# Posterior Restoration Selection among General Dental Practitioners in Karachi

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**Abstract**

**Background:** Tooth restoration is a common, routine procedure among dentists but still has its own difficulties especially for posterior teeth. As it is a straightforward procedure, some dentists are not aware of the difficulties that may contribute in reducing the longevity of the filling.

**Objective:** To determine the difficulties encountered during and after placement of restorative materials in deep cavities.

**Study Design:** Cross sectional

**Place and Duration of Study:** Department of Operative Dentistry, Bahria University Dental College from 1st November 2020 - 30th April 2021.

**Methodology:** Three hundred and fifteen populations of general dental practitioners practicing in different settings of Karachi were enrolled. Standardized questionnaires were divided randomly among general private dental practitioners in Karachi. The preference of dentists towards the ideal material for posterior restorations was evaluated through their recorded response.

**Results:** The mean age of patients was 25.2±4.2 years with 64.8% females and 35.2% males. Amalgam was used in deep cavity by 52.4% practitioners while composite was opted in shallow and moderate cavities by 63.2% and 62.9% practitioners respectively.

**Conclusion:** Matching tooth-colored restorations is a common practice with amalgam used for deep cavity and composite in shallow and moderate cavity restoration.

**Keywords:** Amalgam, Composite, Posterior restoration, Restorative dentistry.

## INTRODUCTION

Dental-caries is a common problem seen in majority of public all over the globe. It has shown a high prevalence not only in deciduous but also in permanent teeth. Around two and a half billion adults are affected by dental caries in addition to 621 million children all over the globe.[1] The frequently adapted technique for treatment of sequelae of dental-caries includes direct restoration.[2-4] Restoring the integrity, morphology as well as function of missing structure of posterior teeth can be achieved by dental restorations, commonly known as fillings. It initiates from 1st molar to 3rd molar. During the process of taking a bite or chewing the molar area will produce a pressure from 597–847 N. This results in the importance of the material used in filling specifically in this area.[5]

The gold standard used during permanent restoration of posterior teeth consists of amalgam which is an alloy mixture. One of the serious concerns regarding amalgam usage is its toxicity by one of its alloys being mercury therefore decreasing its global usage.[6] Further it has an aesthetic denial by many due to non-tooth colored restoration. Despite the reason that amalgam is not only cost effective but also less in sensitivity to various clinical procedures the composite and "Glass Ionomer Cement" (GIC) is overcoming amalgam usage. The reason being its dental restoration by matching tooth color, increasing aesthetic and comeliness.[7, 8] Most of the professionals opt composite-resin for restoring tooth decay; post the formation of dentin acid protocol.[9, 10] Various clinical findings support the fact that composite-resins show good results in terms of longevity and lasting restorations.[11-13] Although related research also elaborates the fact that long time restoration is highly influenced by patients increased occlusal-stress as well as surged risk for caries.[14, 15]

Failure of any dental material in addition to the decision of dental replacement is significantly dependent on various factors related to both patient and the dentist such as socioeconomic as well as patient's demography.[9, 11-15] More focus on restoration by matching tooth color has been observed in developed countries with a persistence of amalgam usage only in 3-7% patients in previous two decades. However, amalgam is still considered in 50% of restoration techniques in developing countries.[16]

**Materials and Methods:**

This was a cross-sectional study performed at Department of Operative Dentistry, Bahria University Dental College, Karachi during a duration of 1st November 2020 to 30th April 2021. Three hundred and fifteen general dental-practitioners (GDP) who were practicing in various settings of city Karachi were enrolled. A well organized and standardized questionnaire was then divided through randomization among all the general and private dental-practitioners practicing in Karachi. The study included all those dentists who were performing the posterior-restorations in their private dental practices. Whereas dental auxiliaries, dental students or and non-qualified/experienced practitioners were excluded from the study. Responses were then gathered from all the practitioners and data regarding their preference of ideal material used for posterior restorations was documented. The data was entered and analyzed through SPSS-23 using chi square test, p value less than 0.05 was considered as significant.

**RESULTS**

In present study there were 315 participants with more females 64.8% than males 35.2%. The mean age of the participants was 25.2±4.2 years. Majority of the participants belonged to 22 to 26 years followed by 27-31 years of age. Within the practitioner's majority had an experience of less than 5 years of clinical practice followed by five to ten years of hands-on experience. Table 1

Table 1: Demographic information of the participants & choice of material in posterior teeth(n=315)

| **Variable** | **No.** | **%** |
|---|---|---|
| **Age (years)** | | |
| 22-26 | 176 | 55.9 |
| 27-31 | 79 | 25.1 |
| 32-36 | 36 | 11.4 |
| 37-41 | 24 | 7.6 |
| **Gender** | | |
| Male | 111 | 35.2 |
| Female | 204 | 64.8 |
| Duration of practice (years) | | |
| <5 | 176 | 55.9 |
| 5-10 | 79 | 25.1 |
| 11-15 | 60 | 19.0 |

| Choice of material | **Shallow Cavity** | **Moderate Cavity** | Deep Cavity |
|---|---|---|---|
| Amalgam | 4 (1.3%) | 79 (25.1%) | 165 (52.4%) |
| Composite | 199 (63.2%) | 198 (62.9%) | 132 (41.9%) |
| GIC | 112 (35.6%) | 38 (12.1%) | 18 (5.7%) |

Amalgam was opted by majority (52.4%) of the dentist in case where restoration of deep cavity was required. However, in case of shallow or moderate cavity composite was material of choice seen in 63.2% and 62.9% of GDP respectively. GIC was also used in shallow cavity with a significant difference with amalgam and composite usage. ($p< 0.05$) [Table 1].
In present study 46.3% and 40% participants agreed that the material they used was preserving the tooth structure and patient's mercury related concerns respectively. There was an insignificant response variance between agreed and neutral in context of clinical performance of the material in use. Feasibility to obtain moisture control, patients aesthetic demand, financial circumstances and request for certain material were main agreed features by majority of the GDP's before using of any restoration material (Table 2).

Table 2: Factors influencing choice of restorative materials in posterior teeth (n=315)

| **Question** | **Strongly agree** | **Agree** | **Neutral** | **Disagree** | **Strongly disagree** |
|---|---|---|---|---|---|
| Preservation of tooth structure | 85 (27%) | 146 (46.3%) | 52 (16.5%) | 32 (10.2%) | - |
| Patients concern regarding the mercury toxicity | 44 (14%) | 126 (40%) | 113 (35.9%) | 29 (9.2%) | 3 (1%) |
| Easy handling of the material | 53 (16.8%) | 176 (55.9%) | 58 (18.4%) | 28 (8.9%) | - |
| Documented clinical performance of the material | 66 (21%) | 118 (37.5%) | 100 (31.7%) | 23 (7.3%) | 8 (2.5%) |
| Feasibility to obtain moisture control | 49 (15.6%) | 184 (58.4%) | 52 (16.5%) | 22 (7%) | 8 (2.5%) |
| Patient aesthetic demand | 32 (10.2%) | 173 (54.9%) | 75 (23.8%) | 27 (8.6%) | 8 (2.5%) |
| Patient financial situation | 57 (18.1%) | 172 (54.6%) | 38 (12.1%) | 40 (12.7%) | 8 (2.5%) |
| Patient request for a certain material | 57 (18.1%) | 148 (47%) | 65 (20.6%) | 37 (11.7%) | 8 (2.5%) |
| Dentist concern regarding the mercury toxicity | 48 (15.2%) | 173 (54.9%) | 63 (20%) | 31 (9.8%) | - |

**P<0.05**

Table 3: Comparative analysis

| | Shallow Cavity | | | | | Moderate cavity | | | | Deep Cavity | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Amalgam | Composite | GIC | P Value | Amalgam | Composite | GIC | P Value | Amalgam | Composite | GIC | P Value |
| Preservation of tooth structure | Strongly agree | 0 | 48 | 37 | 0.192 | 22 | 49 | 14 | 0.004 | 46 | 33 | 6 | 0.010 |
| | Agree | 4 | 93 | 49 | | 39 | 91 | 16 | | 83 | 59 | 4 | |
| | Neutral | 0 | 34 | 18 | | 4 | 40 | 8 | | 22 | 22 | 8 | |
| | Disagree | 0 | 24 | 8 | | 14 | 18 | 0 | | 14 | 18 | 0 | |
| | Strongly Disagree | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | |
| Patients concern regarding the mercury toxicity | Strongly agree | 0 | 30 | 14 | 0.002 | 12 | 26 | 6 | 0.168 | 21 | 17 | 6 | 0.002 |
| | Agree | 0 | 69 | 57 | | 30 | 77 | 19 | | 81 | 40 | 5 | |
| | Neutral | 4 | 83 | 26 | | 33 | 67 | 13 | | 49 | 57 | 7 | |
| | Disagree | 0 | 14 | 15 | | 4 | 25 | 0 | | 11 | 18 | 0 | |
| | Strongly Disagree | 0 | 3 | 0 | | 0 | 3 | 0 | | 3 | 0 | 0 | |
| Easy handling of the material | Strongly agree | 0 | 27 | 26 | 0.000 | 11 | 28 | 14 | 0.000 | 24 | 23 | 6 | 0.000 |
| | Agree | 4 | 97 | 75 | | 54 | 101 | 21 | | 118 | 49 | 9 | |
| | Neutral | 0 | 55 | 3 | | 10 | 45 | 3 | | 19 | 36 | 3 | |
| | Disagree | 0 | 20 | 8 | | 4 | 24 | 0 | | 4 | 24 | 0 | |
| | Strongly Disagree | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | |
| Documented clinical performance of the material | Strongly agree | 0 | 52 | 14 | 0.000 | 36 | 16 | 14 | 0.000 | 45 | 15 | 6 | 0.000 |
| | Agree | 0 | 75 | 43 | | 16 | 93 | 9 | | 47 | 62 | 9 | |
| | Neutral | 4 | 64 | 32 | | 23 | 68 | 9 | | 63 | 34 | 3 | |
| | Disagree | 0 | 8 | 15 | | 4 | 13 | 6 | | 10 | 13 | 0 | |
| | Strongly Disagree | 0 | 0 | 8 | | 0 | 8 | 0 | | 0 | 8 | 0 | |
| Feasibility to obtain | Strongly agree | 0 | 39 | 10 | | 23 | 20 | 6 | | 36 | 7 | 6 | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| moisture control | Agree | 4 | 104 | 76 | 0.000 | 48 | 112 | 24 | 0.000 | 105 | 75 | 4 | 0.000 |
| | Neutral | 0 | 34 | 18 | | 4 | 40 | 8 | | 20 | 24 | 8 | |
| | Disagree | 0 | 22 | 0 | | 4 | 18 | 0 | | 4 | 18 | 0 | |
| | Strongly Disagree | 0 | 0 | 8 | | 0 | 8 | 0 | | 0 | 8 | 0 | |
| Patient aesthetic demand | Strongly agree | 0 | 26 | 6 | 0.000 | 14 | 12 | 6 | 0.000 | 29 | 3 | 0 | 0.000 |
| | Agree | 0 | 111 | 62 | | 32 | 118 | 23 | | 68 | 90 | 15 | |
| | Neutral | 4 | 44 | 27 | | 29 | 46 | 0 | | 58 | 17 | 0 | |
| | Disagree | 0 | 18 | 9 | | 4 | 14 | 9 | | 10 | 14 | 3 | |
| | Strongly Disagree | 0 | 0 | 8 | | 0 | 8 | 0 | | 0 | 8 | 0 | |
| Patient financial situation | Strongly agree | 0 | 51 | 6 | 0.000 | 29 | 22 | 6 | 0.000 | 44 | 13 | 0 | 0.000 |
| | Agree | 4 | 104 | 64 | | 42 | 105 | 25 | | 89 | 72 | 11 | |
| | Neutral | 0 | 26 | 12 | | 4 | 30 | 4 | | 18 | 16 | 4 | |
| | Disagree | 0 | 18 | 22 | | 4 | 33 | 3 | | 14 | 23 | 3 | |
| | Strongly Disagree | 0 | 0 | 8 | | 0 | 8 | 0 | | 0 | 8 | 0 | |
| Patient request for a certain material | Strongly agree | 0 | 51 | 6 | 0.000 | 29 | 22 | 6 | 0.000 | 44 | 13 | 0 | 0.000 |
| | Agree | 4 | 81 | 63 | | 27 | 98 | 23 | | 60 | 73 | 15 | |
| | Neutral | 0 | 49 | 16 | | 19 | 46 | 0 | | 41 | 24 | 0 | |
| | Disagree | 0 | 18 | 19 | | 4 | 24 | 9 | | 20 | 14 | 3 | |
| | Strongly Disagree | 0 | 0 | 8 | | 0 | 8 | 0 | | 0 | 8 | 0 | |
| Dentist concern regarding the mercury toxicity | Strongly agree | 0 | 42 | 6 | 0.000 | 20 | 22 | 6 | 0.000 | 35 | 13 | 0 | 0.000 |
| | Agree | 0 | 105 | 68 | | 47 | 97 | 29 | | 94 | 64 | 15 | |
| | Neutral | 4 | 34 | 25 | | 8 | 55 | 0 | | 22 | 41 | 0 | |
| | Disagree | 0 | 18 | 13 | | 4 | 24 | 3 | | 14 | 14 | 3 | |
| | Strongly Disagree | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | |

A cross tabulation of different variables showed interesting outcomes. The preservation of tooth structure was an important factor in material selection in moderate cavities, with majority of practitioners favoring the use of composites (p-value 0.004). With regard to patients' concern for mercury toxicity, composite was favored for shallow cavities (p-value 0.002), however for deep cavities, amalgam remained the material of choice (p-value 0.002). Composites were preferred in shallow and moderate cavities considering the ease of handling (0.000) while in deep cavities amalgam was the material most commonly used. Moisture control in moderate and shallow cavities was easily achieved with composites (0.000), however in regards to deep cavities amalgam was preferred. (0.000) Composites were the material of choice all over when it came to aesthetic demands of patients (0.000).

## DISCUSSION

The present study found high number of young adults who came for restoration of their teeth with majority being females. A study in Malaysian population showed a higher trend of posterior restoration among young adults with females being in majority.[17, 18] Amalgam usage escalates in cases where deep cavity is found, with the incidence using amalgam for deep restorations being 52.4%. A previous study found this number for Pakistani dentists even higher (81.5 %).[19] This trend was also observed in a study where Malaysian dentists also inclined towards usage of amalgam in deep cavities.[20] Further a high-grade preference has been given to matching dental coloring by general practitioners as has been adapted by other practicing dentists from developing countries like Pakistan as well as developed countries such as Norway, UK and Finland.[19, 20] The current study also noted that the practice of using GIC has also increased in Pakistani practitioners, however previous literature in this regard shows discouraging results and higher percentage of failure of GIC restorations has been reported with 1.9-14.4% GIC annual failure-rate.[21] This unsuccessful rating might attribute to its decreased use in contrast to amalgam and composite. A study reported a three to five times increased incidence of erosion by GIC in comparison to composite and amalgam respectively making the GDP avoid its usage especially in restoration of occlusal-surface of the posteriorly located teeth.[22]

There has been an increased awareness seen among GDP towards minimal interventional approaches in dentistry with a great emphasis on preservation of natural integrity of the tooth.[19]

Another significant fact elaborated through results of the current study as well as work published elsewhere is that those GDP who had longer experience of practicing in clinical settings had specific restoration material choice than those who had an experience less or equal to five years.[17] This suggests that opting the material used for posterior tooth restoration changes with time and experience among GDP. The application of composite is not endorsed by American Dental Association Council (ADAC) in cases where tooth isolation is not effectively possible.[23, 24] Studies evidently prove that isolation of good healthy tooth prior to posterior restoration will assist in reduction of secondary-caries incidence. The proficiency in isolation of this kind is learned through experience and therefore is achieved by expert GDP's only.[25]

The present study also indicates that patients concern about esthetics and specific demands made by the patients can significantly contribute to the choice of material that the dentist makes for posterior restoration, mostly resulting in an increase in composite restorations. This is in line with a study conducted in Saudi Arabia where patients' esthetic demands and desire were reported as the most common factors leading to the use of composites as posterior restorations.[26] This finding is also supported by similar studies where patients opted for a tooth-colored restoration for their teeth by request in contrast to a silver one.[27]

In regards to concerns about mercury toxicity associated with amalgam, this study reports that although this is a valid factor that influences material selection for posterior restoration, in deep cavities amalgam still remains the material of choice. In shallow cavities, however, composites were preferred. This finding is also supported by work published elsewhere, reporting that majority of dentists did not consider amalgam as an occupational hazard and did not replace good amalgam restorations in posterior teeth with composites.[26-28]

## CONCLUSION

The GDP in city Karachi have a trend for opting posterior permanent restoration based on matching tooth-color. Majority of GDP agree with patients own choice of material concerning their aesthetic and financial requirements. Deep cavity restoration is performed by using amalgam while composite is opted for shallow and moderate restoration.

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