



COMMON MATERIALS USED BY DENTISTS FOR PEDIATRIC RESTORATIONS - A SURVEY

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Cite This Article: Mokshi. R. Jain & Dr. Ganesh Jeevanandan, "Common Materials Used By Dentists for Pediatric Restorations - A Survey", International Journal of Multidisciplinary Research and Modern Education, Volume 3, Issue 1, Page Number 276-284, 2017.

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Abstract:

The aim of this article was to conduct a questionnaire based survey on the choice of material used by dentists in Chennai for paediatric restorations. The prevalence of dental caries in the pediatric population is on the rise due to the changing dietary habits with current lifestyle trends. As a result, dentists have to choose the most appropriate restorative material based on criteria such as site of the lesion, patient cooperation, aesthetics, anti-cariogenicity, biocompatibility and mechanical properties. A questionnaire was prepared and randomly distributed to 114 dentists (general practitioners and specialists) in Chennai working in teaching institutions, government hospitals, private hospitals and private dental clinics. The survey form consisted of 10 questions in multiple choice format. The data was tabulated in spreadsheets and statistical analysis was done to obtain the results. Group responses were summarized and comparisons were made using Pearson Chi Square test. The results showed that 109 dentists (95.6%) used glass ionomer cement most frequently for restoring primary teeth whereas 5 dentists (4.4%) used composite. Significant variation ($p=0.018$) was seen in the choice of material for restoring proximal lesions where GIC is used by 57.9% dentists followed by SSC (33.3%). As a wide range of restorative materials are now available, this survey will provide a better understanding about the most convenient and preferred materials by dentists.

Key Words: Composite, Glass Ionomer Cement, Primary Teeth, Restorations & Stainless Steel Crown

Introduction:

The lifestyle and dietary habits of children as well as adults have undergone a drastic change in the past few decades with the amount of carbohydrates and fats taking over the other components of the required balanced diet. As a result, the increased incidence of dental caries has necessitated the need for adopting the most ideal restorative materials and techniques. Restorative dentistry in general practice and for pediatric restorations in particular has advanced markedly during the 20th century. Dental caries is a multifactorial chronic infectious disease that affects approximately 50% of children less than 12 years old worldwide ^[1]. Restoration of carious primary teeth is extremely important not only for the healthy development and psychic state of the child but also for the normal development of permanent teeth ^[2]. It is extremely important for the practitioner to assess each carious lesion and decide which restorative material is most suitable in terms of mechanical, biological properties, caries control and aesthetics. Patient factors which influence the choice of material include: developmental status of the dentition, caries risk assessment, oral hygiene, anticipated parental compliance, likelihood for timely recall and patient's ability to cooperate for treatment ^[3]. The survival of the restoration is influenced by the type of tooth, position of the tooth in the dental arch, size and design of restoration and physical properties of the restoration ^[4]. Dental amalgam has been a reliable restorative material due to its superior mechanical properties since the 1880s. However, due to the increased concerns of mercury toxicity, environmental pollutions and aesthetics has decreased the use of amalgam for restoring primary teeth. A significant proportion of the dentists still believe that amalgam is the material of choice for large occlusal restorations and Class II restorations not extending beyond the line angles which require durability and strength ^[5]. In the last decade tooth coloured and adhesive restorative materials have become popular. Conventional glass ionomer cement is biocompatible, adhesive, aesthetic and fluoride leaching material with favourable thermal expansion and contraction properties. However, it is brittle, radiolucent and susceptible to erosion and are most commonly used in primary teeth which are due to exfoliate within two years ^[6]. Resin modified glass ionomers are glass ionomer/resin hybrids with command set, ease of handling, fracture toughness and wear resistance which makes it a suitable alternative for amalgam ^[7]. Composite resins are the most common desirable esthetic materials which are adhesive to tooth structure with good wear properties and command set. The only disadvantages are the technique sensitivity requiring complete moisture control and polymerisation shrinkage ^[8]. Compomers are relatively new and are recommended for pediatric restorations as they exhibit properties similar to composite and release fluoride ^[9]. The aim of this study was to obtain an overview of the materials and techniques used by dentists to restore primary teeth and how this choice varies depending on various factors such as extent of caries, aesthetic consideration and durability.

Materials and Methods:

A questionnaire based on a similar survey [2] was prepared and randomly distributed to 114 dentists (general practitioners and specialists) in Chennai working in teaching institutions, government hospitals, private hospitals and private dental clinics. The survey form consisted of 10 questions in multiple choice format. Demographic details such as the age of the dentist, years of experience and area of specialization were also noted. The questions assessed the following topics:

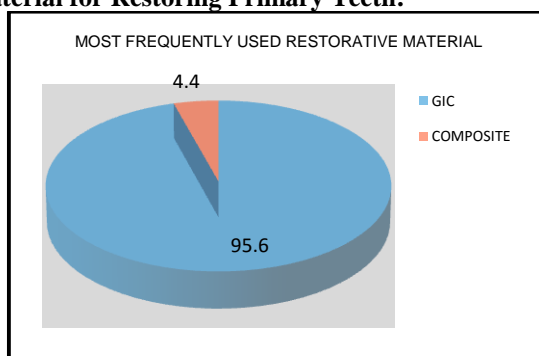
- ✓ most frequently used material for restoring primary teeth.
- ✓ restorative material of choice for primary anterior teeth.
- ✓ material of choice for restoring primary molars.
- ✓ choice of material for restoring proximal lesions.
- ✓ restorative material of choice for non cavitated incipient lesions.
- ✓ material of choice for occlusal lesions just into enamel.
- ✓ material of choice for occlusal lesions half way to dentino-enamel junction.
- ✓ material of choice for occlusal lesions into dentin.
- ✓ material of choice for lesions half way to the pulp.
- ✓ treatment option for mechanical exposure of pulp.

The data was tabulated in spreadsheets and statistical analysis was done to obtain the results. Group responses were summarized and comparisons were made using Pearson Chi Square test.

Results:

The study sample (n=114) was divided into three groups based on the years of experience as less than 3 years (n=38), 3-5 years (n=38) and more than 5 years (n=38). The overall percentage of responses for each question was obtained and a comparison was made between the three study groups.

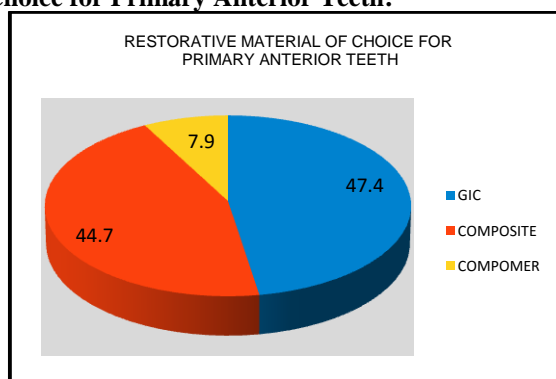
1. Most Frequently Used Material for Restoring Primary Teeth:



Material o Choice	Years of Experience		
	< 3 years	3-5 years	> 5 years
GIC	94.7%	94.7%	97.4%
COMPOSITE	5.3%	5.3%	2.6%

109 dentists (95.6%) used glass ionomer cement most frequently for restoring primary teeth whereas 5 dentists (4.4%) used composite. The results obtained in Table 1 (p=0.811) show that there is no significant variation in the choice of material based on the years of experience.

2. Restorative Material of Choice for Primary Anterior Teeth:



Material of Choice	Years of Experience		
	< 3 years	3-5 years	> 5 years
GIC	34.2%	50%	57.9%
COMPOSITE	55.3%	47.4%	31.6%
COMPOMER	10.5%	2.6%	10.5%

Glass ionomer cement was used by 54 respondents (47.4%) for restoring primary anterior teeth followed by composite (44.7%) and compomer (7.9%). The results obtained in Table 2 (p=0.147) show that there is no significant variation in the choice of material based on the years of experience.

3. Material of Choice for Restoring Primary Molars:

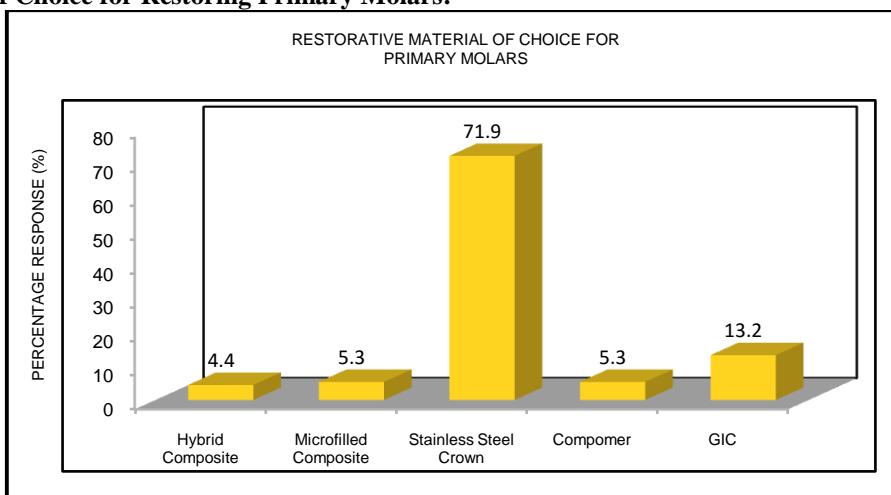


Table 3: Percentage of responses within years of experience for restorative material of choice for primary molars.

Material of Choice	Years of Experience		
	< 3 years	3-5 years	> 5 years
Hybrid Composite	10.5%	2.6%	0%
Microfilled composite	5.3%	5.3%	5.3%
SSC	71.1%	73.7%	71.1%
Compomer	7.9%	5.3%	2.6%
GIC	5.3%	13.2%	21.1%

For restoring primary molars, 5 dentists (4.4%) use hybrid composite, 6 dentists (5.3%) use microfilled composite, 82 respondents (71.9%) use stainless steel crowns, 6 dentists (5.3%) use compomer and 15 (13.2%) use glass ionomer cement. The results obtained in Table 2 (p=0.278) show that there is no significant variation in the choice of material based on the years of experience.

4. Choice of Material for Restoring Proximal Lesions:

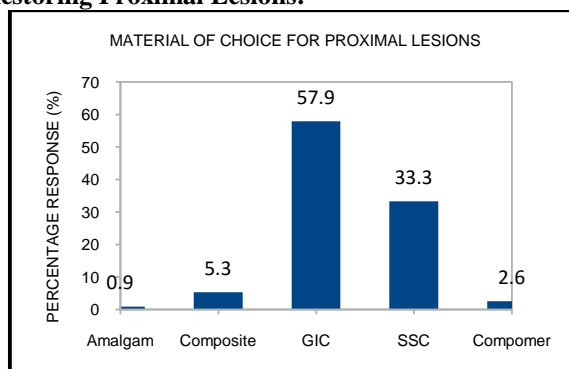


Table 4: Percentage of responses within years of experience for restorative material of choice for proximal lesions.

Material of Choice	Years of Experience		
	< 3 years	3-5 years	> 5 years
Amalgam	2.6%	0%	0%
Composite	2.6%	10.5%	2.6%
GIC	78.9%	44.7%	50%
SSC	13.2%	44.7%	42.1%
Compomer	2.6%	0%	5.3%

The results obtained show that GIC is used by 57.9% dentists followed by SSC (33.3%), Composite (5.3%), Compomer (2.6%) and amalgam by 0.9% of the dentists. The results obtained in Table 4 (p=0.018) show that there is significant variation in the choice of material based on the years of experience.

5. Restorative Material of Choice for Non Cavitated Incipient Lesions:

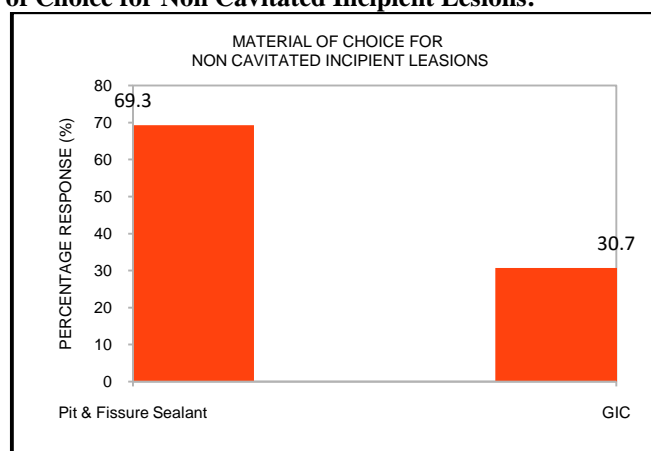
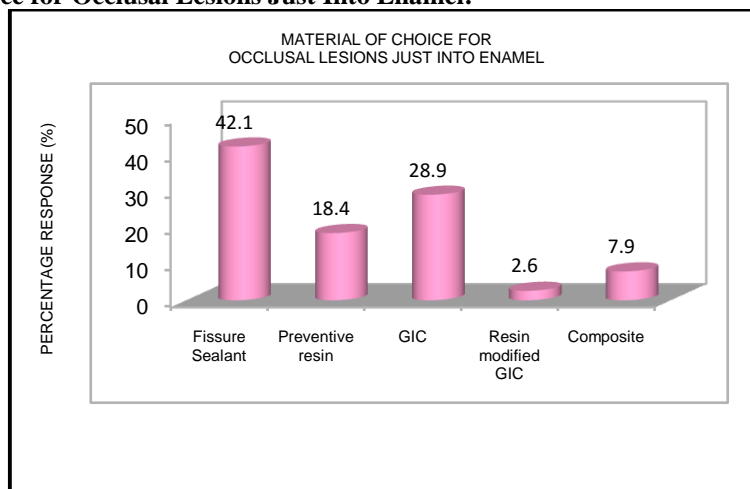


Table 5: Percentage of responses within years of experience for restorative material of choice for non cavitated incipient lesions

Material of Choice	Years of Experience		
	< 3 years	3-5 years	> 5 years
Pit & Fissure Sealant	68.4%	60.5%	78.9%
GIC	31.6%	39.5%	21.1%

79 respondents (69.3%) use pit and fissure sealant to restore non cavitated incipient lesions and 35 dentists (30.7%) use GIC for the same. The results obtained in Table 5 (p=0.218) show that there is no significant variation in the choice of material based on the years of experience.

6. Material of Choice for Occlusal Lesions Just Into Enamel:



Material of Choice	Years of Experience		
	< 3years	3-5 years	> 5 years
Fissure Sealant	31.6%	47.4%	47.4%
Preventive resin	28.9%	18.4%	7.9%
GIC	28.9%	23.7%	34.2%
Resin modified GIC	2.6%	0%	5.3%
Composite	7.9%	10.5%	5.3%

The most commonly used material for restoring occlusal lesions just into enamel is fissure sealant (42.1%) followed by GIC which is used by 28.9% of the dentists. The results obtained in Table 6 (p=0.305) show that there is no significant variation in the choice of material based on the years of experience.

7. Material of Choice for Occlusal Lesions Half Way to Dentino-Enamel Junction:

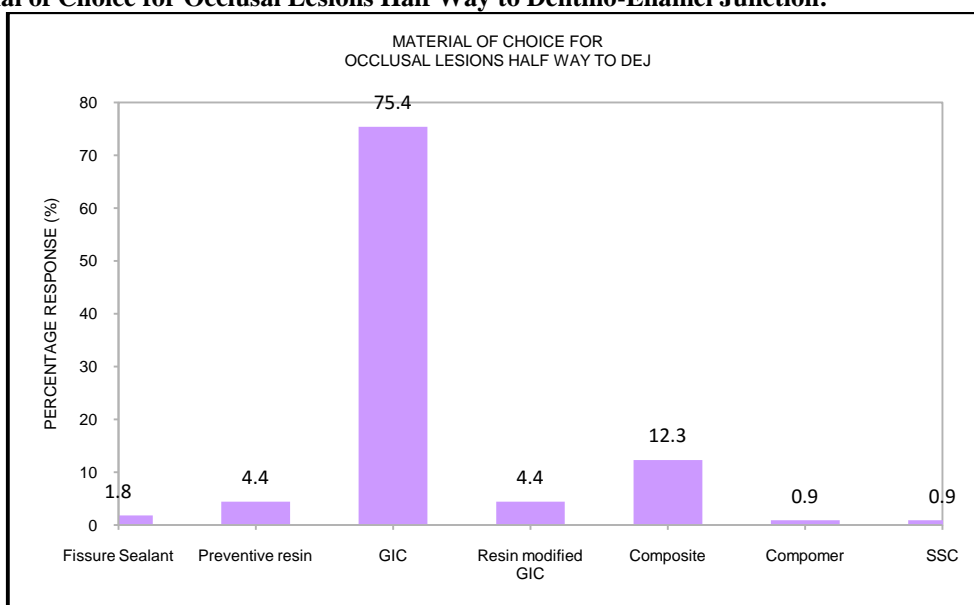


Table 7: Percentage of responses within years of experience for restorative material of choice for occlusal lesions half way to DEJ.

Material of Choice	Years of Experience		
	<3 Years	3-5 Years	>5 Years
Fissure sealant	5.3%	0%	0%
Preventive resin	5.3%	2.6%	5.3%
GIC	65.8%	78.9%	81.6%
Resin modified GIC	5.3%	2.6%	5.3%
Composite	18.4%	13.2%	5.3%
Compomer	0%	2.6%	0%
SSC	0%	0%	2.6%

86 dentists (75.4%) prefer GIC to restore occlusal lesions half way to DEJ followed by composite which is preferred by 14 dentists (12.3%). The results obtained in Table 7 (p=0.427) show that there is no significant variation in the choice of material based on the years of experience.

8. Material of Choice for Occlusal Lesions into Dentin:

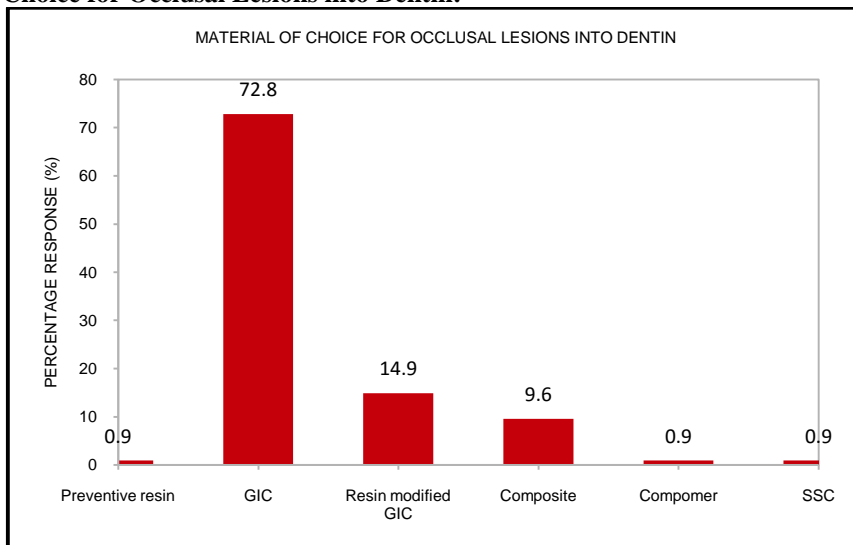
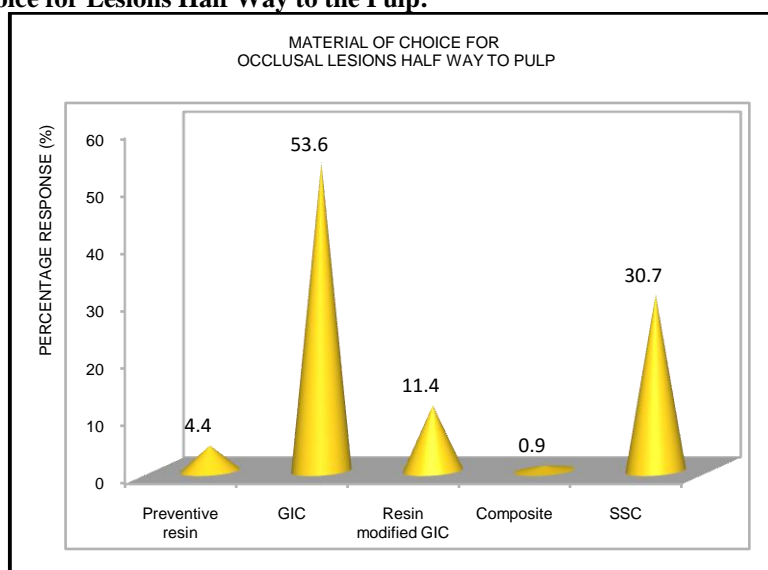


Table 8: Percentage of responses within years of experience for restorative material of choice for occlusal lesions into dentin

Material of Choice	Years of Experience		
	< 3 years	3-5 years	>5 years
Preventive resin	0%	0%	2.6%
GIC	71.1%	65.8%	81.6%
Resin modified GIC	13.2%	23.7%	7.9%
Composite	13.2%	10.5%	5.3%
Compomer	2.6%	0%	0%
SSC	0%	0%	2.6%

Majority of the dentists (72.8%) use GIC to restore occlusal lesions into dentin and 14.9% of the dentists use resin modified GIC followed by composite which is used by 9.6% of the respondents. The results obtained in Table 8 (p=0.339) show that there is no significant variation in the choice of material based on the years of experience.

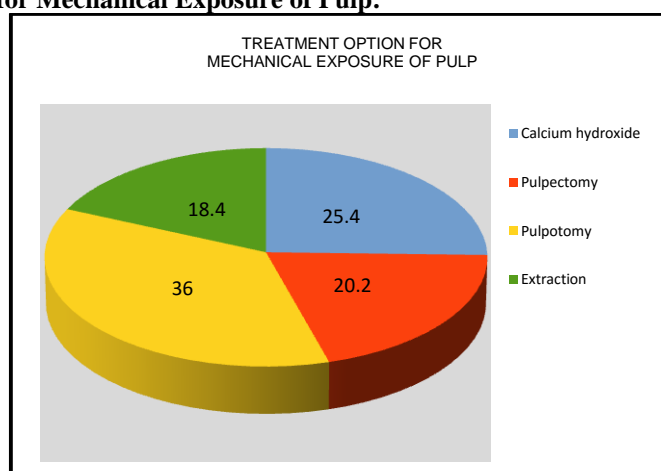
9. Material of Choice for Lesions Half Way to the Pulp:



Material of Choice	Years of Experience		
	< 3 years	3-5 years	>5 years
Preventive resin	5.3%	7.9%	0%
GIC	52.6%	50%	55.3%
Resin modified GIC	10.5%	13.2%	10.5%
Composite	2.6%	0%	0%
SSC	28.9%	28.9%	34.2%

For restoring occlusal lesions that progress half way to the pulp, 60 respondents (52.6%) use GIC, 35 respondents (30.7%) use stainless steel crowns and 13 respondents (11.4%) use resin modified GIC. The results obtained in Table 9 ($p=0.727$) show that there is no significant variation in the choice of material based on the years of experience.

10. Treatment Option for Mechanical Exposure of Pulp:



Material of Choice	Years of Experience		
	< 3 years	3-5 years	> 5 years
Calcium hydroxide	15.8%	28.9%	31.6%
Pulpectomy	21.1%	26.3%	13.2%
Pulpotomy	42.1%	28.9%	36.8%
Extraction	21.1%	15.8%	18.4%

36% of the dentists prefer pulpotomy as the treatment option for mechanical exposure of the pulp followed by calcium hydroxide (25.4%). The results obtained in Table 10 ($p=0.543$) show that there is no significant variation in the choice of material based on the years of experience.

Discussion:

Majority of clinicians believe that the ideal restorative material is one which prevents further ingress of bacteria and restores the normal tooth function. Restorations of primary teeth differ from those of permanent teeth due to the differences in the tooth morphology. The mesiodistal diameter of a primary molar is greater than the cervicoocclusal dimension. The enamel and dentin is thinner with the enamel rods ending cervically in an abrupt manner. The pulp chambers are larger and closer to the surface. Hence, an appropriate treatment plan needs to be formulated for the treatment of a pediatric patient^[10]. The statistical analysis shows that glass ionomer cement (GIC) is the most popular restorative material for children. Glass ionomer cements have gained popularity over conventional materials such as amalgam due to its favorable properties such as biocompatibility, adhesiveness, decreased moisture sensitivity and thermal expansion and contraction. The primary objective of restorative treatment especially for children is to arrest the caries. Hence, the fluoride releasing property of GIC has proved to be beneficial. Similar results were obtained in a survey conducted by Rafi et al^[2] where GIC was reported as the material of choice for anterior and posterior restorations, proximal lesions and deep caries

without pulpal involvement. Due to the increased concern for restoring aesthetics of primary anterior teeth, composite and GIC are the most commonly chosen materials. With the introduction of various modifications of composite such as microfilled and hybrid composite with better properties, most dentists have started using these materials for pediatric restorations. While restoring primary molars, mechanical strength and ability to resist occlusal wear is of utmost importance. For many decades, stainless steel crown has been the material of choice for posterior restorations which has been evidenced by a survey by Guelmann et al^[11] where 85% of the dentists preferred to use stainless steel crowns for deep caries. GIC is most commonly used for restoring proximal lesions in the anterior teeth whereas for posterior teeth, stainless steel crown is the material of choice. The restorative material for proximal lesions varies for primary and permanent teeth because primary teeth have much broader and flattened contact areas. Tran LA and Messer LB stated in their study that GIC was the material of choice for proximal lesions in primary teeth whereas counterpart for permanent teeth was found to be amalgam^[12]. Most of the dentists use pit and fissure sealant for restoring non cavitated incipient lesions and occlusal lesions just into the enamel. Sanjay et al reported in his study conducted in 2016 that 82% of the dentists used fissure sealant as it micromechanically binds to the tooth preventing access by cariogenic bacteria to their source of nutrients^[13]. The most commonly used materials for restoring occlusal lesions approaching dentin are GIC, resin modified GIC and composite in decreasing order of preference. A study conducted by Tran et al^[12] reported that preventive resin is the material of choice for occlusal lesions which approach half way to DEJ and into the dentin. Recent clinical studies by Croll et al^[14] have shown that resin modified glass ionomer cements can be used as alternatives for amalgam due to their fracture toughness and wear resistance. For lesions which approach the pulp, majority of dentists use GIC whereas 30.7% of them choose to perform pulp therapy and restore the posterior tooth with a stainless steel crown. When mechanical exposure of the pulp is encountered during cavity preparation or following a traumatic injury, majority of the dentists in this study chose to perform pulpotomy and the second most popular choice was calcium hydroxide. Rafi et al^[2] and Sanjay et al^[13] suggested that a biocompatible radioopaque base such as MTA or calcium hydroxide must be placed in contact with the exposed pulp tissue. The advantage of using calcium hydroxide is its ability to stimulate reparative dentin formation due to its high alkalinity and activation of alkaline phosphatase enzyme^[15]. Thus, it is crucial to choose the most optimum restorative material after considering the associated factors such as extent of caries, moisture control, site of caries and location of the tooth. The success of the restoration can be maintained only if it is followed by proper oral hygiene and care.

Conclusion:

It can be concluded from this study that glass ionomer cement is a clear choice for pediatric restorations. A wide range of restorative materials are now available which makes it necessary for the dentist to evaluate all the clinical scenarios and choose the most favorable material. The above study has given useful information such as:

- ✓ Glass ionomer cement is the mostly commonly used restorative material.
- ✓ GIC and Composite are the popular choices of material for anterior restorations.
- ✓ Primary molars are mostly restored by stainless steel crown followed by GIC and resin based cements.
- ✓ GIC is the most common choice for restoring proximal lesions followed by stainless steel crown.
- ✓ Non cavitated incipient lesions are most commonly restored with pit and fissure sealant.
- ✓ Fissure sealant is the common choice for restoring occlusal lesions just into the enamel.
- ✓ For deeper lesions half way to dentin, GIC is most commonly used.
- ✓ Occlusal lesions involving dentin are restored with GIC and resin modified GIC.
- ✓ For lesions close to pulp, GIC is used. Other options include pulp therapy followed by stainless steel crown.
- ✓ Pulpotomy is the most common choice of treatment for mechanical exposure of pulp.

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