CAHIERS MAGELLANES-NS
Volume 06 Issue 1
2024

ISSN:1624-1940
DOI 10.6084/m9.figshare.26207138
http://magellanes.com/

KNOWLEDGE AND CLINICAL PRACTICE OF DENTAL STUDENTS IN SAUDI ARABIA REGARDING REPLACEMENT OF RESTORATIONS.

Osama Khattak[1], Dimah Alruwaili[2], Khalid Alzabni[2], Hams Alshahrani[3], Hatoon Almaqboul[4], Ibtisam Masoud[4] Salma Laghbi[5], Hanin Asiri[6], Khames T. Alzahrani[7*].

[1]Department of Restorative Dentistry, College of Dentistry, Jouf University, Sakaka, Kingdom of Saudi Arabia.
[2]Dental student, Aljouf university, Skaka, Saudi Arabia
[3]Dental student, King Khalid University, Abha, Saudi Arabia
[4]General dentist, Jeddah, Saudi Arabia
[5]General Dentist, King Khalid university, abha, Saudi Arabia
[6]Dental Intern, King Khalid university, Abha, Saudi Arabia
[7]BDS, PGD in Endo, Saudi Board of Endodontic SR, King Faisal Specialist Hospital & Research Centre, Riyadh, Saudi Arabia.

Corresponding author: Khames T. Alzahrani
Email: dr.khames.alzahrani@gmail.com

Abstract:

Background: It is clear that dentists are now using composite restorations more often in clinical dentistry for the treatment of carious teeth. The majority of dental procedures are performed to change out composite restorations. Recurrent cavities, minor defects, discoloration, wear, and loss of anatomic integrity are some of the most common causes of restorative failure. Repetitive iatrogenic pulp insults that may cause pulp vitality loss and degradation of the remaining tooth structure inevitably come from restoration replacement and the removal of sound tooth structure from areas that aren't impacted by any localized defect. Due to the increasing prevalence of composite restorations that aren't functioning well, it's critical to assess Saudi dental students' attitudes and understanding regarding how to handle these situations.

Objectives: This cross-sectional study aim to evaluate the knowledge and clinical practices of restoration repair and replacement in undergraduate courses in Saudi Arabia Universities.

Methodology: Data was collected using a survey questionnaire that using Google forms through social media platforms among undergraduate dental students from different universities in Saudi Arabia. The sample size is estimated by using the Qualtrics calculator with a confidence level of 95%; the minimum sample size is 384. The collection of data was entered on the computer using the Microsoft Excel (2016) program for Windows. The data is later transferred to the Statistical-Package of Social-Science Software (SPSS) program, version 20. For statistical analysis.

Results: The majority of students fall in the age group of 20-30 years, accounting for 93.1% of the total students. The second parameter is gender, with 52.3% of the students being female and 47.7% being male. The highest number of students (30.6%) is from King Khalid University, followed by Jouf University (8.4%) and Ibn Sina College for Medical Studies (7.1%). The types of restorations that students have performed repairs on also vary, with composite restorations being the most common (72.0%). This is followed by amalgam (40.4%). When asked about the valid reasons for restoration

ISSN:1624-1940
DOI 10.6084/m9.figshare.26207138
http://magellanes.com/

repair, the responses indicate that students recognize the importance of preservation of tooth substance (55.2%), protection of the pulp (49.5%), and extending the longevity of restorations (51.2%). The types of restoration defects that are considered suitable for repair include marginal gap (51.0%), partial loss of restoration/fracture (50.5%), and secondary caries (42.9%).
Conclusion: In conclusion, the knowledge and clinical practice of dental students in Saudi Arabia regarding the replacement of restorations are influenced by various factors, including the quality of education and training, availability of resources, and cultural and social factors.
Keywords: Attitude, Composite, Dentists, Knowledge, Practice, Survey.

Introduction:

It is evident that these days dentists have been employing composite restorations more frequently to repair carious teeth in clinical dentistry [1]. It could be said that composite restorations have been used as an attractive restorative material in both posterior and anterior teeth. Composite resin should retain its polish and color in order to serve as a long-term aesthetic restorative material [2]. Most dental treatment are conducted to replace composite restorations. Some of the most typical causes of restoration failure include recurring caries, marginal flaws, discoloration, wear, and loss of anatomic integrity [3]. Moreover, total restoration replacement is the clinical standard management technique in these restorations that shows any sign of defect [4].
Repair has grown in popularity over the last two decades as the concept of "Minimal Intervention Dentistry" (MID) has become more entrenched in the clinic [5]. Faulty restorations can be fixed simply by replacing the defective part. Recent research has shown that repairs can significantly extend the life of the restored tooth while needing less time, perhaps cheaper costs, and a lesser risk of problems than total replacements [6]. Restoration replacement and the removal of sound tooth structure from places that aren't affected by any localized defect invariably result in repeated iatrogenic pulp insults that may result in pulp vitality loss and deterioration of the remaining tooth structure [7]. The patient's caries risk may influence the decision to repair or replace a faulty restoration. Proper case selection and procedure are essential for successful faulty restoration repair. Composite restorations are showing acceptable clinical performance, with yearly rates of failure ranging between one and four percent in both anterior and posterior teeth [8]. Composite restorations can fail as a result of biological, mechanical, or aesthetic causes, and when they do, they require additional intervention in the form of refurbishment, replacement, or repair [9]. A study conducted in 2022 revealed that dental students had increased knowledge, awareness, and practice in finishing and polishing of composite restorations, according to the study, 81% of students said it was important to be knowledgeable about polishing and finishing of composite restorations [10]. Due to higher rate of defective composite restorations, it's important to evaluate the knowledge and attitudes about how to manage defective restorations among dental students in Saudi Arabia.
Objective**s:** This study was designed to measure knowledge and clinical practice of dental students about "repair or replacement" of damaged restorations.

Materials and Methods:
Study design: A cross-sectional questionnaire survey consists of 16 questions are designed and

ISSN:1624-1940
DOI 10.6084/m9.figshare.26207138
http://magellanes.com/

distribute among dental student in Saudi Arabia during 2023-2024.

Study setting: Participants, recruitment, and sampling procedure: From those who received the questionnaire in 2023, all dental students at Saudi Arabia's dental college.

Inclusion and Exclusion criteria: Inclusion: all dental students include senior and intern in KSA male and female. Exclusion: all students in KSA except dental students

Sample size: The sample size is estimated by using the Qualtrics calculator with a confidence level of 95%; the minimum sample size was 384.

Method for data collection and instrument (*Data collection Technique and tools)*: The survey instrument is a based on published questionnaire in English, containing questions regarding Knowledge and Clinical practice of dental students in Saudi Arabia regarding Replacement of restorations.

Scoring system:

Overall, 16 questions were used to assess the knowledge and clinical practice of the dental students regarding the management of defective restorations. A score of 0 was provided for an incorrect response.

Knowledge questions: There were ten questions in this part and the students were asked regarding their knowledge level toward the replacement of defective restoration. Each question had two choices. A correct answer was given 1 score, whereas a 0 score was given for a wrong answer. The original Bloom's cut-off points, 80.0%-100.0%, 60.0%-79.0%, and 59.0%, 16 they were used to classify KAP into three levels. The scores for knowledge varied from 1 to 10 points and were classified into three levels as follows:

1. High level: 8-10 scores; 2. Moderate level: 6-7 scores; and 3. Low level: 0-5 scores.

Practice questions: In this part, the scores regarding compliance with the abattoir laws throughout the operation activities varied from 0 to 20. These scores were classified into three levels. The questions were assessed as zero-one indicator (dichotomous) variables. The variables were given the value zero for "no" and value one for "yes." They were classified as good practice, fair practice, and poor practice as follows: 1. good level: 18-20 scores; 2. fair level: 11-17 scores; and 3. poor level: 0-10 scores.

This scoring system was derived from the following research "Knowledge and Clinical Practice of Restoration Repair among Dental Undergraduate Students in the Kingdom of Saudi Arabia. [11]

Analyzes and entry method: The collection of data was entered on the computer using the Microsoft Excel (2016) program for Windows. The data is later transferred to the Statistical-Package of Social-Science Software (SPSS) program, version 20. For statistical analysis.

Results:

Table (1) shows that, the first parameter is age, and it is observed that the majority of students fall in the age group of 20-30 years, accounting for 93.1% of the total students. The second parameter is gender, with 52.3% of the students being female and 47.7% being male. The third parameter is region/city, and it is observed that the highest number of students (37.8%) is from the southern region, followed by the western region (24.1%). The fourth parameter is year/level without preparatory year, and it is observed that the highest number of students (25.9%) is in their 3rd year, followed by the 4th year (21.8%). The fifth parameter is GPA (out of 5), and it is observed that the highest number of students (34.5%) have a GPA between 4.51-5.00, followed by 31.3% of students with a GPA between 4.01-4.50. The last parameter is the dental university, and it is observed that the highest number of

ISSN:1624-1940
DOI 10.6084/m9.figshare.26207138
http://magellanes.com/

students (30.6%) is from King Khalid University, followed by Jouf University (8.4%) and Ibn Sina College for Medical Studies (7.1%).

Table (1): Sociodemographic characteristics of participants (n=715)

Parameter		**No.**	**%**
Age	less than 20	42	5.9
	20- 30	666	93.1
	31- 40	4	.6
	50 -60	3	.4
Gender	Male	341	47.7
	Female	374	52.3
Region/ City	Central region	123	17.2
	Eastern region	53	7.4
	North region	97	13.6
	South region	270	37.8
	Western region	172	24.1
Year/Level with out Preparatory year	3rd year	185	25.9
	4th year	156	21.8
	5th year	123	17.2
	6th year	104	14.5
	Other	147	20.6
GPA (Out of 5) :	2.00-2.50	25	3.5
	2.51-3.00	17	2.4
	3.01-3.50	59	8.3
	3.51-4.00	143	20.0
	4.01-4.50	224	31.3
	4.51-5.00	247	34.5
Dental University	Al Baha University	24	3.4
	Batterjee Medical College	7	1.0
	Dar Al Uloom University	4	.6
	Ha'il University	24	3.4
	Ibn Sina College For Medical Studies	51	7.1
	Imam Abdulrahman Bin Faisal University	19	2.7
	Jazan University	14	2.0
	Jouf University	60	8.4
	King Abdulaziz University	79	11.0
	King Faisal University	10	1.4
	King Khalid University	219	30.6

ISSN:1624-1940
DOI 10.6084/m9.figshare.26207138
http://magellanes.com/

	King Saud bin Abdulaziz University for Health Sciences (KSAU-HS)	14	2.0
	King Saud University	55	7.7
	Majmaah University	3	.4
	Najran University	8	1.1
	Other	10	1.4
	Prince Sultan University	12	1.7
	Princess Nourah Bint Abdul Rahman University	12	1.7
	Qassim University	17	2.4
	Riyadh Elm University	10	1.4
	Taibah University	17	2.4
	Taif University	9	1.3
	Umm Al Qura University	9	1.3
	Visions College	28	3.9

Table (2) showed that, the majority of dental students (86.6%) have been taught about restorations repair during their dental education. The level at which these lectures are provided varies, with the highest percentage in the 3rd year (30.2%) and the lowest in the 6th year (7.0). When it comes to the frequency of repairs done in daily clinical practice, the responses vary. While some students report frequent repairs (23.1%), others indicate that they never perform repairs (12.4%). When surveyed about factors that play a role in the decision to repair or replace a restoration, (79.7%) of participants said size of the defect, (56.8%) type of restorative material, (37.8%) kind of tooth, (36.2%) age of defect, and (44.5%) localization of the defect. When surveyed about the kind of tooth that plays a role in the decision to repair or replace a restoration, participants showed a higher likelihood of repair for molars (62.9%) compared to premolars (39.4%) and anterior teeth (48.1%). The types of restoration defects that are considered suitable for repair include marginal gap (51.0%), partial loss of restoration/fracture (50.5%), and secondary caries (42.9%). In terms of restorative materials used for repair, composite (78.5%) is the most commonly used, followed by ceramic crowns (33.0%) and porcelain fused to metal (29.8%). Finally, it is worth noting that while a majority of students are aware of the meaning of "refurbishing" (54.8%), there is still a significant portion who are not familiar with the term.

Table (2): Knowledge of participants of online nutritional applications and tele-dietetics (n=715).

Parameter		No.	Percent
During your dental education so far, have you been taught about restorations repair?	Yes	619	86.6
	No	96	13.4
If yes, at which level have you had lectures about dental	2nd year and less	118	16.5
	3rd year	216	30.2

ISSN:1624-1940
DOI 10.6084/m9.figshare.26207138
http://magellanes.com/

repair/ replace of restorations?	4th year	189	26.4
	5th year	83	11.6
	6th year	50	7.0
	other	59	8.3
How would you describe the frequency of repairs done in your daily clinical practice for different restorative materials?	Frequent	165	23.1
	Never	89	12.4
	Occasional	173	24.2
	Sometimes	288	40.3
When deciding to repair or replace a restoration, which factors play a role? (check all that apply)	Size of defect	570	79.7
	ive restoration	497	69.5
	Type of restorative material	406	56.8
	Kind of tooth	270	37.8
	Age of defect	259	36.2
	Localization of defect	318	44.5
If you think the kind of tooth plays a role, when is it more likely that you repair/refurbish a restoration rather than replace it:	premolar	282	39.4
	Anterior	344	48.1
	Molar	450	62.9
Which of the following restoration defects are suitable for repair :	Marginal gap	365	51.0
	Partial loss of restoration/ fracture	361	50.5
	Secondary caries	307	42.9
	Endodontic access cavity of crown	234	32.7
	Veneer chipping of crowns	145	20.3
	Marginal discoloration	266	37.2
	Correction of color	314	43.9
	Correction of anatomic form	294	41.1
Which restorative materials have you used or can be used for restoration repairs? (check all that apply)	Composite	561	78.5
	Amalgam	197	27.6
	Ceramic Crowns	236	33.0
	Porcelain fused to metal	213	29.8
Are you aware of the meaning of " Refurbishing" ?	Yes	392	54.8
	No	323	45.2

ISSN:1624-1940
DOI 10.6084/m9.figshare.26207138
http://magellanes.com/

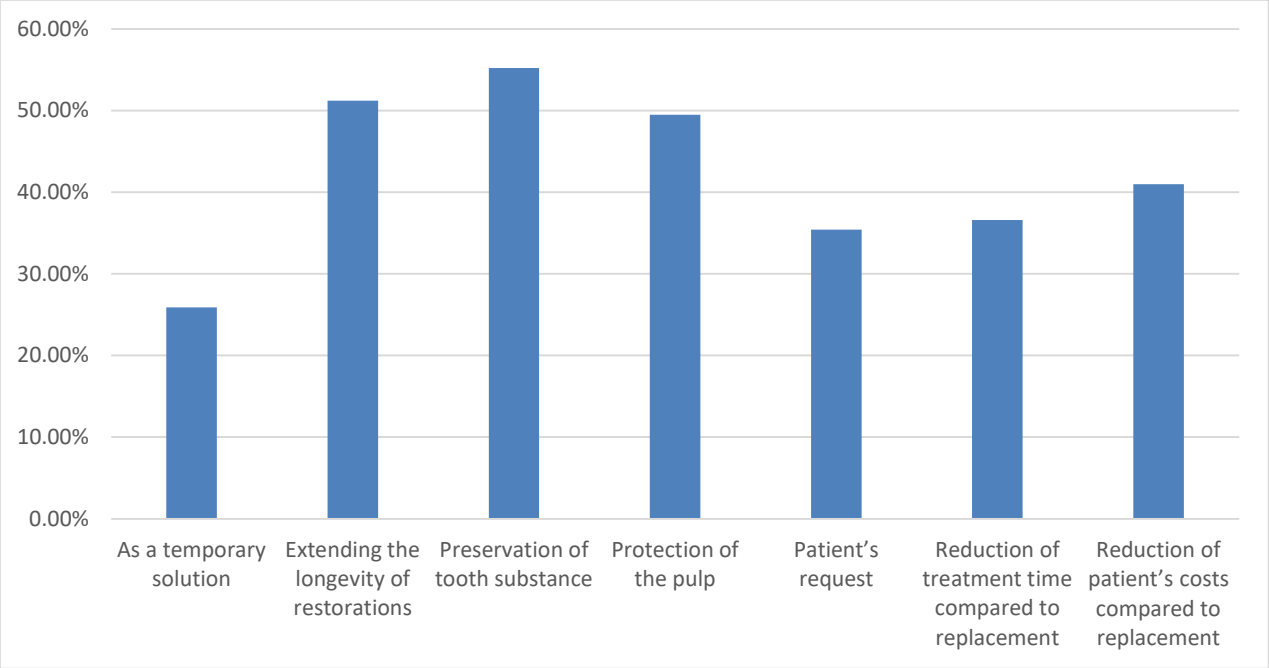
If yes, please define it :	Is done to refinish or polish a restoration which is rough, with or without recontouring. Only margins of a restoration are refinished, while resurfacing may involve part or all of the exposed surfaces of the restoration.	196	50.0
	Is indicated if generalized or severe problems and interventions are necessary and usually combined with more loss of tooth structure.	18	4.6
	Is limiting the amount of lost tooth substance and the amount of exposed dentine surface. Includes slight grinding and polishing of tooth or restoration, removal of overhangs, polishing of discolored tooth- colored restorations and may include sealing margins. Localized marginal defects, marginal staining, bulk fracture of a limited portion of the restoration, initial secondary caries, localized wear of the restoration.	157	40.1
	I don't know	21	5.4

Regarding valid reasons for restoration repair in figure (1), the responses indicate that students recognize the importance of preservation of tooth substance (55.2%), protection of the pulp (49.5%), and extending the longevity of restorations (51.2%).

Figure (1): Participants' knowledge of valid reasons for repair

CAHIERS MAGELLANES-NS
Volume 06 Issue 1
2024

ISSN:1624-1940
DOI 10.6084/m9.figshare.26207138
http://magellanes.com/



The types of restorations that students have performed repairs on also vary, with composite restorations being the most common (72.0%). This is followed by amalgam (40.4%), ceramic crowns (27.4%), and porcelain fused to metal (17.6%), as illustrated in figure (2).

Figure (2): Kinds of restoration repair performed by participants, if performed.

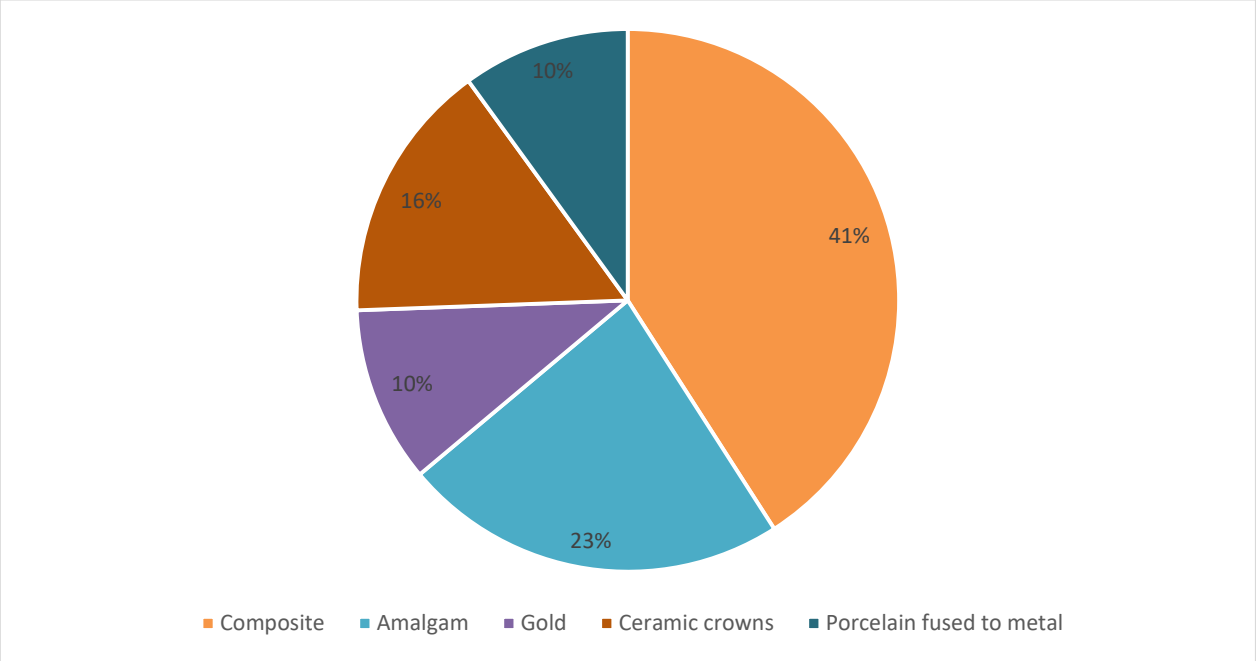


Table (3) explores the relationship between the level of education about restorations repair, the frequency of repairs done in daily clinical practice for different restorative materials, and the awareness of the meaning of "Refurbishing". A higher GPA is associated with a greater likelihood of being educated about restorations repair, with a significant increase in the percentage of individuals educated as the GPA range increases. Additionally, the table suggests that those with a higher GPA are more likely to be aware of the meaning of "Refurbishing," as evidenced by the higher percentages in the 3.51-

ISSN:1624-1940
DOI 10.6084/m9.figshare.26207138
http://magellanes.com/

4.00, 4.01-4.50, and 4.51-5.00 GPA ranges. Furthermore, the data suggests a correlation between the frequency of repairs done in daily clinical practice and GPA, with a higher GPA being associated with a greater frequency of repairs. This is evidenced by the higher percentages in the 3.51-4.00, 4.01-4.50, and 4.51-5.00 GPA ranges. The data also provides insights into the relationship between the level of education about restorations repair and the grade level of the respondents. It appears that individuals in the 2nd year and less category are more likely to be educated about restorations repair compared to those in higher grade levels. In addition, the table presents information on the frequency of repairs done in daily clinical practice for different restorative materials. It suggests that those with a higher GPA are more likely to engage in frequent repairs, while those with lower GPAs are more likely to report never or occasional repairs. The data also sheds light on respondents' awareness and understanding of the meaning of "Refurbishing." It appears that a higher GPA is associated with a greater likelihood of being aware of the meaning of "Refurbishing," as evidenced by the higher percentages in the 3.51-4.00, 4.01-4.50, and 4.51-5.00 GPA ranges.

Table (3): Participants knowledge of restoration replacement with their GPA

		GPA						**Total (N=715)**	**P value**
		2.00-2.50	2.51-3.00	3.01-3.50	3.51-4.00	4.01-4.50	4.51-5.00		
Educated about restorations repair	**yes**	22	12	47	131	191	216	619	**0.081**
		3.1%	1.7%	6.6%	18.3%	26.7%	30.2%	86.6%	
	No	3	5	12	12	33	31	96	
		0.4%	0.7%	1.7%	1.7%	4.6%	4.3%	13.4%	
If yes, which grade	2nd year and less	8	4	18	11	31	46	118	**0.001**
		1.1%	0.6%	2.5%	1.5%	4.3%	6.4%	16.5%	
	3rd year	5	6	12	51	87	55	216	
		0.7%	0.8%	1.7%	7.1%	12.2%	7.7%	30.2%	
	4th year	8	4	15	60	42	60	189	
		1.1%	0.6%	2.1%	8.4%	5.9%	8.4%	26.4%	
	5th year	0	1	2	14	30	36	83	
		0.0%	0.1%	0.3%	2.0%	4.2%	5.0%	11.6%	
	6th year	0	1	10	1	16	22	50	
		0.0%	0.1%	1.4%	0.1%	2.2%	3.1%	7.0%	
	other	4	1	2	6	18	28	59	
		0.6%	0.1%	0.3%	0.8%	2.5%	3.9%	8.3%	
Frequency of repairs done in	Frequent	10	6	11	44	50	44	165	**0.001**
		1.4%	0.8%	1.5%	6.2%	7.0%	6.2%	23.1%	
	Never	5	3	7	12	25	37	89	

ISSN:1624-1940
DOI 10.6084/m9.figshare.26207138
http://magellanes.com/

your daily clinical practice for different restorative materials		0.7%	0.4%	1.0%	1.7%	3.5%	5.2%	12.4%	
	Occasional	1	4	25	23	62	58	173	
		0.1%	0.6%	3.5%	3.2%	8.7%	8.1%	24.2%	
	Sometimes	9	4	16	64	87	108	288	
		1.3%	0.6%	2.2%	9.0%	12.2%	15.1%	40.3%	
Aware of the meaning of " Refurbishin	Yes	13	9	36	105	121	108	392	**0.001**
		1.8%	1.3%	5.0%	14.7%	16.9%	15.1%	54.8%	
	No	12	8	23	38	103	139	323	
		1.7%	1.1%	3.2%	5.3%	14.4%	19.4%	45.2%	
If yes, please define it:	Is done to refinish or polish a restoration which is rough, with or without recontouring.	15	5	21	40	85	71	237	**0.001**
		2.1%	0.7%	2.9%	5.6%	11.9%	9.9%	33.1%	
	Is indicated if generalized or severe problems and interventions are necessary and usually combined with more loss of tooth structure.	0	0	3	5	9	4	21	
		0.0%	0.0%	0.4%	0.7%	1.3%	0.6%	2.9%	
	Is limiting the amount of lost tooth substance and the amount of exposed dentine surface.	2	7	17	64	45	40	175	
		0.3%	1.0%	2.4%	9.0%	6.3%	5.6%	24.5%	
	Don't know	15	5	21	40	85	71	237	
		2.1%	0.7%	2.9%	5.6%	11.9%	9.9%	33.1%	

Discussion:

The replacement of dental restorations is a crucial aspect of clinical practice for dental students in Saudi Arabia. As future dental professionals, they need to possess the necessary knowledge and skills to perform this procedure effectively and efficiently. However, the extent of their knowledge and clinical practice in this area is a subject of debate [3,7]. One of the primary factors that affect the knowledge and clinical practice of dental students in Saudi Arabia regarding the replacement of restorations is the quality of their education and training. The curriculum of dental schools in Saudi Arabia is designed to

ISSN:1624-1940
DOI 10.6084/m9.figshare.26207138
http://magellanes.com/

provide students with a strong theoretical foundation and practical experience in various aspects of dentistry. However, some dental schools may not provide adequate training in the replacement of restorations, leading to a lack of confidence and proficiency among students [11]. Another factor that affects the knowledge and clinical practice of dental students in Saudi Arabia is the availability of resources. Dental schools in Saudi Arabia may not have access to the latest technologies and equipment required for the replacement of restorations. This may limit the exposure of students to advanced techniques and procedures, leading to a lack of confidence and expertise in this area [12].

Assessing their knowledge, 86.6% of the participants have been taught about restoration repair, this is consistent with a study which was conducted to evaluate the perception of repair and replacement of dental restorations by graduates and undergraduates at King Abdulaziz University and showed that approximately 70.7% of students have reported receiving instruction on the indicators of restorative repair [13]. A study conducted in the central region of Saudi Arabia showed that 77.8% of respondents said that they have received education on restoration repair throughout their preclinical coursework at the undergraduate level [11]. According to a recent research conducted in 2021, an examination of the educational practices pertaining to the repair of damaged resin-based composite restorations at dental schools situated in Middle Eastern and North African (MENA) countries revealed that a majority of 69% of these schools included repair techniques as a viable option to the complete replacement of restorations. Out of the educational institutions that do not already provide repair instruction, 80% expressed their intention to include this subject into their academic programs during the next five-year period. The majority of educational institutions primarily focus on imparting theoretical and practical knowledge related to repair, but limited to a clinical level [14].

In our study, when asked about the valid reasons for restoration repair more than half of the participants voted for preservation of tooth substance, about half of them voted for extending the longevity of restorations and protection of the pulp, followed by reduction of patient's costs compared to replacement, reduction of treatment time compared to replacement, and as temporary solution. In line with a study held among a subpopulation of Saudi dental students which showed that cost-effective rate of 76% was reported, which was subsequently accompanied by a 71% increased longevity [9]. The findings of our study align with those of Gordan et al., who conducted a comprehensive review of published information on composite restoration repair. Their conclusion was that repaired restorations exhibited greater rates of survival and demonstrated improved sealing of crevices or ditches, resulting in increased longevity compared to untreated restorations [15].

Regarding which restoration defects are suitable for repair, our study showed that marginal gap and partial loss of restoration/ fracture were the most selected options for almost more than half of the participants, followed by correction of color, secondary caries, correction of anatomic form, marginal discoloration, and endodontic access cavity of crown. On the other hand another study showed that partial fractures and correction of anatomic form were the most selected options by participants [11]. The results align with prior responses provided by students in the Middle East, Africa [14], the United Kingdom, and Ireland [16], who expressed the belief that partial material loss and marginal flaws were the prevailing signals. In contrast, previous studies conducted in Saudi Arabia have identified secondary caries as the primary rationale for treatments [9, 13].

When asked what kind of tooth is more likely to be repaired/refurbished a restoration rather than replace

ISSN:1624-1940
DOI 10.6084/m9.figshare.26207138
http://magellanes.com/

it, the most selected was molars followed by anterior and then premolars. Similarly a study showed that the responders showed a preference for repairing molar teeth, followed by anterior and finally premolars [11]. The findings were consistent with other research, which indicated that dental professionals had a higher tendency to perform repairs on molar restorations. One potential cause is that molar teeth tend to experience a greater magnitude of biting pressures, which may result in a higher likelihood of requiring restorative procedures involving multiple surfaces [17].

When asked about deciding to repair or replace a restoration, the majority of participants chose size of defect, followed by IVE restoration, type of restorative material, localization of defect, and kind of tooth, respectively. Similarly, in a present investigation, the primary clinical assessment variables identified by students for selecting restorative repairs were the size of the defect, the kind of restorative material, and the overall size of the deficient restoration. In addition, it has been revealed that the most significant clinical repairs were conducted on composite restorations [11]. Numerous investigations have consistently shown composite as the preferred material for restorative procedures [13,17]. Similar to our study which showed that participants selected composite, followed by ceramic crowns, porcelain fused to metal, and amalgam, respectively, as materials used for restoration repair. The rationale behind this phenomenon can be attributed to the significant advancements observed in resin composite materials over the past few years. These materials have demonstrated an improved capacity to adhere to both pre-existing composites and tooth surfaces. Furthermore, they have been shown to effectively strengthen the existing tooth structure, particularly in the context of extensive restorations involving molar teeth [17,18].

Furthermore, the cultural and social factors in Saudi Arabia may also affect the knowledge and clinical practice of dental students regarding the replacement of restorations. In some cases, patients may prefer to retain their existing restorations, even if they are worn out or damaged. This may lead to reluctance among dental students to recommend replacement, as they may fear offending their patients or being perceived as overly aggressive [4,11].

Conclusion:

In conclusion, the knowledge and clinical practice of dental students in Saudi Arabia regarding the replacement of restorations are influenced by various factors, including the quality of education and training, availability of resources, and cultural and social factors. To ensure that dental students are adequately prepared for this aspect of clinical practice, dental schools in Saudi Arabia need to provide comprehensive training and access to the latest technologies and equipment. Additionally, dental professionals need to educate patients about the importance of replacing worn-out or damaged restorations to ensure optimal oral health.

Acknowledgement:

We thank the participants who all contributed samples to the study.

Ethical approval

An informed consent was obtained from each participant after explaining the study in full and clarifying that participation is voluntary. Data collected were securely saved and used for research purposes only.

ISSN:1624-1940
DOI 10.6084/m9.figshare.26207138
http://magellanes.com/

Funding

The study did not receive any external funding.

Conflict of interests

The authors declare that there are no conflicts of interest.

Informed consent:

Written informed consent was obtained from all individual participants included in the study.

Data and materials availability

All data associated with this study are present in the paper.

References:

1. Nema T, Al-Assadi H, Hadi M, Ghani Nema T, Al-Assadi HZ, Jawad MH. MANAGEMENT OF DEFECTIVE COMPOSITE RESTORATION (REPAIR OR REPLACE) : A SURVEY STUDY AMONG IRAQI DENTISTS Evalaution of the effect of different light cure devices on microleakage of cl v composite resto View project CAD CAM SYSTEM View project MANAGEMENT OF [Internet]. 2021. Available from: https://connectjournals.com/03896.2021.21.263
2. Yuvashree CS, Kumar K, Ganapathy D, Ahmed N, Maiti S. EVALUATION OF MARGINAL DISCOLOURATION IN CLASS 3 COMPOSITE RESTORATION. 2023;12:1475–86.
3. Kattan W, Urquhart O, Comnick C, McQuistan MR, Guzmán-Armstrong S, Kolker J, et al. Repair versus replacement of defective direct restorations: A cross-sectional study among US dentists. J Am Dent Assoc. 2021 Nov 1;152(11):927–35.
4. Al-Badri HM, Mansi ZM, Alhashimi RA. A Questionnaire-Based Survey Assessment of Iraqi Dentists Using Repair Versus Replacement of Defective Composite Restoration. Vol. 14, Indian Journal of Forensic Medicine & Toxicology. 2020.
5. Staxrud F, Tveit AB, Rukke H V., Kopperud SE. Repair of defective composite restorations. A questionnaire study among dentists in the Public Dental Service in Norway. J Dent. 2016 Sep 1;52:50–4.
6. Kanzow P, Wiegand A, Wilson NHF, Lynch CD, Blum IR. Contemporary teaching of restoration repair at dental schools in Germany – Close to universality and consistency. J Dent. 2018;75:121–4.
7. REPAIR OR REPLACEMENT OF DEFECTIVE DIRECT. 2015;
8. Demarco FF, Corrêa MB, Cenci MS, Moraes RR, Opdam NJM. Longevity of posterior composite restorations: Not only a matter of materials. Dent Mater. 2012 Jan;28(1):87–101.
9. Al-Qarni MA, Khalil SN, Obied ESS, Alshehri MM, Assiri MAA, Mualwi SAM, et al. Knowledge about composite restorations repair vs replacementa survey among a subpopulation of saudi dental students. Brazilian Dent Sci. 2021;24(1):1–8.
10. Knowledge, attitude and practice of finishing and polishing of composite restoration among dental students. J Pharm Negat Results. 2022 Jan 1;13(SO4).
11. Sibai N, AlFadhel R, AlSaleh L, Durayhim S Bin, AlMthen H, AlSewailem L. Knowledge and Clinical Practice of Restoration Repair among Dental Undergraduate Students in the Kingdom

ISSN:1624-1940
DOI 10.6084/m9.figshare.26207138
http://magellanes.com/

of Saudi Arabia. Open Dent J. 2023;17(1):1–7.

12. Aldowah O. The Ability of Dental Interns and Freshly Graduated Dentists to Assess Tooth Restorability. A Multicenter, Cross-Sectional Study. *Clin Cosmet Investig Dent*. 2022;14:337-352. Published 2022 Nov 22. doi:10.2147/CCIDE.S386676
13. Yousef M, Khoja N. Repair and replacement perception of dental restorations. Magalat Game'at al-Malik Abdul Aziz Al-U'lum al-Tibyat 2009; 16(1): 75-85.
14. Nassar M, Al-Fakhri O, Shabbir N, *et al.* Teaching of the repair of defective composite restorations in Middle Eastern and North African Dental Schools. J Dent 2021; 112: 103753.
15. Gordan VV, Garvan CW, Blaser PK, Mondragon E, Mjör IA. A long-term evaluation of alternative treatments to replacement of resin-based composite restorations: results of a seven-year study. J Am Dent Assoc. 2009 Dec;140(12):1476-84.
16. Blum IR, Lynch CD, Wilson NHF. Teaching of direct composite restoration repair in undergraduate dental schools in the United Kingdom and Ireland. Eur J Dent Educ 2012; 16(1): e53-8.
17. Gordan VV, Riley JL III, Rindal DB, *et al.* National Dental Practice-Based Research Network Collaborative Group. Repair or replacement of restorations. J Am Dent Assoc 2015; 146(12): 895-903.
18. Cho K, Rajan G, Farrar P, Prentice L, Gangadhara PB. Dental resin composites: A review on materials to product realizations. Compos Part B Eng 2022; 230: 109495