VOLUME - 11, ISSUE - 03, MARCH - 2022 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Dental Science

KNOWLEDGE, ATTITUDE AND PRACTICE OF UG STUDENTS TOWARDS FAILURE OF AMALGAM RESTORATION & IT'S PREVENTION

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ABSTRACT

Aims and objective - This study aims to assess the knowledge, attitude and practice of Undergraduate students towards failure of class I and class II amalgam restoration in permanent molars and the method used for its prevention.

Methodology - An online survey was conducted among 128 Undergraduate students (2nd year, 3rd year, 4th year and interns) of the institute Rajarajeshwari Dental College and Hospital, using a 14-point Questionnaire, statistical analysis, descriptive statistics and inferential statistics (Chi Square Goodness of Fit Test). The level of significance (P-value) was set at $P < 0.05$.

Conclusion - Longevity of any restoration depends upon several factors and as we know that amalgam as a restorative material has been used in dentistry for about more than 150 years now and it is still being used because of its low cost, strength & longevity. But certain factors have proven to be the reason for failure of amalgam restoration. For a long time, people have been using different preventive measures to eradicate these reasons and to increase the life of amalgam restoration. This study concludes about the most common signs and reasons seen and known by the current learning and practising Undergraduate students for failure of amalgam restoration.

KEYWORDS : amalgam, restoration, signs, failure, prevention

INTRODUCTION

Amalgam which is still prevalent as an excellent dental restorative material because of its longevity, strength and low cost. It has been used in dentistry for about more than 150 years now. It is an alloy of silver, copper, tin and zinc combined with mercury. [1,2]

A proper manipulation of dental amalgam alloy increases the longevity of the restoration at least up to 10 years. As high copper amalgam alloy contains (eta) phase (strongest phase) in addition to elimination of 2 (gamma) phase (weakest phase) which prevents corrosion, so they are considered better than low copper amalgam alloy. [3,4]

As we know amalgam restoration shows certain signs like fracture lines, proximal overhangs and certain reasons for its failure can be bulk fracture, tooth fracture or marginal ridge fractures. [3,5]

So, the satisfactory functioning of the amalgam restoration for a longer duration can be achieved by proper case selection, cavity preparation, and by eliminating the post-operative factors.[6]

MATERIALS AND METHODS

An online survey was conducted among 128 Undergraduate students (2nd year, 3rd year, 4th year and interns) of the institute Rajarajeshwari Dental College and Hospital, using a 14-point questionnaire. The questionnaire was prepared by considering the various signs and reasons of failure of dental amalgam restoration.[6]

Statistical Analysis:

Statistical Package for Social Sciences [SPSS] for Windows, Version 22.0. Released in 2013. Armonk, NY: IBM Corp., was used to perform statistical analyses.

Descriptive Statistics:

Descriptive analysis includes expression responses to the study questionnaire in terms of Frequency and Proportions.

Inferential Statistics:

Chi Square Goodness of Fit Test was used to compare the distribution of responses to the questionnaire by the study participants.

The level of significance [P-Value] was set at $P<0.05$ and is used to assess the knowledge, attitude and challenges faced by the Undergraduate students during their practice.

RESULTS AND DISCUSSIONS:

Table 1: Distribution of study participants based on age, gender and year of study.

Variable	Category	n	%
Age	19-21 yrs.	81	63.3%
	22-24 yrs.	47	36.7%
		Mean	SD
	Mean	21.21	1.00
	Range	19 – 24	
Gender	Category	n	%
	Males	21	16.4%
	Female	107	83.6%
Year of study	II BDS	52	40.6%
	III BDS	59	46.1%
	IV BDS	14	10.9%
	Interns	3	2.3%

There were about 128 participants, in which 83.6 % are females and 16.4% are male. Among which 63.3% student's age ranges from 19-21 years and 36.7% student's age ranges from 22-24years.

Among them about 46.1% participants were of III BDS, 40.6% of II BDS, 10.9% of IV BDS and 2.3% were Interns.

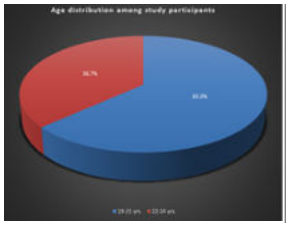

Figure 1: Age distribution among study participants.

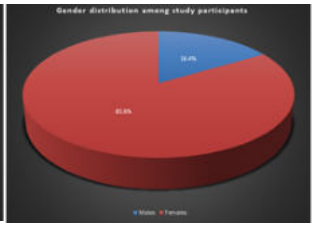

Figure 2: Gender distribution among study participants.

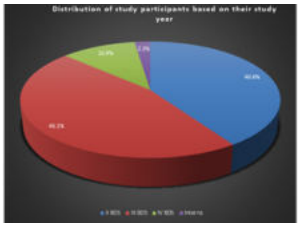

Figure 3: Distribution of participants based on their study year.

Table 2: Comparison of distribution of responses to the study questionnaire using Chi Square Goodness of Fit Test

Question	Responses	n	%	χ^2 Value	P-Value
1. Do you have any idea about the signs of failure of amalgam restoration?	Yes	124	96.9%	112.500	<0.001*
	No	4	3.1%		
2. Which of the following signs have you heard of?	Fracture Line	35	27.3%	..	..
	Poor Anatomic Contour	31	24.2%		
	Amalgam Blues	11	8.6%		
	Poor Occlusal contacts	31	24.2%		
	Bulk Fracture	23	18.0%		
	All the above	72	56.3%		
	Not Sure	5	3.9%		
3. According to you, which amalgam restoration is more prone to failure?	Class I	8	6.3%	98.000	<0.001*
	Class II	120	93.8%		
4. What are the common signs of failure seen in class II amalgam restoration?	Proximal overhang	27	21.1%	..	..
	Fracture line	16	12.5%		
	Voids	18	14.1%		
	Recurrent caries	18	14.1%		
	Marginal Ditching	28	21.9%		
	Improper Proximal Contour	29	22.7%		
	All the above	69	53.9%		
	Not Sure	7	5.5%		
5. Can "case selection" affect the longevity of amalgam restoration?	Yes	52	40.6%	51.063	<0.001*
	No	6	4.7%		
	Maybe	70	54.7%		
6. What are the common conditions which may lead to failure of amalgam restoration in "improper case selection"?	Inadequate tooth structure	20	15.6%	..	..
	Opposing cusp impinging on the restoration	14	10.9%		
	Bruxism	13	10.2%		
	Extensive proximal caries	15	11.7%		
	Masticatory load	18	14.1%		
	All the above	84	65.6%		
	Not Sure	11	8.6%		
7. What other reasons do you know which lead to failure of amalgam restoration?	Improper cavity Preparation	17	13.3%	..	..
	Error in manipulation of Amalgam	17	13.3%		
	Improper selection of alloy	2	1.6%		
	Improper condensation	15	11.7%		
	Error in matricing technique	8	6.3%		
	All the above	104	81.3%		
	Not Sure	4	3.1%		
8. According to you, what are the common reasons which may lead to improper cavity preparation?	Cavity of depth less than 1.5mm	24	18.8%	..	..
	Curved pulpal floors	16	12.5%		
	Width of isthmus	5	3.9%		
	Occlusal divergence	18	14.1%		
	Sharp axiopulpal line angle	6	4.7%		
	Improper convenience form	20	15.6%		
	All the above	95	74.2%		
	Not Sure	3	2.3%		
9. Do you think, improper matricing technique can lead to failure of class II amalgam restoration?	Yes	102	79.7%	130.516	<0.001*
	No	1	0.8%		
	Maybe	25	19.5%		
10. What are the common reasons which may lead to errors in matricing?	Stability of matrices	24	18.8%	..	..
	Choice of Matrices	24	18.8%		
	Wedging Technique	23	18.0%		
	Time of Matrix removal	28	21.9%		
	All the above	96	75.0%		
	Not Sure	5	3.9%		
11. Do you think post-operative pain and sensitivity may lead to failure of amalgam	Yes	61	47.7%	37.703	<0.001*
	No	10	7.8%		

	Maybe	57	44.5%		
12. What reasons according to you are likely to cause postoperative pain?	Occlusal high point	17	13.3%	..	..
	Contamination during condensation of amalgam	23	18.0%		
	Improper layer of base OR varnish	17	13.3%		
	Cracked tooth syndrome	18	14.1%		
	Galvanism	29	22.7%		
	All the above	73	57.0%		
	Not Sure	9	7.0%		
13. Do you think proper isolation methods can prevent failure of amalgam restoration?	Yes	78	60.9%	62.641	<0.001*
	No	5	3.9%		
	Maybe	45	35.2%		
14. What other methods of isolation can be used?	Cotton Wools	29	22.7%	..	..
	Rubber Dam	48	37.5%		
	Saliva ejector	22	17.2%		
	Throat shield	3	2.3%		
	Mouth props	5	3.9%		
	High volume evacuation	14	10.9%		
	All the above	67	52.3%		
	Not Sure	9	7.0%		

* - Statistically Significant

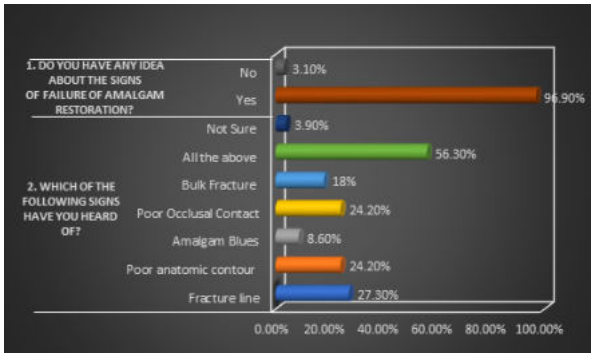

Figure 4: Distribution of responses to the study question no. 1 &2

About 96.9% of participants have an idea about the signs of failure of amalgam restoration and about 3.1% have not heard about these.

The signs of failure of amalgam restoration that are commonly heard by the participants are fracture line (27.3%), poor anatomic contour (24.2%), poor occlusal contact (24.2%), bulk fracture (18%), amalgam blues (8.6%) and about 56.3% of them have heard all the above-mentioned signs and 3.9% are not sure about any of these.

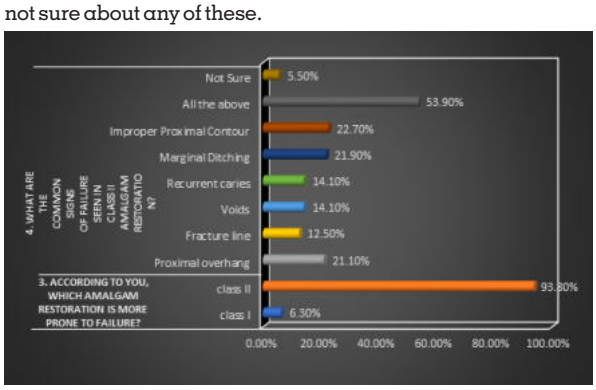

Figure 5: Distribution of responses to the study question no. 3 & 4

According to 93.8% of participants, class II amalgam restorations are more prone to failure while about 6.3% of them think class I amalgam restoration are more prone to failure.

The common signs of failure seen by the participants in class II amalgam restoration are improper proximal contour (22.7%), marginal ditching (21.9%), proximal overhang (21.1%), voids (14.1%), recurrent caries (14.1%), fracture line (12.5%) and according to 53.9% of participants all these signs are common while 5.5% of them are not sure about any of these.

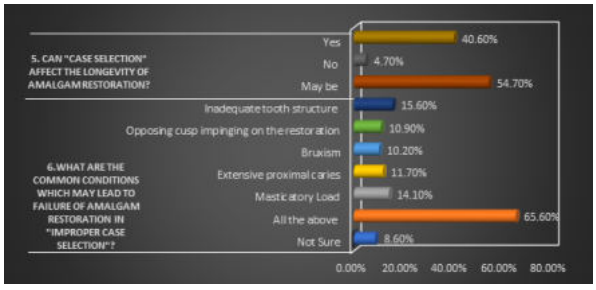

Figure 6: Distribution of responses to the study question no. 5 & 6

According to 54.7% of the participants "case selection" may be affecting the longevity of amalgam restoration, while 40.6% of them agreed that it affects and 4.7% of them think it does not affect the longevity.

The common conditions that may lead to the failure of amalgam restoration, if an improper case selection is done are inadequate tooth structure (15.6%), masticatory load (14.1%), extensive proximal caries (11.7%), opposing cusp impinging on the restoration (10.9%), bruxism (10.2%) and according to 65.6% of the participants all the above conditions may lead to failure and 8.6% of them are not sure about any of these.

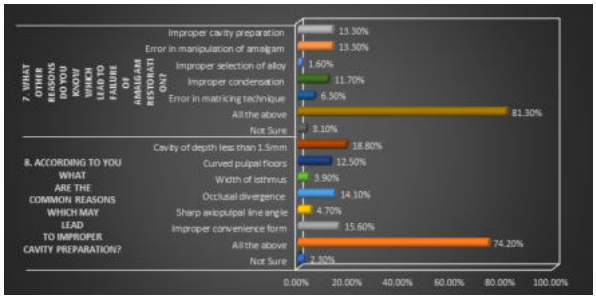

Figure 7: Distribution of responses to the study question no. 7 & 8

Other reasons that may lead to failure of amalgam restoration are improper cavity preparation (13.3%), error in manipulation of amalgam (13.3%), improper condensation (11.7%), error in matricing technique (6.3%), and improper

selection of alloy (1.6%), and according to 81.3% of participants, all the above reasons may lead to failure and 3.1% of them are not sure about any of these.

The common reasons that may lead to improper cavity preparation are cavity of depth less than 1.5mm (18.8%), improper convenience form (15.6%), occlusal divergence (14.1%), curved pulpal floors (12.5%), sharp axiopulpal line angle (4.7%), width of the isthmus (3.9%) and according to 74.2% of participants, all the above reasons commonly affect it and 2.3% of them are not sure about any of these.

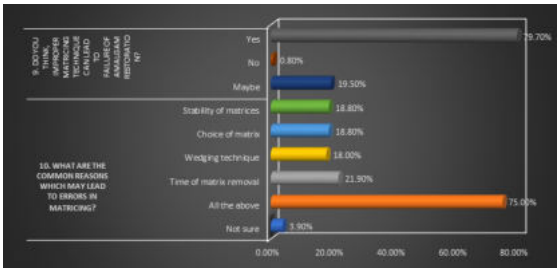

Figure 8: Distribution of responses to the study question no. 9 & 10

According to 79.7% of participants, improper matricing technique can lead to failure of class II amalgam restoration while 19.5% of them think maybe it can and about 0.8% think it does not lead to failure.

The common reasons that may lead to errors in matricing are time of matrix removal (21.9%), stability of matrices (18.8%), choice of matrices (18.8%), wedging technique (18%) and according to 75% of the participants, all the above reasons may lead to error and 3.9% of them are not sure about any of these.

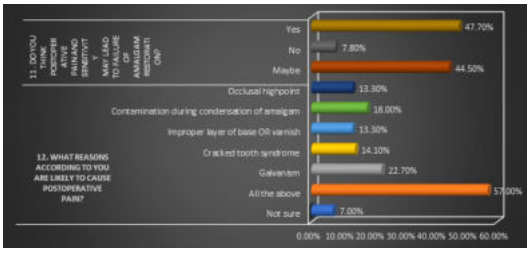

Figure 9: Distribution of responses to the study question no. 11 & 12

According to 47.7% of the participants, post-operative pain and sensitivity may lead to failure of amalgam restoration, while 44.5% of them think maybe it can cause and about 7.8% of think it does not lead to failure.

The reasons that are likely to cause postoperative pain are Galvanism (22.7%), contamination during condensation of amalgam (18%), cracked tooth syndrome (14.1%), occlusal high points (13.3%), improper layer of base or varnish (13.3%) and according to 57% of the participants, all the above reasons are likely to cause postoperative pain and 7% of them are not sure about any of these.

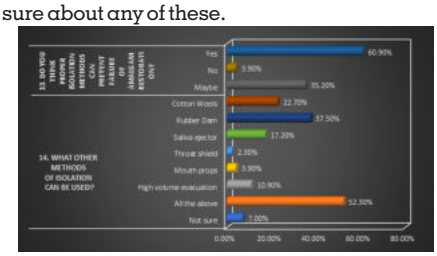

Figure 10: Distribution of responses to the study question no. 13 & 14

According to 60.9% of the participants, proper isolation methods can prevent failure of amalgam restoration, while 35.2% think maybe it can prevent failure and about 3.9% of them think it does not prevent it.

The other methods of isolation that can be used while doing amalgam restoration are rubber dam (37.5%), cotton rolls (22.7%), saliva ejector (17.2%), high volume evacuation (10.9%), mouth props (3.9%), throat shield (2.3%) and according to 52.3% of participants, all the above methods can be used and 7% of them are not sure about any of these.

CONCLUSION

The most common factors which are concluded from this study and are known by the Undergraduate students include certain signs and reasons. The most common sign seen is fracture line. Class II amalgam restoration being more prone to failure with the commonest sign as Improper proximal contour. The most common reason of failure being the improper case selection with condition mainly like Inadequate tooth structure. Other common reasons leading to failure are improper cavity preparation and error in manipulation of amalgam. And the most likeable method of isolation is rubber dam. The preventive measures that can be taken to avoid failure of amalgam restorations are proper post-operative instructions which are given to patients,, mainly to educate them to maintain good oral hygiene, to avoid parafunctional habits like bruxism with the use of preventive mechanical aids. The patients are advised to avoid chewing of any hard food from the restored side for the next 24hrs. The elimination of the above signs, reasons and by taking the proper post-operative measures the amalgam restorations can be saved with a better survival rate.

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