or surface sealant (73.7%). More than 90% of them indicated that polished restorations play a vital role in restoring esthetics, longevity, and maintaining oral health.

The participants' attitudes toward and clinical practices in finishing and polishing composite restorations are listed in Table 3. A total of 131 (95.6%) respondents finish and polish their composite restorations during their sessions and use a special kit (77.4%) to do so. Approximately 40% said they might replace a restoration solely because of a color change. Figure 1 summarises the participants' clinical practices using different burs to finish and polish restorations. The following burs were used primarily to finish composite restorations: 52.6% reported

that they use fine diamond finishing burs for occlusal surfaces, 47.4% indicated that they use aluminum oxide finishing disks (Sof-Lex disk) for facial surfaces, and 67.9% stated that they use fine diamond finishing strips to finish interproximal anterior surfaces. Finally, 61.3% answered that the process of polishing direct anterior composite restorations was of medium difficulty.

Table 1: *Participants' Demographic Information*

Variables		Frequency	Percent
Gender	Male	65	47.4
	Female	72	52.6
Age	20-22 y	46	33.6
	23-25 y	78	56.9
	25-27 y	13	9.5
Academic year	4th y	37	27.0
	5th y	33	24.1
	6th y	32	23.4
	Intern	35	25.5
Total	137	100.0	100.0

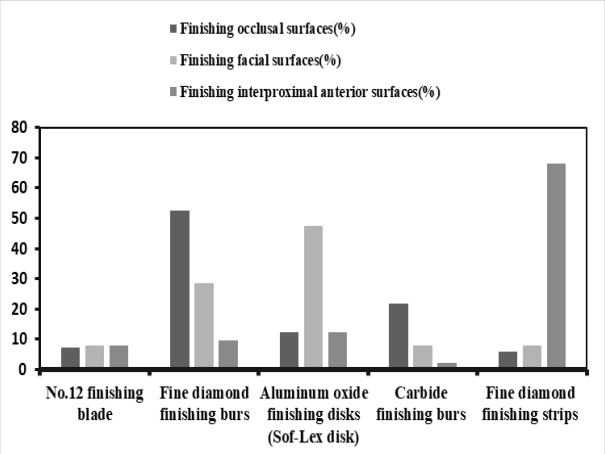

Figure 1: *Types of burs used for finishing and polishing by participant's clinical practice. Fine diamond finishing burs were favored for occlusal surfaces, Aluminum oxide finishing disks were favored for facial surfaces, and Fine diamond finishing strips were highly used for finishing interproximal anterior surfaces.*

No statistically significant difference was found between male and female students' knowledge or attitude toward finishing and polishing composite restorations. Further, students at different academic levels did not differ significantly in knowledge except for the question on whether the polishing and finishing procedure plays a crucial role in the composite restorations' color stability (p=0.02), in which the correct answers differed between 6th-year students and interns. In addition, there was a significant difference between participants who used polishing paste(p=0.003) and surface sealant (p=0.001) and those who did not.

DISCUSSION

Finishing and polishing resin composite restorations is considered to be one of the most important steps that need to be performed in the proper sequence to achieve optimal results that will increase the restoration's longevity (Reddy et al., 2021). Knowledge about the importance of finishing and polishing composite restorations is crucial to a dentist's education. This study evaluated the knowledge of UQU dental students in their clinical years; 127 (92.7%) of the participants reported that finished resin composite restorations offer high aesthetics, increased longevity, and improved oral health. This comes in agreement with several studies that reported that the composite restoration aesthetic and longevity depend on following the final steps of finishing and polishing, which is a critical process of the clinical restorative procedure (Attar, 2007). As well as Lu et al.'s findings, indicated that polishing procedures help maintain restoration longevity and preserve good oral health (Lu et al., 2005; Yap et al., 2004). This reflects the student's understanding of the relationship between finished and polished composite restorations and their longevity in the oral cavity.

Moreover, it has been stated that composite restorations' surface roughness has an effect on plaque accumulation, and therefore, it may lead to gingival inflammation, secondary caries, and colour changes (Choi et al., 2005; Miličević et al., 2018). This is consistent with the undergraduate students' responses, which showed that over 90% of them agreed that restorations with rough surfaces are more likely to fail. This means that the study participants understand that the outcome of a composite restoration should be finished and polished properly. Many studies have concluded that all rough surfaces serve as a place where microorganisms accumulate; thus, composite restorations require meticulous finishing and polishing (Ganapathy, 2021).

In addition, the composite resin materials' color stability is related primarily to the type of materials used, as several factors may lead to discoloration because of the resin material itself, such as alterations in the resin matrix and the matrix-filler interface (Güler et al., 2009). This is consistent with the results of this study, as the majority of the students (94.2%) reported that color stability is related directly to the type of composite. In addition, many studies have shown that finishing and polishing composite restorations properly influences the ability to achieve excellent color stability (Dhananjaya et al., 2019; Güler et al.,

2009; Schmitt et al., 2011), and most of the respondents in this study (90.5%) confirmed that polishing and finishing procedures play a crucial role in composite restorations' color stability. These outcomes indicate that most students know the factors influencing composite restorations' color stability.

Table 2: *Participants' Knowledge of the Importance of Finishing and Polishing the Composite's Color Stability*

Knowledge Question		Frequency	Percent
In your opinion, does the type of composite play a vital role in colour stability?	Yes	129	94.2
	No	8	5.8
Do you think that polishing composite restorations is mandatory?	Yes	117	85.4
	No	20	14.6
Is colour stability a significant concern while providing composite restorations?	Yes	125	91.2
	No	12	8.8
Do you think that using polishing paste is required?	Yes	32	23.4
	No	105	76.6
Do you think that polishing a composite restoration influences color stability over time?	Yes	110	80.3
	No	27	19.7
Do you think a finished restoration offers high esthetics, longevity, and maximal oral health?	Yes	127	92.7
	No	10	7.3
Do you think rough surfaces on the restorations are more likely to cause failure?	Yes	124	90.5
	No	13	9.5
Does the polishing and finishing procedure play a crucial role in the composite restorations' color stability?	Yes	124	90.5
	No	13	9.5
Is it essential to use composite surface sealants?	Yes	36	26.3
	No	101	73.7

The participants' attitudes in clinical practices reflected their awareness of finishing and polishing for composite restorations, as a total of 131 (95.6%) respondents performed the finishing and polishing procedure during their clinical sessions. Approximately 40% of the students said they might replace a restoration solely because of a color change. Similarly, Kroeze et al. concluded that marginal discoloration was one of the primary reasons for the replacement of composite restoration (Kroeze et al., 1990).

Further, the outcomes of this study demonstrated that 105 respondents (76.6%) believe that it is unnecessary to use polishing paste, while 101 respondents (73.7%) thought that it is not essential to apply surface sealant. Only 15.3% apply the polishing paste in their daily clinical sessions. This may indicate that most of the participants are unaware of the importance of applying polishing paste and surface sealant, or they have not had comprehensive training on the techniques and tools required for achieving optimal restoration outcomes. Similarly, Al Qarni et al., who conducted a cross-sectional survey of general dentists in 10 demographic regions in Saudi Arabia, showed that 109 (62.6%) and 106 (61.3%) of the participants reported that using polishing paste and surface sealant, respectively, is not required (Alqarni et al., 2013).

Table 3: *Participants' Attitude Toward and Clinical Practices Used in Finishing and Polishing Composite Restorations*

Attitude Question		Frequency	Percent
Do you finish and polish composite restorations in your clinical sessions?	Yes	131	95.6
	No	6	4.4
Do you use a Polishing kit/Polishing burs?	Yes	106	77.4
	No	31	22.6
Do you use composite polishing paste in your daily clinical sessions?	Yes	21	15.3
	No	116	84.7
Do you replace composite restorations solely because of color changes?	Yes	55	40.1
	No	82	59.9

Another cross-sectional study that Sherif et al. conducted among dental students reported that 52 (52%) agreed that polishing paste is required (Sheriff, 2020). However, the results did not specify whether or not the students were applying polishing paste in their clinical practice. Interestingly, this suggests that many undergraduate dental students and some general dentists lack knowledge of the importance of applying polishing pastes and their effects on composite restorations' longevity and color stability. However, many studies have claimed that polishing pastes provides smoother surfaces and effectively improves resin composite restorations' color stability (Jefferies, 2007; Sen et al., 2002).

In practice, dentists who prioritize high-quality work understand that the finishing and polishing steps heavily influence the final appearance of restoration. Concerning finishing and polishing procedures on composite restorations, most of the participants (95.6%) among the dental students at UQU perform these procedures routinely in clinical sessions. Similarly, another study showed that 85% of dental students perform finishing and polishing procedures in their practice (Sheriff, 2020). These results indicate that undergraduate dental students are applying

their knowledge to the practice of these procedures. However, they do not perform polishing procedures properly, as stated previously, because most students fail to use polishing pastes.

The study findings showed that the students use different finishing tools daily. For example, 52.6% of the students use fine diamond finishing burs when finishing the occlusal surface, 47.4% use the Sof-Lex disk to finish the facial surface, and 67.9% use fine diamond finishing strips to finish the interproximal surface. Interestingly, these results are comparable to those of another study conducted on general dentists with more than 5 years of experience (Alqarni et al., 2013). This emphasizes that the knowledge and attitude of the undergraduate dental students at UQU are consistent with practicing dentists' standards. Dentists who value excellence and patient-centered care understand that every restoration should be completed to the highest standards. Therefore, investing time and effort in the finishing and polishing stages is important and essential to providing high-quality dental care.

However, this study had some limitations, including surveying a limited number of students with the same knowledge sources throughout their academic years. Therefore, a larger and more diverse sample must be used to establish significant conclusions that can be generalized to other populations. Another limitation was that the old curriculum introduced the finishing and polishing topic, which was delivered using a traditional constructed learning method. To overcome this limitation, a new curriculum was introduced in 2023 to improve the learning outcome by establishing more interactive learning methods.

CONCLUSION

With the increased use of composite resin restorations, it is essential to ensure that dental students are aware of the importance of finishing and polishing. Within the limitations of this study, the level of knowledge and attitude in performing finishing and polishing procedures on composite restorations reflected the need to improve the student's knowledge level at Umm Al-Qura University College of Dental Medicine, Saudi Arabia. Implementing continuous education programs and workshops is recommended to reduce the difficulty level of these procedures. Further, undergraduate students must understand the importance of using composite polishing paste and implement that in their practice.

AUTHOR CONTRIBUTION

HR: Contributed substantially to the conception and design of the work, including HR, RAH, and AAN, as well as the acquisition, analysis, and interpretation of data. RAH and AAN drafted the manuscript. HR, RAH, and AAN performed critical evaluations for important intellectual content. All authors have critically reviewed and approved the final draft and are responsible for its contents.

DECLARATIONS

Ethical Approval

Not Applicable.

Participants Consent

All participants gave informed consent at the onset of the study. They were assured of confidentiality and their right to withdraw from the study.

Source of Funding

Not Applicable.

Conflict of Interest

All authors have declared that no financial support was received from any organization for the submitted work. All authors have declared that no other relationships or activities could appear to have influenced the submitted work.

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