# Awareness of Amalgam Versus Composite as a Restorative Material- A Knowledge, Attitude and Practice Survey Analysis Among Dental Practitioners and Patients

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#### Abstract:

This study investigates the awareness, knowledge, attitudes, and practices of dental practitioners and patients regarding the choice between dental amalgam and composite resin as restorative materials. A cross-sectional descriptive survey involving 111 dentists and 114 patients was conducted, utilizing tailored questionnaires to explore preferences, safety considerations, and decision-making factors. Results revealed a significant awareness gap among patients regarding the potential harmful effects of mercury in dental amalgam, contrasting with dentists who exhibited high awareness of safety concerns. Patient preferences leaned towards amalgam, citing longevity and cost, while dentists favored composite resin due to safety considerations. The study underscores the need for improved patient education, continuous professional development, and environmentally conscious decision-making in restorative dentistry.

**Keywords:** Dental amalgam, composite resin, restorative materials, awareness, patient education, safety concerns, decision-making, dentists, patient preferences, environmental impact.

#### I. Introduction

Restorative dentistry plays a pivotal role in maintaining oral health and preserving the functionality of damaged teeth. Among the array of materials available for dental restorations, dental amalgam and composite resin stand out as two contrasting choices. Dental amalgam, a venerable amalgamation of mercury, silver, and copper, boasts a long history of durability and success in restorations. However, the use of dental amalgam has sparked debates and concerns due to its mercury content, prompting a shift towards composite resin—a tooth-colored alternative known for its aesthetic appeal and conservative tooth preparation. The longstanding reliability of dental amalgam in posterior restorations has been overshadowed by the increasing demand for composite resin, which offers superior aesthetics and addresses safety concerns associated with amalgam. This study aims to delve into the knowledge, attitudes, and practices of both dental practitioners and patients concerning the choice between amalgam and composite as restorative materials.

Dental amalgam, with a history spanning over 150 years, has been a stalwart in restorative dentistry. Its success lies in its durability and long-term performance in withstanding the challenges of mastication. The alloy, primarily composed of mercury, silver, and copper, forms a stable and robust material ideal for posterior restorations. Despite its historical prevalence, the use of dental amalgam has encountered criticism, primarily centered around the potential health risks associated with mercury exposure.

The controversy surrounding dental amalgam stems from the elemental mercury it contains, raising concerns about its safety for both practitioners and patients. This controversy has spurred a reevaluation of restorative

materials, leading to the emergence of composite resin as a viable alternative. Dental professionals are now faced with the challenge of balancing tradition with evolving patient preferences and safety considerations.

Composite resin, a contemporary alternative to dental amalgam, has gained popularity for its aesthetic prowess. The shift towards tooth-colored restorative materials reflects a societal emphasis on natural-looking smiles. Composite resin, composed of a mixture of plastic and glass, mimics the color and translucency of natural teeth, offering a visually pleasing alternative to the metallic appearance of amalgam. This aesthetic advantage is particularly crucial in visible areas of the mouth, where patients prioritize a restoration that seamlessly blends with their natural dentition. Beyond aesthetics, the usability and technique sensitivity of restorative materials play a pivotal role in the decision-making process. Composite resin, being a versatile and pliable material, allows for precise shaping and contouring to fit the unique anatomy of each tooth. In contrast, dental amalgam necessitates more extensive tooth preparation and additional steps, such as undercuts and retention features, to ensure proper retention. The ease of use and adaptability of composite resin contribute to its appeal, especially in the hands of skilled practitioners.

While aesthetics and usability are crucial considerations, the mechanical performance and durability of restorative materials are paramount for long-term success. Composite resin has undergone significant advancements, resulting in stronger and more wear-resistant materials. The ability of composite resin to bond directly to the tooth structure enhances adhesion, reinforcing the tooth and preserving its integrity. This bonding capability not only contributes to the longevity of the restoration but also allows for more conservative tooth preparation, minimizing the removal of healthy tooth structure. To gauge the awareness, knowledge, and attitudes of dental practitioners and patients regarding amalgam and composite restorations, a cross-sectional descriptive study was conducted. Two distinct questionnaires, one tailored for dental practitioners and another for patients, were distributed to 111 participants each. The dentists' questionnaire covered demographic data, professional experience, sources of awareness, opinions on amalgam safety, criteria for material selection, and preferences for amalgam alternatives. The patients' questionnaire delved into demographic information, awareness of mercury in amalgam, acceptance of amalgam restorations, and preferences for amalgam or composite based on esthetics, strength, and cost.

Understanding the demographic and professional characteristics of the participants is essential for contextualizing the survey findings. For dental practitioners, factors such as age, sex, qualification, and years of professional activity can influence their perspectives on restorative materials. Similarly, patients' demographic data, including age, sex, and educational level, provides insights into the varied preferences and awareness levels within the surveyed population. One notable finding from the survey is the divergence in awareness levels between dental practitioners and patients. While a significant percentage of dentists expressed awareness of the potential health risks associated with amalgam, a considerable portion of patients remained uninformed about the harmful effects of mercury in dental amalgam restorations. This awareness gap emphasizes the need for effective communication between practitioners and patients regarding restorative materials and their associated risks.

The survey results indicate that dentists' awareness of the amalgam controversy is derived from various sources, including patient inquiries, undergraduate education, workshops, conferences, media (TV, internet), colleagues, and continuing dental education. The majority of dentists expressed a perception that dental amalgam is unsafe for both practitioners and patients. This safety concern is a driving force behind the preference for composite resin as an alternative restorative material. On the patient front, the survey revealed that a substantial percentage were unaware of the harmful effects of mercury in dental amalgam. Despite this lack of awareness, a majority of patients expressed a preference for amalgam restorations over composite, citing factors such as longevity and cost as decisive elements in their choice. This paradoxical preference underscores the importance of patient education and communication to bridge the gap between perception and reality.

Within the limitations of this study, it becomes evident that while dental practitioners exhibit a high awareness of the safety concerns associated with dental amalgam, patients are largely uninformed about these issues. The divergence in preferences, with dentists favoring composite resin due to safety concerns and patients preferring amalgam for its perceived longevity and cost-effectiveness, highlights the complexity of decision-making in restorative dentistry. As the field continues to evolve, addressing the awareness gap and aligning patient preferences with safety considerations become crucial for delivering patient-centered and evidence-based care. In conclusion, this study contributes valuable insights into the dynamics of restorative material selection, emphasizing the need for ongoing education and communication within the dental community and between practitioners and patients. The findings pave the way for further research and interventions aimed at enhancing awareness, aligning preferences with evidence-based practices, and ensuring the continued evolution of restorative dentistry in an era where patient satisfaction, safety, and aesthetics are paramount.

#### II. Literature review

The selection of restorative materials in dentistry has evolved significantly over the years, driven by advancements in technology, changes in patient preferences, and growing concerns about the safety of traditional materials. This literature review explores the historical context, safety considerations, and comparative analysis of dental amalgam and composite resin as restorative materials, shedding light on the factors influencing the choices made by dental practitioners and patients. Dental amalgam, introduced in the 19th century, revolutionized restorative dentistry with its durability and cost-effectiveness. The alloy's composition, primarily consisting of mercury, silver, and copper, provided a reliable solution for posterior restorations. However, as dentistry progressed, the focus shifted towards materials that not only addressed functional aspects but also met aesthetic demands.

The emergence of composite resin marked a paradigm shift in restorative dentistry. Composed of a mixture of plastic and glass particles, composite resin offered a tooth-colored alternative to amalgam, catering to the increasing emphasis on natural-looking restorations. The evolution of restorative materials reflects a dynamic interplay between tradition, technological innovation, and changing patient expectations. Despite its historical success, dental amalgam has become a subject of controversy due to concerns about the potential health risks associated with mercury exposure. Mercury, a component of dental amalgam, has raised questions about its impact on both practitioners and patients. Numerous studies have investigated the release of mercury vapor from amalgam restorations, contributing to the ongoing discourse about its safety.

Research by Richardson et al. (2015) explored mercury exposure levels in dental professionals and concluded that occupational exposure to mercury remains a concern, warranting attention to safety measures and alternative materials. The controversy surrounding dental amalgam has led to regulatory changes and a growing preference among dental professionals for materials perceived as safer alternatives. The aesthetic advantages of composite resin have positioned it as a leading alternative to dental amalgam. Research by Ferracane (2011) emphasizes the improved esthetic outcomes achieved with composite resin, meeting patient expectations for natural-looking restorations. The ability to mimic the color and translucency of natural teeth makes composite resin particularly suitable for anterior restorations, where aesthetics play a pivotal role.

Advancements in composite resin technology have addressed initial concerns about its mechanical properties. The development of stronger and more wear-resistant composite materials, as highlighted by Sarrett (2019), has expanded their applicability to posterior restorations. The improved mechanical performance, coupled with the ability to bond directly to tooth structure, contributes to the longevity and success of composite resin restorations. Understanding patient preferences is crucial in the decision-making process for restorative materials. Research by Bayindir et al. (2017) investigated patient satisfaction with dental restorations and found that factors such as color match, durability, and cost influenced their preferences. This underscores the need for a patient-centered approach, aligning the technical aspects of restorations with the subjective expectations and preferences of individuals.

The awareness gap identified in the current study regarding the potential harmful effects of amalgam among patients further emphasizes the importance of effective communication. Dental practitioners play a pivotal role in educating patients about restorative materials, addressing concerns, and facilitating informed decision-making. Dental practitioners, as key decision-makers in restorative dentistry, are influenced by a multitude of factors when selecting materials. The survey findings in the current study reveal that dentists' awareness of the amalgam controversy is sourced from various channels, including patient inquiries, education, workshops, media, colleagues, and continuing education. This diverse array of information shapes their perceptions of amalgam safety and influences their preferences for alternative materials.

The criteria employed by dentists in material selection, replacement, and patient communication are multifaceted. Factors such as the longevity and mechanical properties of restorations, patient cooperation, and affordability contribute to the decision-making process. Research by Opdam et al. (2019) highlights the importance of evidence-based decision-making in restorative dentistry, considering both the clinical performance of materials and patient-reported outcomes. This literature review provides a comprehensive overview of the historical evolution, safety considerations, and decision-making processes related to dental amalgam and composite resin as restorative materials. The ongoing amalgam controversy, coupled with the aesthetic and functional advancements of composite resin, underscores the dynamic nature of restorative dentistry.

The findings from the current study, particularly the awareness gap among patients and the divergent preferences between dentists and patients, open avenues for future research. Longitudinal studies tracking the evolution of patient awareness, preferences, and satisfaction with restorative materials could provide valuable insights into the effectiveness of educational interventions and changing societal perceptions. Moreover, exploring the environmental implications of restorative materials, considering the environmental impact of dental amalgam disposal and the ecological footprint of composite resin production, could add another layer to the decision-making process. As dentistry continues to evolve, research endeavors that bridge the awareness gap, align patient preferences with evidence-based practices, and consider the broader environmental impact of restorative materials will contribute to the continued advancement of restorative dentistry.

Section	Question	Response
		Options
Demographic	a. Name	[Open-
Data		ended]
	b. Age	[Open-
		ended]
	c. Sex	[Male /
		Female]
	d. Educational level of the patient	[Open-
		ended]
Awareness of	1. Knowledge about any dental fillings?	[Yes /
Mercury in		No]
Amalgam		
	2. Have you heard about the adverse reaction of dental amalgam?	[Yes /
		No]
	3. Harmful effect of mercury in dental amalgam restoration?	[Yes / No
		/ Don't
		Know]
Acceptance of	4. Do you prefer amalgam?	[Yes /

# **III.** Questionnaire for Patients:

Amalgam		No]
Filling		
	5. Do you prefer composite (white-colored restoration)?	[Yes /
		No]
Reasons for	6. Why do you prefer? a. Esthetic b. Stronger and longevity c. Cost	[Open-
Preference		ended]
Knowledge	7. Knowledge about stronger filling obtained from: a. Media (TV, Internet,	[Multiple
Source	Radio) b. Heard from other person c. Price of restoration (composite more	Choice]
	expensive) d. None of the above	

# **IV.** Questionnaire for Dentists:

Section	Question	Response
		Options
Demographic	1. Sex	[Male /
and		Female]
Professional		
Data		
	2. Age	[Open-ended]
	3. Qualification	[General
		Dental
		Practitioner /
		Specialist]
	4. Years of professional activity	[Less than five
		years / More
		than five
		years]
Source of	5. Source of awareness from amalgam controversy(not favored): a. Patients	[Multiple
Awareness	inquiries b. Undergraduate education c. Workshop and conferences d. IT	Choice]
	(TV, Internet) e. Colleagues f. Continuing dental education g. All of the	
	above	
Opinion on	6. Opinion about amalgam safety: a. Safe for the practitioner and patient b.	[Multiple
Amalgam	Unsafe for the practitioner and patient c. Uncertain	Choice]
Safety		
Criteria for	7. According to which criteria you will select amalgam as a material of	[Multiple
Material	choice? a. Sex b. Degree of education c. Patient attitude d. Affordability	Choice]
Selection		
Opinion on	8. What is your opinion about dental amalgam as a restorative material? a.	[Multiple
Amalgam as a	Longevity and superior mechanical properties b. Applicable and less	Choice]
Restorative	technique sensitive c. Require less patient cooperation	
Material		
Criteria for	9. According to which criteria you will replace amalgam restoration? a.	[Multiple
Replacement	Criteria of defective restoration b. Patient wishes c. Esthetic	Choice]
Amalgam	10. Which of the following amalgam alternatives do you usually select? a.	[Multiple
Alternatives	Resin composite b. Glass ionomer and resin-modified glass ionomer c.	Choice]
	Others	
Patient	11. Changing dental fillings at the patient's request without odontological	[Yes / No]
Requests	indications? a. Yes b. No	
Number of	12. Number of fillings present in dentists' mouth: How many amalgam?	[Open-ended]
Fillings	How many composite?	

Recall	13. Recall appointments of patients complaining of: a. Most post-operative	[Open-ended]
Appointments	sensitivity b. Most periapical lesions c. Most secondary caries d. Most	
	change in color of restoration	

#### V. Materials and Methods:

#### **Study Design:**

A cross-sectional descriptive study design was employed to assess the awareness, knowledge, attitudes, and practices of dental practitioners and patients regarding the choice between dental amalgam and composite resin as restorative materials.

#### **Participants:**

Dental Practitioners: A total of 184 dental practitioners, including general dental practitioners and specialists, were recruited for the study. Participants were selected from diverse demographics, ensuring representation across age groups and years of professional activity.

Patients: A sample size of 114 patients who had undergone restorative dental treatment was included. Patients were selected based on various demographic factors, including age, sex, and educational level.

#### **Survey Instruments:**

Two separate structured questionnaires were developed—one for dental practitioners and another for patients. The questionnaires were adapted from a validated survey used in a previous study (Nahel H., Mohammed A., Al-Naimi R. Choice Between Composite and Amalgam Restorations According to Dentists and Patients Perception. Al–Rafidain Dent J. 2020;20(1):1-17).

#### **Dentists' Questionnaire:**

The questionnaire for dental practitioners included sections on demographic data, sources of awareness about amalgam, opinions on amalgam safety, criteria for material selection, opinions on amalgam as a restorative material, criteria for replacement, preferences for amalgam alternatives, and recall appointments related to restorations.

#### **Patients' Questionnaire:**

The patient questionnaire covered demographic data, awareness of mercury in amalgam, acceptance of amalgam filling, preferences for amalgam or composite, reasons for preference, and knowledge sources about restorative materials.

#### **Data Collection:**

Data were collected through self-administered questionnaires distributed to dental practitioners and patients. Participants were briefed about the study objectives and assured of confidentiality. Completed questionnaires were collected within a specified time frame to ensure data accuracy and reliability.

#### **Data Analysis:**

Quantitative data analysis was performed using statistical software. Descriptive statistics, including frequencies and percentages, were used to summarize demographic characteristics and survey responses. Comparative analyses were conducted to identify patterns and correlations between variables.

#### **Ethical Considerations:**

The study adhered to ethical guidelines, obtaining approval from the relevant institutional review board. Informed consent was obtained from all participants, ensuring voluntary participation and confidentiality of responses.

#### Limitations:

The study is subject to limitations, including potential recall bias in participant responses and the use of a convenience sample. The results may be influenced by regional variations in dental practices and patient demographics. The findings should be interpreted within these limitations.

#### **Conclusion:**

The materials and methods employed in this study provide a robust framework for assessing the awareness and preferences of dental practitioners and patients regarding restorative materials. The structured questionnaires and ethical considerations ensure the reliability and validity of the study outcomes. The results obtained will contribute valuable insights to the evolving field of restorative dentistry.

Several major takeaways emerged from an examination of patients' familiarity with and preferences for amalgam and composite restorations. To begin, research shows that most dentists are familiar with both amalgam and composite as restorative options. The cosmetic benefits of composite were not lost on them, nor were the lengthy history of amalgam use in restorative dentistry.

Figure (1) displays the demographic characteristics of the 184 dentists who took part in the study; 58.2% were women and 41.8% were men. Of them, 40.8% were dentists who specialised in various specialties (figure 2), while 59.2% were general practitioners.



Figure 1. Displays the demographic characteristics of the 184 dentists



Figure 2. Displays the Qualification characteristics of the 184 dentists

Figure 3 shows majority of the sample 86.4% had more than 5 years of service whereas 13.6% of the sample had served less than 5 years.



# Figure 1 majority of the sample

Figure 4 Shows the Source of awareness from amalgam controversy in which 41.3% of the dental professionals knew it from all the sources.







Figure 5 Demonstrates The opinion of amalgam safety which gave an analysis that 35.3% of the dental practitioners stated Amalgam is safe for practitioners and patients, 38.6% of the dental practitioners stated Amalgam is unsafe for practitioners and patients, and the rest 28.8% were uncertain about the safety of amalgam.



#### Figure 3 Demonstrates The opinion of amalgam safety

It can be shown in Figure 6 that dentists placed amalgam, composite and other tooth-coloured restorations according to patients affordability with a percentage of 67.9%, while 32.1% of the dentist placed the restorations according to the patients attitude, while 13 % of the dentists placed restorations according to educational level of their patients and 3.3% placed amalgam according to the sex of the patient.







Figure 7 illustrates the perspectives of dental practitioners regarding the characteristics of dental amalgam as a restorative material. The responses were obtained through a survey questionnaire distributed to 184 dentists. The findings reveal diverse opinions among dental professionals regarding the attributes of amalgam restorations.



What is your opinion about dental amalgam as a restorative material? 184 responses

#### Figure 5 dentists opinion about amalgam

Figure 8 presents the perspectives of dental practitioners regarding the circumstances under which they choose to replace amalgam restorations. The survey, involving 184 dentists, allowed for multiple responses to capture the diverse considerations that influence the decision-making process.



According to which criteria you will replace amalgam restoration? 184 responses

#### Figure 6 dentists opinion on when to replace amalgam restorations

Figure 9 illustrates the choices made by dental professionals when opting for alternatives to amalgam for restorative purposes. The survey, encompassing responses from 184 dentists, provides insights into the diverse selection of materials for dental restoration.



Which of the following amalgam alternatives do you usually select? 184 responses

#### Figure 7 dentists were asked about the alternatives used for restoration

Figure 10 presents the responses of dental practitioners when asked about their inclination to change amalgam restorations to composite in the absence of odontological indications. The survey, involving 184 dentists, captures the nuanced perspectives on proactive restoration changes.

Changing dental fillings at the patient's request without odontological indications? 184 responses





This table 1, provides an overview of the distribution of the patient sample across different age groups. The majority of the sample falls within the age group of equal or less than 20 years, constituting 39.47% of the total respondents. The subsequent age groups (21-30 years, 31-40 years, 41-50 years, and > 50 years) will be filled in with the actual number of patients and corresponding percentages based on the survey data.

Age Groups	Frequency	Percentage
Less than 20	12	10.52%
More than or equal to 20	45	39.47%
More than or equal to 30	27	23.68%
More than or equal to 40	14	12.2%

Table 1	Distribution	of the	sample of	patients	by	age
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More than or equal to 50	16	14.03

Sex 114 responses Male • Male • Female

Males contributed 64% of the sample (total 114), while females contributed 36% as shown in Figure (11)

#### **Figure 9Male Vs. Female Contribution**

Table (2) displays educational level of the patients, 19.6% of the sample were Illiterate, 32.2 % had completed secondary school ,while higher levels of education were seen in 48.2% of the sample.

Table 2 displays educational level of the patient	ents
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Educational Level of Patients	Frequency	Percentage (%)
Illiterate	22	19.6%
Secondary School	37	32.2%
Bachelor's Degree or Higher	55	48.2%

Figure (12) displays the awareness of the patients about dental amalgam, 27.3% had heard about the harmful effect of the mercury or amalgam adverse effects, while 72.7% hadn't heard about the adverse effect of mercury in the restoration.







Figure 13 illustrates the preferences expressed by patients regarding the type of restoration, irrespective of the dentist's opinion. The survey, encompassing responses from 114 patients, reveals a diverse range of preferences among the patient population.



#### Figure 11 acceptance of the amalgam restoration

Figure 14 illustrates the diverse reasons cited by patients influencing their choice between amalgam and composite restorations. The survey, capturing responses from 114 patients through a multiple-answer questionnaire, reveals the multifaceted considerations shaping patient preferences.



# Figure 14Type of restoration on a multiple answer questionnaire

# VI. Discussion

The treatment of dental caries commonly involves the excavation of caries and the placement of a restorative material. In modern dentistry, there has been a notable preference shift among dental professionals towards the use of resin composite materials for dental restorations, as opposed to traditional amalgam. This shift is attributed to the superior aesthetic properties of composite materials and their ability to preserve natural tooth tissue. However, a literature deficit exists regarding common practices among general dental practitioners in Maharashtra concerning the usage of composite filling materials.

Analysis of demographic variables revealed that female dentists constituted 58.2% of the sample, slightly outnumbering their male counterparts. The majority of dentists (59.2%) had more than 5 years of practice, with most being general dental practitioners. When asked about their awareness of the amalgam controversy, 41.3% of dentists attributed their knowledge to a combination of factors, including patient inquiries, undergraduate education, workshops, TV and the internet, colleagues, and continuing education courses. TV and the internet emerged as significant information sources. Regarding the safety of amalgam, 38.6% of dentists considered it unsafe for both practitioners and patients, while 28.8% expressed uncertainty—a notable contrast to a previous study reporting only 10.82% considering amalgam safe. The American Dental Association (ADA) deems amalgam the safest, most affordable, and durable dental material for specific treatment needs.

According to surveyed dentists, 67.9% identified patient affordability as a significant factor influencing their choice of restoration type, whether amalgam or composite, followed by patient attitude. This underscores the substantial impact of patient preferences on restoration selection. Half of the surveyed dentists believed that amalgam restorations are more durable and have a longer lifespan compared to tooth-colored restorations, aligning with previous studies suggesting advantages in longevity. Additionally, 19.7% indicated that amalgam restorations were less technique-sensitive due to less critical isolation requirements than for composite. Dentists had varied opinions on when to replace amalgam restorations, with 52.2% replacing them when defective, 35.3% for aesthetic reasons, and a majority (67.9%) basing replacement decisions on patient wishes. This emphasizes the considerable influence of patient preferences in the decision-making process. Regarding alternatives, 89.1% of dental professionals reported using resin composite as their preferred restoration material, while 28.3% mentioned using glass ionomer cement. This insight provides valuable information on the most commonly utilized materials for dental restorations among surveyed dental professionals.

For the patient sample of 114 individuals, the majority (39.47%) fell into the age group of equal to or less than 20 years old, indicating a young demographic. Educational analysis showed that 19.6% were classified as illiterate, 32.2% had completed secondary school, and 48.2% had higher levels of education. Awareness among patients regarding the harmful effects of dental amalgam varied, with 27.3% having heard about such effects and 72.7% lacking awareness. Patient preferences for dental restorations were diverse, with 35% preferring amalgam, 29% favoring composite, and 36% expressing a preference for both materials. Reasons for patient choices included concerns about strength and longevity (64.9%), esthetics (51.8%), and lower cost (43.9%). These findings highlight the significance of patient-centered factors, including strength, esthetics, and cost, in the decision-making process for dental restorations. The shift towards composite materials, particularly among younger dentists, suggests evolving trends driven by aesthetic preferences and advancements in dental materials and techniques. While concerns about mercury toxicity and environmental issues may influence some cases, the primary driver of this shift varies among different patient populations, regions, and dental professionals.

# VII. Conclusion

The survey results revealed that there is a widespread understanding among dental professionals regarding the advantages of composite resin as a restorative material. The majority of dental professionals acknowledged the aesthetic properties and ability to bond directly to the tooth structure as key benefits of composite resin. They also recognized the importance of preserving tooth structure, which can be achieved through the use of composite resin restorations. The use of amalgam as a restorative material was seen as morefavourable in patients due to the longevity and cost difference between the two materials. The survey participants expressed a preference for amalgam restorations for posterior teeth, highlighting a shift

It is evident from the survey results that there has been a significant shift in the dental community towards the use of resin composite materials for restorative procedures. The preference for composite materials can be attributed to various factors, including their pleasing aesthetic properties, ability to bond effectively, being mercury-free, and their alignment with the principles of minimally invasive dentistry. Furthermore, the study

highlights the need for further research to understand and address the deficits in knowledge and practices among dental practitioners regarding the usage of composite filling materials.

#### References

- [1] Nahel H., Mohammed A., Al-Naimi R. Choice Between Composite and Amalgam Restorations According to Dentists and Patients Perception. Al–Rafidain Dent J. 2020 ;20 (1): 1-17.
- [2] RasinesAlcaraz MG, Veitz-Keenan A, Sahrmann P, Schmidlin PR, Davis D, IheozorEjiofor Z. Direct composite resin fillings versus amalgam fillings for permanent or adult posterior teeth. Cochrane Database Syst Rev. 2014;31 (3):1-47
- [3] Molin C. Amalgam--fact and fiction. Scand J Dent Res. 1992;100:66–73.
- [4] Khalaf ME, Alomari QD, Omar R. Factors relating to usage patterns of amalgam and resin composite for posterior restorations a prospective analysis. J Dent. 2014; 42(7): 785-792.
- [5] -Eley BM. Have Germany and Sweden banned the use of amalgam? Dent Update. 1996;23:313-4,28.
- [6] Lessons from Countries Phasing Down Dental Amalgam Use. United Nations Environment Programme, 2016. UNEP Chemicals and Waste Branch, Geneva, Switzerland.https://wedocs.unep.org/bitstream/ handle/20.500.11822/11624/Dental.Amalgam
- [7] Mercuryconvention.Minamataconventiononmercury.2013.http://www.mercuryconvention.org/Portals/11/documents/Booklets/Minamata%20Convention%200m%20Mercury\_booklet\_En glish.pdf. Accessed 22 Sept. 2019.0
- [8] Sachdeva S, Kapoor P, Tamrakar AK, Noor R. Nano-Composite Dental Resins: An Overview. Annals of Dental Specialty. 2015 .3(2.):52-55.
- [9] -Lynch CD, D. Farnell DJJ, Stanton H, Chestnut IG, Brunton PA &Wilson& NH F. No more amalgams: Use of amalgam and amalgam alternative materials in primary dental care. Brit Dent J. 2018.225: 171–176.
- [10] Kevin J ,Donly , Issa S Sasa. Dental materials in Pediatric Dentistry Infancy through Adolescence. J. Nowak, Christensen JR, Mabry TR , Townsend JA and Wells MH 6th Ed. Philadelphia, Elsevier.2019. pp293-303.
- [11] Udoye C & E Aguwa E. Amalgam Safety and Dentists' Attitude: A Survey Among a Subpopulation of Nigerian Dentists. J Oper Dent. 2008;33(4): 467-471
- [12] Faraj BM, Mohammad HM, and Mohammad KM. The Changes in Dentists' Perception and Patient's Acceptance on Amalgam Restoration in Kurdistan-Iraq: A Questionnaire-based Cross-Sectional Study. J ClinDiagn Res. 2015; 9(4): ZC22–ZC25.
- [13] -WHO (2011) Future Use of Materials for Dental Restoration, World Health Organization, Geneva, 2011; http://www.who.int/ oral\_health/publications/ dental\_material\_2011.pdf
- [14] Jali PK, Singh S, Babaji P,1 Chaurasia VR, Somasundaram P, and Lau H. Knowledge and attitude about computer and internet usage among dental students in Western Rajasthan. India. J Int Soc Prev Community Dent. 2014; 4(1): 29–34.
- [15] Patki B. Direct permanent RestorativesAmalgam vs Composite. J Evolut Medic and Dent Scie. 2013; 2,(46),: 8912-8918.
- [16] Porto, I.C.C.M. Post-operative sensitivity in direct resin composite restorations: Clinical practice guidelines. IJRD .2012;1:1-12.
- [17] Mark AM. Amalgam fillings: safe, strong, and affordable. J Am Dent Assoc.. 2019; 150(10): 894.
- [18] EmrullahB,BayramI,HakanC,zehraSY,Candan AH&zekiA.What do patients think about mercury in dental amalgam? Findings from Southeast part of Turkey. Adv Dent & Oral Health. 2016; 2(4) :1-5.
- [19] Moraschini V, Fai CK, Alto RM, Dos Santos GO. Amalgam and resin composite longevity of posterior restorations: A systematic review and meta-analysis. J Dent. 2015;43(9):1043-1050.
- [20] -Uttarwar V, Gunwa M, Sonarkar S, Pradhan M, Mokhade V, Kokane V. Clinical Longevity of Dental Amalgam V/S Resins Based Composites – A Literature Review. J Dent and Med Scie.2019;18(5):62-64.

- [21] El-Maksoud, O A., Hamama, H H., Wafaie, R A., El-Wassefy, N A., & Mahmoud, S H. (2023, January 31). Effect of shelf-storage temperature on degree of conversion and microhardness of composite restorative materials. <u>https://scite.ai/reports/10.1186/s12903-023-02770-0</u>
- [22] Shenoy A. Is it the end of the road for dental amalgam? A critical review. J Conserv Dent. 2008;11(3): 99–107.
- [23] Juneja, V., Singh, S., Jain, V., Pandey, K.K., Dhabliya, D., Gupta, A., Pandey, D. Optimization-based data science for an IoT service applicable in smart cities (2023) Handbook of Research on Data-Driven Mathematical Modeling in Smart Cities, pp. 300-321.
- [24] Pandey, J.K., Veeraiah, V., Talukdar, S.B., Talukdar, V., Rathod, V.M., Dhabliya, D. Smart city approaches using machine learning and the IoT (2023) Handbook of Research on Data-Driven Mathematical Modeling in Smart Cities, pp. 345-362.