

Original Article

## Longevity and Aesthetic Outcomes of Composite Restorations Placed by Dental Students

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### ABSTRACT

Fracture, wear and postoperative sensitivity, secondary caries, and marginal deficits are the primary reasons why composite fillings fail. While many of these flaws are manageable, patients require numerous care to ensure that any restoration is preserved over time. The purpose of the study is to evaluate the quality of class II composite restorations made by undergraduate dentistry students so that the instructors can, if necessary, help the students develop their clinical abilities. The patient files and post-operative radiographs (bitewings) were used in this retrospective analysis. After obtaining permission from the Research Centre and clinic director, 341 patient files were chosen from Muneseya clinics using convenient sampling. It was concerning that 35% of restorations had been determined to be defective. 63% of restorations were continuous with the existing anatomic form, 29% were discontinuous with the existing anatomic form, and 8% had enough material loss to reveal dentin or base, according to anatomic form criteria used to evaluate quality. In general, the students' restorations were of unsatisfactory quality.

**Keywords:** Composite restorations, Dental students, Quality assessment, Retrospective

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### Introduction

Restoring a decaying tooth aims to improve its shape and function while removing the carious area. However, there is a potential for failure because of inappropriate material utilization in addition to an effective recuperation. The quality and longevity of dental restorations are greatly influenced by one's abilities and experiences. In addition to these variables, the method of restoration and the types of materials used also affect its quality. Nevertheless, the likelihood of failure has decreased with the advent of novel materials and technology [1].

Fracture, wear and postoperative sensitivity, secondary caries, and marginal deficits are the primary reasons why composite fillings fail. A patient must take numerous precautions to ensure the long-term

preservation of any restoration, even if most of these flaws are controllable [2, 3].

The success of a composite filling can be attributed to three key variables. A few of these include selecting a high-quality composite, using the right bonding and curing systems, and so on. The demerits of composite fillings are:

1. The danger of microleakage and secondary caries.
2. Lower fracture toughness.
3. Sensitive technique.
4. The necessity of oral hygiene.
5. It takes much time to replace as compared to amalgam and many other restorative materials.

In case of failed restoration, a tooth can suffer recurrent caries and need further restoration [4].

These days, tooth-colored material is used to manufacture contemporary fillings. It not only makes

teeth seem better, but it also lowers the likelihood of restorative failures linked to amalgam. Composite is the greatest choice for a natural appearance because the filling won't be visible [5, 6].

The study to ascertain the composite of the anterior teeth directly was carried out by Massano *et al.* [7]. Evaluating the durability of restoration classes using different nano-filled resin composites was the primary goal of the investigation. 53 individuals sought medical attention for caries and fractures at the Department of Operative Dentistry. According to the findings, 93 repairs were assessed during the follow-up visits that were provided to them following their initial recall. In terms of matching color, parameters are impacted by fracture and weak restorations after 60 months, and no significant changes were discovered until 96 months. The yearly failure rate was 2.4% [8].

AlOtaibi *et al.* [9] have examined the results of class II composite restorations made by dental students. The goal of the dentistry students' radiography investigation was to evaluate the subpar class II composite restorations they had positioned. To evaluate the voids, residual caries, open margin, open contact, and flawed class II restorations, bitewing radiographs were examined. Bitewing radiographs show that 1514 permanent teeth had class II composite restorations. The majority of class II composite restorations failed because of overhanging 197 (13.01%), 184 (12.15%) voids, poor contour with 165 (10.88%), 135 (8.91%) open margin, and 87 (5.75%) residual caries. Class II restoration failure was seen in over 925 teeth.

#### *Study justification*

The purpose of the study is to evaluate the quality of class II composite restorations made by undergraduate dentistry students so that the instructors can, if necessary, help the students develop their clinical abilities.

#### *Study hypotheses*

The quality of composite restorations among the patients visiting REU clinics is satisfactory.

#### *Aims of the study*

- To determine the quality of composite restorations among the patients visiting REU clinics.
- To list down the major reasons behind low-quality restorations.

### **Materials and Methods**

#### *Study design and sample*

This is a retrospective study using the patients' files and examining post-operative radiographs (bitewings). Convenient sampling was done, and 341 patients' files were selected from Muneseya clinics after seeking approval from the Research center and clinic director. Sample size calculation:

- Confidence level: 95%
- Population Size: 3000
- Margin of Error: 5%
- Sample size: 341

#### *Inclusion criteria*

Fillings are done by level 9 to 12 students, and X-rays without any artifacts.

#### *Exclusion criteria*

Fillings done by level 8, interns or post-graduate students, x-rays with artifact.

#### *Data collection*

Bitewing radiographs were examined for any faulty composite restorations. Each radiograph was examined by at least two students (researchers), and inter-examiner reliability was measured. Cronbach's coefficient alpha (intra-examiner reliability) value was 0.812. Inter-examiner reliability was 0.798. Prevalence and reasons for any faulty restoration were noted down.

#### *Data confidentiality*

Data collected from the patients' files (name, contact information, and file number) were kept confidential.

#### *Statistical analysis*

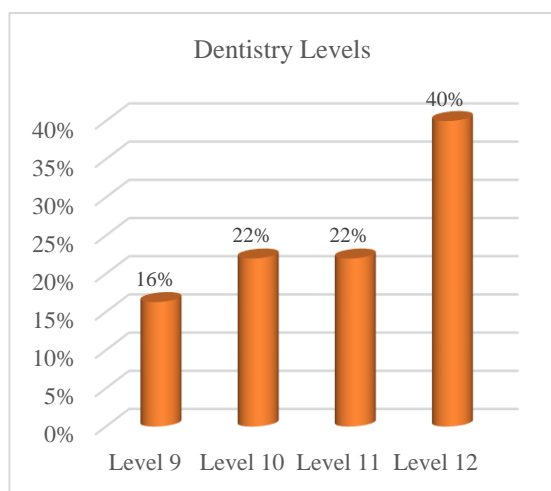
Collected data was analyzed using SPSS version 22, where descriptive and inferential statistics were conducted. A Chi-square test was done to compare the findings based on dentistry level and type of restoration.

### **Results and Discussion**

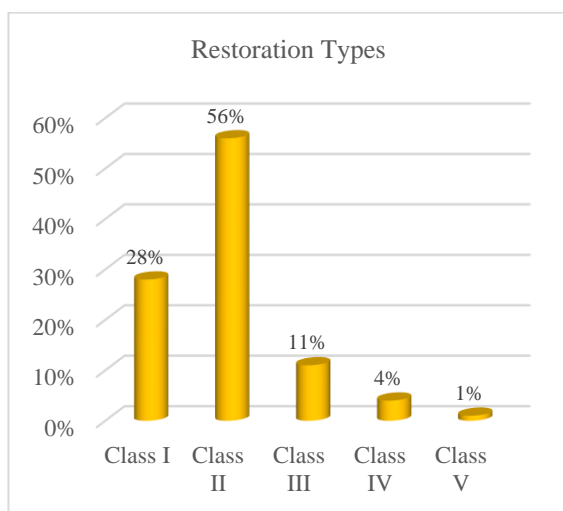
This study examined the files of 334 patients who were treated by dental students at different levels. According to **Figure 1**, 16% of students were in level 9, 22% were in levels 10 and 11, and 40% were in level 12. In terms of the sorts of restorations that were seen, 28% belonged to class I, 56% to class II, 11% to class III, 4% to class IV, and just 1% to class V (**Figure 2**). The incidence of defective restorations was determined to be 35% (**Figure 3**). According to the anatomic form criterion used to assess the quality, 63% of restorations were continuous with the current anatomic form, 29% were discontinuous with the existing anatomic form,

and 8% had sufficient material loss to disclose dentin or base (**Figure 4**). Lastly, restoration quality was assessed using secondary caries criteria, which revealed that just 1% of restorations had a prevalence (**Figure 5**).

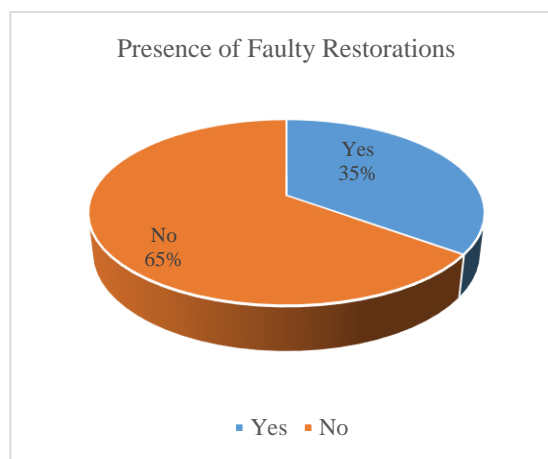
The results of our research were compared by student level in **Table 1**, and as all p-values were more than 0.05, no statistically significant comparisons were found. Class I demonstrated the highest restoration quality (P-value = .000), while **Table 2** compares the results of our investigation by restoration type and reveals statistically substantial alterations in the anatomic form criteria. However, there was no discernible change in the secondary caries criterion.



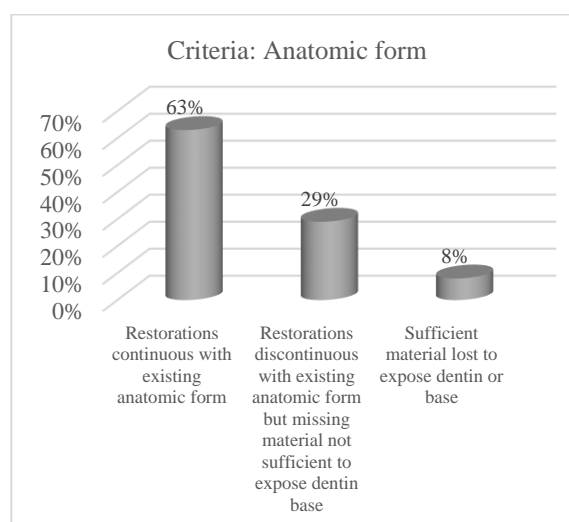
**Figure 1.** Dental proficiency of the pupils whose cases were featured.



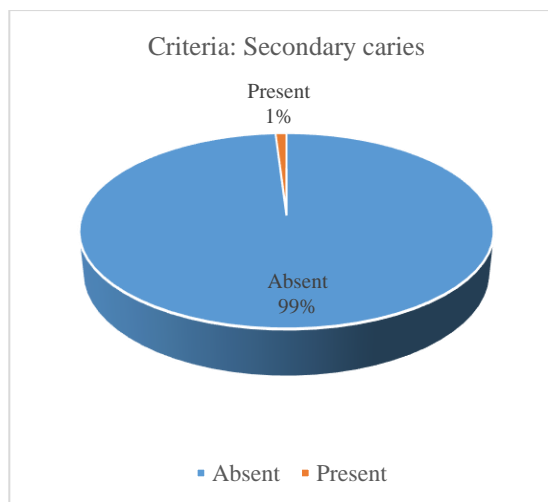
**Figure 2.** Restoration types and frequencies were checked for in this study.



**Figure 3.** Prevalence of faulty restorations in the files of selected cases.



**Figure 4.** Anatomical form standards for evaluating repair quality.



**Figure 5.** Secondary caries criteria for assessing restoration quality.

**Table 1.** Comparison of study findings based on student level.

	Frequencies	P-value
<b>Anatomic form criteria</b>	Level 9: A: 48%, B: 41%, C: 11%	.119
	Level 10: A: 65%, B: 25%, C: 10%	
	Level 11: A: 65%, B: 25%, C: 10%	
	Level 12: A: 68%, B: 29%, C: 4%	
<b>Secondary caries criteria</b>	Level 9: Absent: 100%, Present: 0%	.455
	Level 10: Absent: 99%, Present: 1%	
	Level 11: Absent: 99%, Present: 1%	
	Level 12: Absent: 100%, Present: 0%	

A: Restorations continuous with existing anatomic form

B: Restorations discontinuous with existing anatomic form but missing material not sufficient to expose dentin base

C: Sufficient material lost to expose dentin or base

**Table 2.** Comparison of study findings based on restoration type.

	Frequencies	P-value
<b>Anatomic form criteria</b>	Class I: A: 93%, B: 7%, C: 0%	.000*
	Class II: A: 55%, B: 34%, C: 11%	
	Class III: A: 46%, B: 46%, C: 8%	
	Class IV: A: 25%, B: 58%, C: 17%	
	Class V: A: 0%, B: 100%, C: 00%	
<b>Secondary caries criteria</b>	Class I: Absent: 100%, Present: 0%	.905
	Class II: Absent: 99%, Present: 1%	
	Class III: Absent: 100%, Present: 0%	
	Class IV: Absent: 100%, Present: 0%	
	Class V: Absent: 100%, Present: 0%	

A: Restorations continuous with existing anatomic form

B: Restorations discontinuous with existing anatomic form but missing material not sufficient to expose dentin base

C: Sufficient material lost to expose dentin or base

The purpose of this study was to ascertain the results of different restoration types completed by dental undergraduates [10]. The results showed that 35% of the restorations had some sort of flaw. The clinical performance of undergraduate dentistry students and the reasons behind the failure of composite restorations in the anterior and posterior regions were examined in a three-year study conducted in Brazil. After three years, 15% of the restorations were judged inadequate. Class II and class IV repairs were the most common sites for these failures. Deficient marginal adaption and restoration loss were the reasons for the failures. These losses were not a result of secondary caries. The majority of student dental restorations were judged good following a lengthy review [11]. The percentage of successful restorations made by our students was 65%, which is lower than the study described above when comparing these results with our data. The greatest failure rate of class II and class IV restorations was one comparable finding between the two investigations.

A three-year study examined the recovery rate of posterior resin composite restorations implanted by dentistry students at Kuwait University. With a rate of 95.1%, the annual failure rate was a low 1.7%. Recurrent caries accounted for 71.4% of the failures. The patient's age, gender, and oral hygiene all had an impact on this aspect [12]. The percentage of restorations with secondary caries that our study found was less than 1%, which is significantly less than the study described above. Furthermore, unlike the Kuwaiti study, we did not use and compare variables like age, gender, and dental hygiene.

The quality of posterior resin composite restorations put by students was the subject of a related study conducted in the Netherlands. Of the 703 restorations, 94 had failed. The high rate of restoration failure was caused by several factors, including cavities, endodontic therapy, fractured restorations, faulty margins, and a lack of proximal contact [13]. Compared to our study, the overall failure rate was reduced. Furthermore, our sample contained all kinds of teeth and restorations, while theirs only included the posterior teeth.

Using patient E-files (Dentoplus), a retrospective analysis of the student's composite restorations of the class II order was conducted in a Saudi study. Using digital bitewing radiographs, four qualified, standardized examiners with sufficient inter- and intra-examiner reliability inspected the student-placed class II restorations. The overhang was the most frequent bitewing defect, while residual caries was the least common. Compared to their male peers, female dentistry students put in more class II composite restorations that were deemed satisfactory [7]. Similar results were seen in our investigation as well since overhang (restorations discontinuous with existing anatomic shape) was the most frequent cause of failure. Nevertheless, we did not use gender to compare the results.

#### Study limitations

- Our study excluded variables that could have improved the accuracy of the findings, such as age, gender, and oral hygiene.
- Since we considered all instances, regardless of whether the restorations were three or five years old, the time element was not taken into account in our study.

#### Conclusion

In general, the students' restorations were of unsatisfactory quality. Students' restorative abilities

need to be strengthened. The failure rates were highest in classes II and IV. In the instances studied in the research, secondary caries were not common.

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**Conflict of Interest:** None

**Financial Support:** None

**Ethics Statement:** This study fulfills the ethical requirements of Riyadh Elm University.

## References

1. Magne P, Lazari PC, Carvalho MA, Johnson T, Del Bel Cury AA. Ferrule-effect dominates over use of a fiber post when restoring endodontically treated incisors: an in vitro study. *Oper Dent*. 2017;42(4):396-406.
2. Bücher K, Metz I, Pitchika V, Hickel R, Kühnisch J. Survival characteristics of composite restorations in primary teeth. *Clin Oral Investig*. 2015;19(7):1653-62.
3. Archibald JJ, Santos GC Jr, Moraes Coelho Santos MJ. Retrospective clinical evaluation of ceramic onlays placed by dental students. *J Prosthet Dent*. 2018;119(5):743-8.
4. Rangreez TA, Mobin R. Polymer composites for dental fillings. In applications of Nanocomposite materials in dentistry 2019 Jan 1 (pp. 205-224). Woodhead publishing.
5. Chen MC, Kung PT, Su HP, Yen SM, Chiu LT, Tsai WC. Utilization of tooth filling services by people with disabilities in Taiwan. *Int J Equity Health*. 2016;15(1):1-10.
6. Felicita AS. Quantification of intrusive/retraction force and moment generated during en-masse retraction of maxillary anterior teeth using mini-implants: a conceptual approach. *Dental Press J Orthod*. 2017;22(5):47-55.
7. Massano G, Comba A, Garombo E, Baldi A, Alovisi M, Pasqualini D, et al. Direct composite restorations of anterior teeth: a retrospective clinical study. *J Adhes Dent*. 2019;21(5).
8. Brustolin JP, Mariath AA, Ardenghi TM, Casagrande L. Survival and factors associated with failure of Pulpotomies performed in primary teeth by dental students. *Braz Dent J*. 2017;28(1):121-8.
9. AlOtaibi GL, Aldakheel R, Alhussein H, Alrowili S. Outcomes of class II composite restorations placed by dental students: an observational study. *Saudi J Oral Sci*. 2020;7(1):52.
10. Alkahtani SA, Alsaiani HN, Alqahtani NS, Bakhsh OY, Alqudairi MS, Alwadai AD, et al. Dentist's perception of training and service provision in restorative dentistry in Riyadh. *Arch Pharm Pract*. 2021;12(2):118-24.
11. Moura FR, Romano AR, Lund RG, Piva E, Rodrigues Júnior SA, Demarco FF. Three-year clinical performance of composite restorations placed by undergraduate dental students. *Braz Dent J*. 2011;22(2):111-6.
12. Al-Samhan A, Al-Enezi H, Alomari Q. Clinical evaluation of posterior resin composite restorations placed by dental students of Kuwait University. *Med Princ Pract*. 2010;19(4):299-304.
13. Opdam NJ, Loomans BA, Roeters FJ, Bronkhorst EM. Five-year clinical performance of posterior resin composite restorations placed by dental students. *J Dent*. 2004;32(5):379-83.