

Original Research Article

**Choice of restorative material by dentists for class I caries in second mandibular primary molar in 3-6 year children visiting a university dental hospital- A retrospective study.**

**ABSTRACT:**

Dental caries has long been a frequent and costly disease in the world, with paediatric caries being the most common infectious disease. Caries risk is higher in children who live in rural areas, are impoverished, or have inadequate access to dental care. Restorative treatment should be based on the findings of an appropriate clinical examination and should ideally be part of a comprehensive treatment plan that takes into account the dentition's developmental status, caries risk assessment, the patient's oral hygiene, parental compliance and likelihood of timely recall, and the patient's willingness to cooperate for treatment. Glass-ionomers, resin ionomers, resin ionomer products, and enhanced resin-based composite systems have all been developed, and they are all having a significant impact on restoration of primary teeth. The study's goal was to evaluate paedodontists' restoration choices in youngsters in Chennai. The current study was conducted in a university dental hospital in Chennai and was a retrospective observational study. The data of Paediatrics patients from June 1, 2019 to March 31, 2021 was examined. There were 1448 patients aged 3-6 years with class 1 caries in their second mandibular teeth. The next step was to tabulate the data in Excel. The data was analysed with SPSS software, and the Chi square test was used to compare groups.

**Keywords:** Dental caries, glass ionomer cement, innovative technique, composite restoration.

**INTRODUCTION:**

Dental caries has long been a frequent and costly disease in the world, with paediatric caries being the most common infectious disease. In both primary and mixed dentitions, the illness is becoming increasingly isolated in certain teeth and tooth morphology types, with pits and fissures being the most commonly decaying areas. (Pizzo and colleagues, 2009)

Glass-ionomers, resin ionomers, resin ionomer products, and better resin-based composite systems have all been created, and they are having a significant impact on primary tooth

restoration, particularly the treatment of proximal and anterior cavities. The main benefit of these new materials is that they require less retention form, which is especially significant in primary teeth to preserve the relatively thin enamel that may help avoid caries invasion of dentin later on. (Anderson, no date)

Over the last 60 years, there have been many improvements in the development and availability of dental restorative materials for paediatric patients. Guelmann and Mjör (2002; Guelmann and Mjör, 2002; Guelmann and Mjör, Amalgam has been utilised in restorative dentistry for almost 120 years and is still widely used. (1936, Black). Many dental schools still teach it as the preferred material for Class I and II restorations; it is also the best direct restorative option for bigger restorations or when used to treat interproximal carious lesions (Kilpatrick and Neumann, 2007).

Composite resins are the most attractive cosmetic materials because of their outstanding physical and mechanical properties.

Burke and colleagues (Burke et al., 2002) Compomers are polyacid modified composite resins that include a small amount of glass ionomer cement incorporated into them (GIC). These materials are easier to work with, more durable, and more attractive than GICs. GICs, on the other hand, have a higher fluoride release, better physical qualities, and biocompatibility than composites, but they have less aesthetic properties. Dodes et al., 2001) When compared to amalgam, resin modified glass ionomers and compomers restorations have a similar durability, however regular glass ionomer restorations have a much lower lifespan. (Qvist and colleagues, 1997) Dentists have recently shifted their focus away from amalgams and toward cosmetic restorations. Pediatric dentists primarily employed resin-based materials for primary teeth Class I and II restorations, whereas SSCs were the preferred material when three or more surfaces were involved. However, amalgam was the most prevalent material utilised by Californian paediatric dentists for Class II restorations. (Pair, Udin and Tanbonliong, 2004) The usage of composites has expanded in Japan, according to Fukuyama et al. (2008), owing to patients' aesthetic aspirations. Tooth-colored restorations are currently preferred by more parents and children over amalgam restorations. (2002, Peretz and Ram)

Primary teeth are critical for a child's growth, and to maintain these teeth functional for as long as possible, every effort should be made. Dental caries will grow if left untreated, resulting in pain and infection, resulting in unnecessary suffering and missed school days (Gift, 1992).

Untreated caries levels are linked to physicochemical results, according to research (Alkarimi et al., 2014). Untreated caries has also been demonstrated to have a major impact on children's and their families' oral wellbeing quality of life (Fernandes et al., 2017). Dental restorations have are used to help control the caries progression of the disease by restoring tooth structure integrity, reducing discomfort in deep dentin lesions, and restoring tooth structure integrity. As a result, oral health providers must make informed selections about the sort of restorative material to use when treating children with caries. This is a difficult option to make, because significant advancements in dental restorative materials have extended the market in the last ten years.

This research aims to determine, analyse, and comprehend dentists' preferred restorative material for class 1 caries in Mandibular second molars among children aged 3-6 years old visiting Saveetha dental college and hospital.

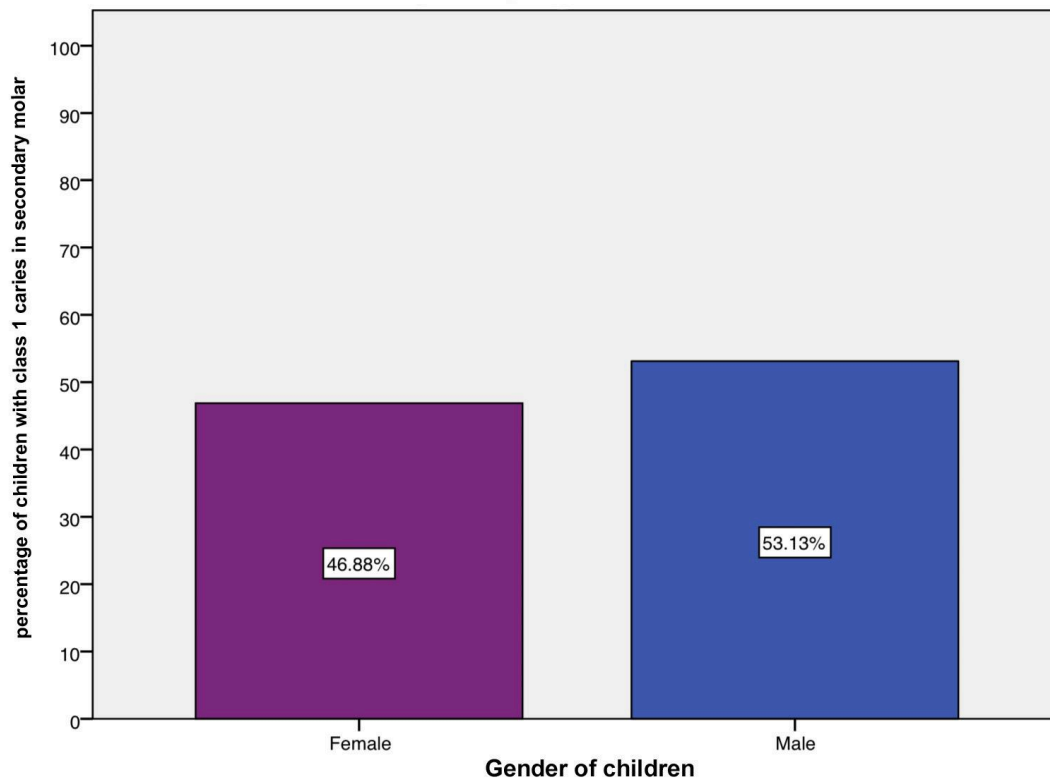
## **MATERIAL AND METHODS**

The records of patients who visited Saveetha Dental College and Hospital between June 1, 2019 and March 31, 2021 were analysed in this retrospective analysis. The institutional review board/SDC/SIHEC/DIASDATA/0619-0320 provided ethical approval. Patients ranging in age from 3-6 years old were enrolled in the study. The study sample consisted of both male and female participants, the majority of whom were South Indians. A total of 1448 paediatric kids aged 3-6 years who visited a university hospital were included in the study. The study included 1448 juvenile patients, 544 of whom were identified with class 1 caries in their second mandibular molars in the hospital database. The necessary information, such as age, gender, and restoration type, was recorded. Incomplete patient records were omitted from the study. Data was entered into Microsoft Excel and then exported to the statistical package for social science for Windows (SPSS), where it was analyzed statistically. The chi square test is used to compare groups.

## **RESULTS:**

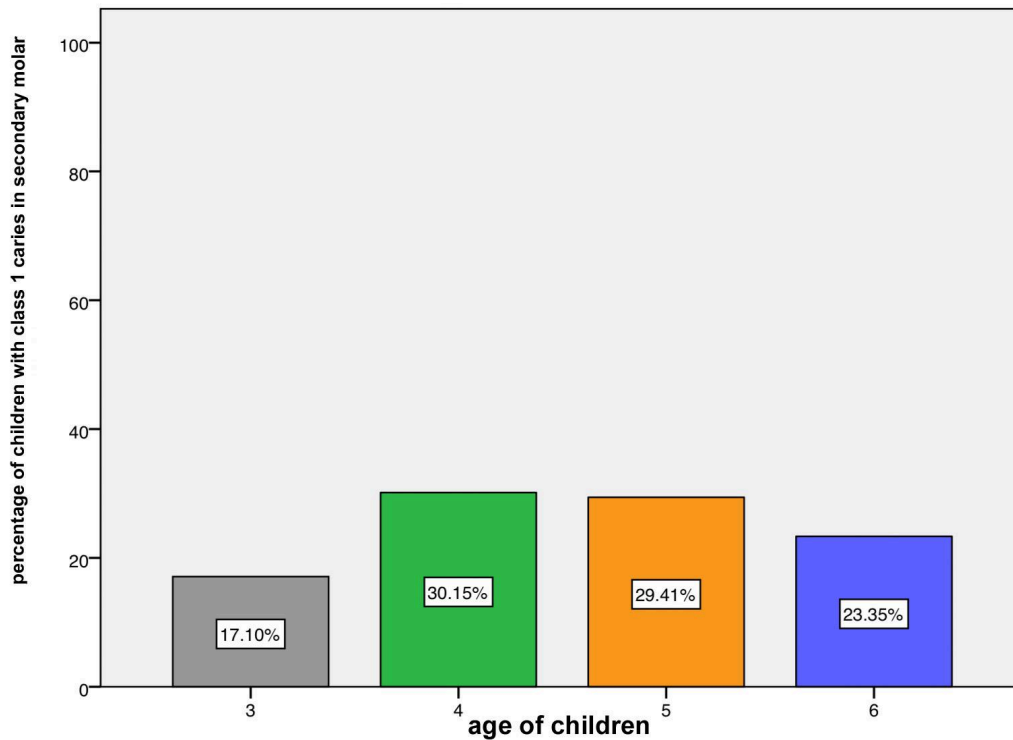
A total of 544 patients were included in the study, with 46.8% of females and 53.1 percent of males. 17.1 percent of patients are children under the age of three, 30.15 percent are children

under the age of four, 29.41 percent are children under the age of five, and 23.35 percent are children under the age of six.

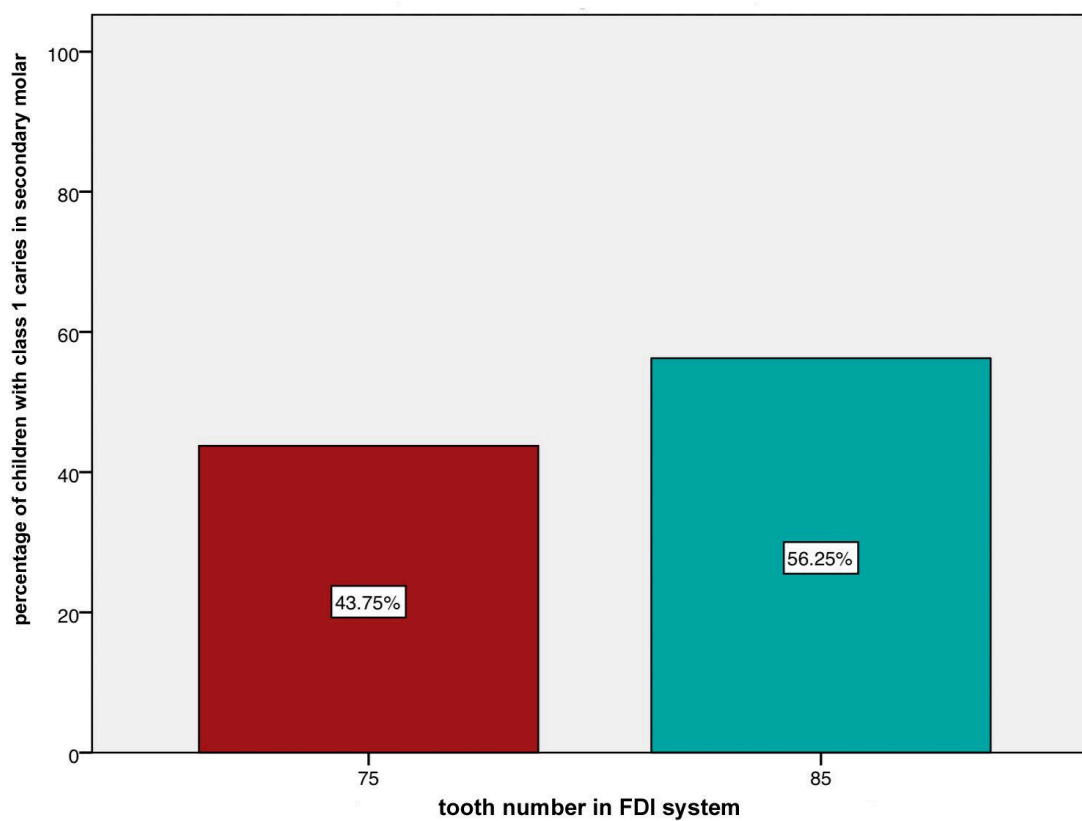


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**Graph 1: Bar chart shows gender distribution of children in the sample population. Purple denotes the female population and Blue represents the male population. 46.8% of the children were girls and 53.1% of the children were boys**

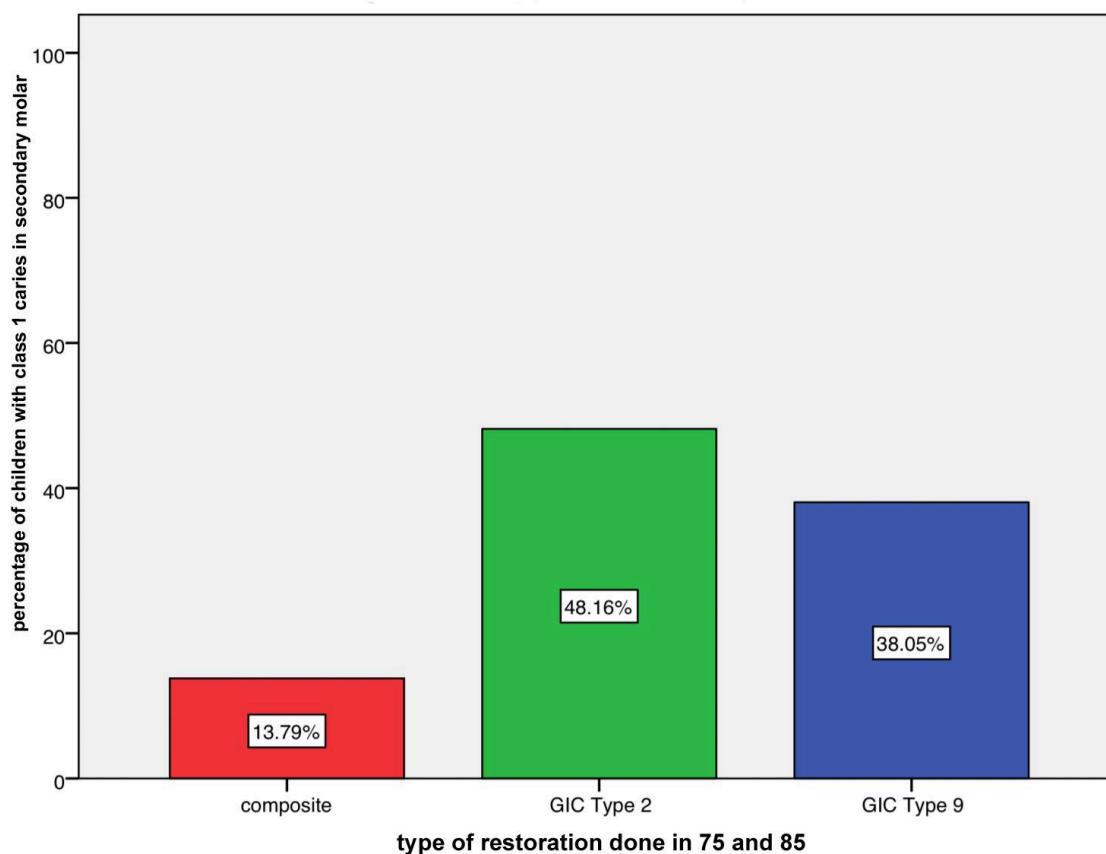


**Graph 2: Bar chart showing age distribution of children in sample population. Grey denotes the children of age 3, green denotes the children of age 4, orange denotes the children of age 5 and blue denotes the children of age 6. 17.1% are patients of age 3, 30.15% are patients of age 4, 29.41% of patients are of age 5 and 23.35% of patients are of age 6**

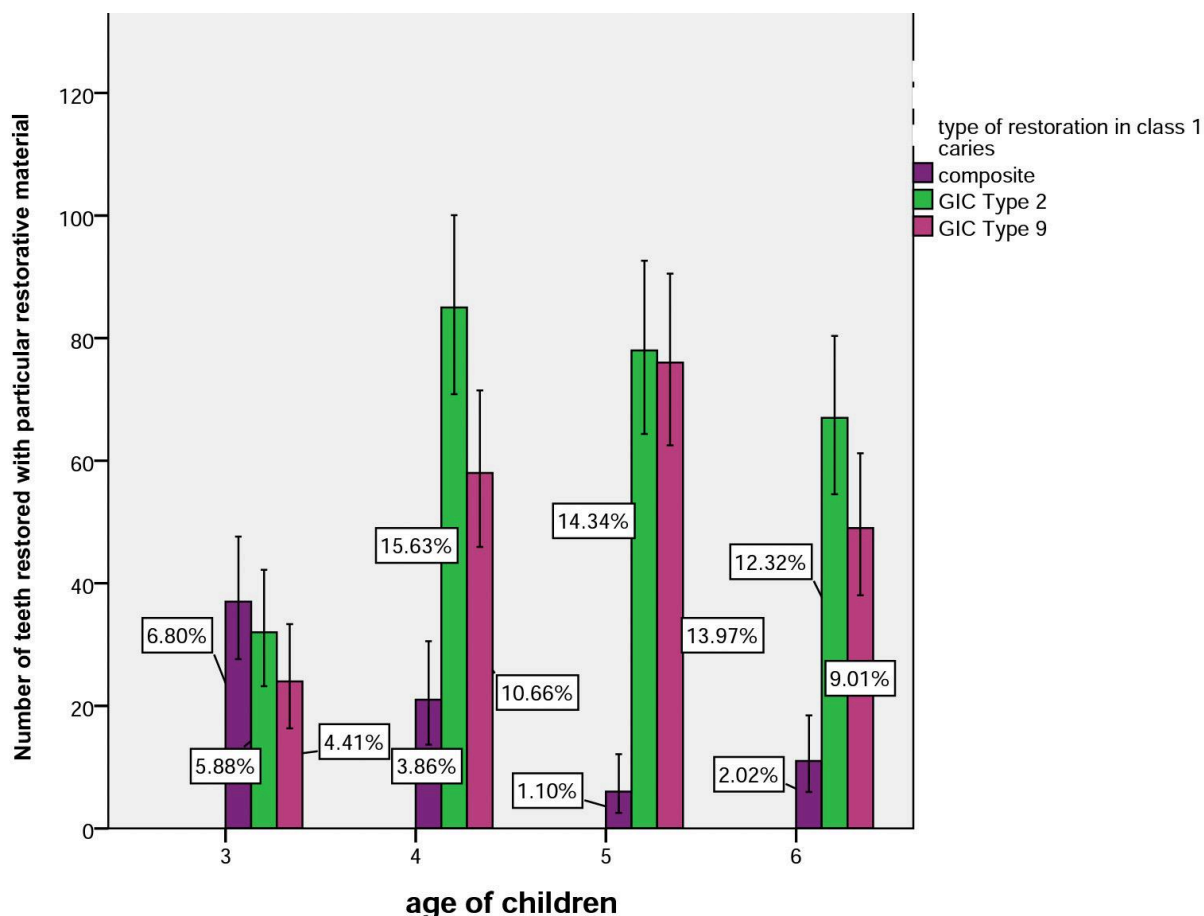


**Graph 3 bar chart showing the distribution of Class I caries in mandibular primary second molars in the sample population.**

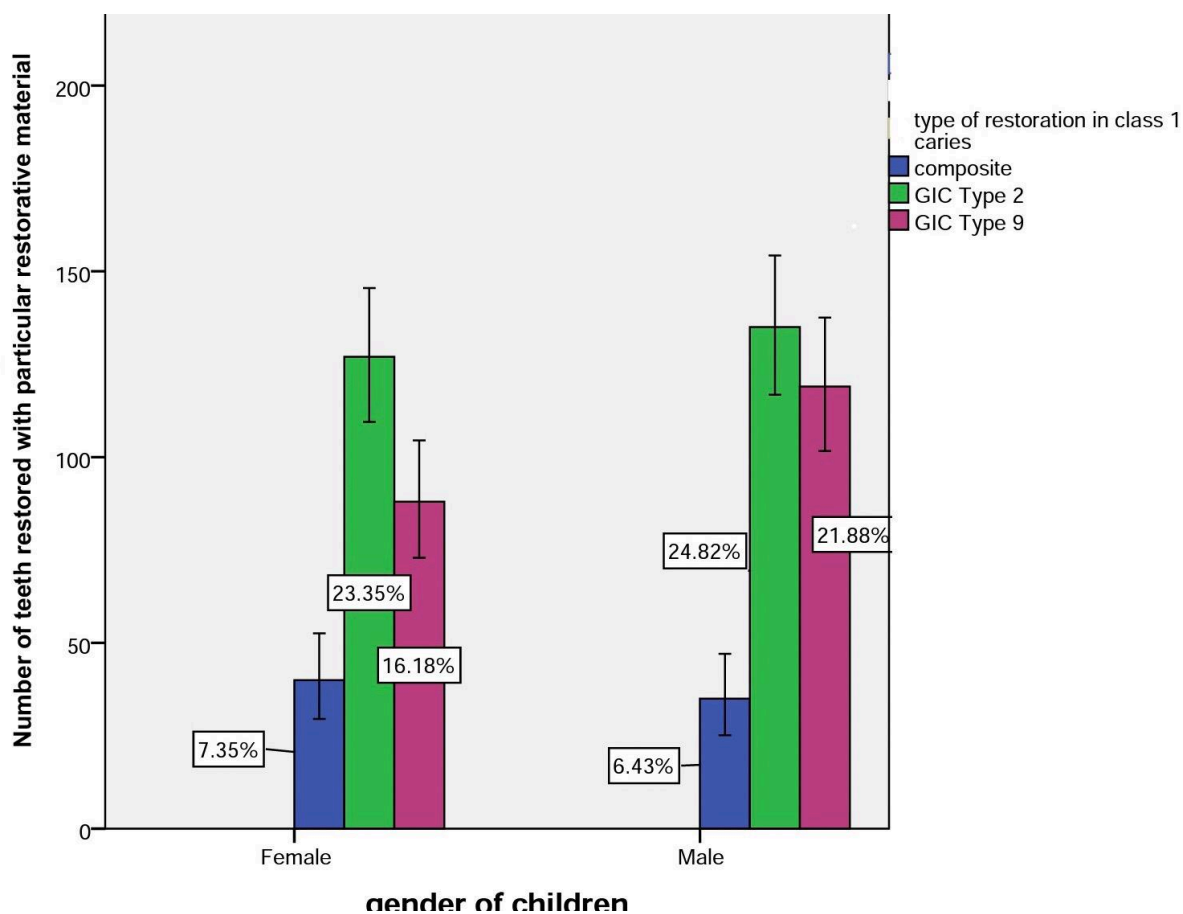
**Red denotes the children who had class 1 caries in 75 and blue denotes the children who had class 1 caries in 85. 43.75% have class 1 caries in 75 and 56.25% have class 1 caries in**



**Graph 4 bar chart showing the distribution on the type of restoration used in the sample population. Red denotes the composite type of restoration who had class 1 caries, Green denotes GIC type 2 type of restoration who had class 1 caries and Blue denotes GIC type 9 type of restoration among children who had class 1 caries. Composite restoration has been used in 13.79% of the children, GIC type 2 restoration has been used in 56.8% of the children and GIC type 9 has been used in 38.05% of the children.**



**Graph 5 Bar chart showing the association between the type of restoration at different ages of children. c. Purple denotes composite restoration, green denotes GIC type 2 restoration and pink denotes GIC type 9 restoration and in class 1 caries of Mandibular second molars of children aged between 3 and 6. X axis denotes the age of children with clustered charts that denote the type of restoration done in each age group and the Y axis denote the percentage of children with class 1 caries in the second molar. Chi square test was done and the association was found to be significant (p value =0.028, <0.05 statistically significant) showing that there was a difference in the choice of restorative material at different ages. The most preferred material for restoration at age of 3 years was found to be composite and at other ages was found to be Type 2 GIC.**



**Graph 6 Bar chart showing the association between the type of restoration in gender of children. Blue denotes composite restoration, green denotes GIC type 2 restoration and pink denotes GIC type 9 restoration and in class 1 caries of Mandibular second molars of children aged between 3 and 6. X axis denotes the gender of children with clustered charts that denote the type of restoration done in each age group and the Y axis denote the percentage of children with class 1 caries in the second molar. The correlation was shown to be not significant (p value =0.211, 0.05 statistically non significant) using the Chi square test. although there was a difference in the choice of restorative material in both genders. The most preferred material for restoration for male children was found to be Type 2 GIC and composite restoration while for female children, Type 2 GIC was more significant.**

**DISCUSSION:**

Amalgam, conventional glass-ionomer cement, resin-modified glass-ionomer cement, high-viscous glass-ionomer cement, compomer, and resin composite are examples of traditional restorative materials used for primary tooth repair. Despite the fact that amalgam was once thought to be the standard method in restorative dentistry, it is no longer recognised to be such. (Mickenautsch, Yengopal, and Banerjee, 2010), its use has decreased because to concerns about mercury poisoning and the greater removal of healthy tissue during cavity preparation (Yengopal et al., 2009). As a result, adhesive-quality restorative materials have grown in popularity, as they match with the minimally invasive dentistry is a concept that aims to provide optimal handling and functional performance while also addressing the cosmetic needs of patients. Despite the fact that placing restorations is a common treatment method in clinical practise, there is a scarcity of scientific evidence to determine which filling material is appropriate for treating caries in the primary dentition. In the systematic review, there where three different samples comparing the types of materials that were considered (Pires et al. (2018) conducted a foregoing systematic review and meta-analysis of network to assess the performance of a variety of typical restorative materials used in posterior primary teeth. Standard GIC restorations in primary molars had a higher failure rate than restorations that comprised of alternative restorative materials. GIC had flaws in previous iterations, including as limited wear resistance and flexibility strength. Due to the brittle quality of this cement, modifications to its previous composition were made to improvise its physical properties, and these modifications are now accessible in the RMGIC or HVGIC (Buerkle et al., 2005). There was no evidence that CP, RMGIC, AMG, or RC were superior as restorative therapies (Casagrande et al., 2013). Choosing one of these resources for therapeutic purposes will be dependent on professional expertise, individuality, and the patient's wishes. Aesthetic criteria, a gentle approach, caries activity, substrate type, and the cavity to be treated should all be taken into account when choosing a restorative material. (2016, Lenzi and colleagues)

Restorative dentistry certainly aids in the restoration of function and aesthetics, as well as assisting the patient/family in biofilm control because illness healing is linked to the regulation of etiological factors, it cannot be credited purely to restoration. Hence, in the oral cavity, restorations are subjected to a range of stresses that cause interfacial degradation, limiting their

longevity. Restoration failures demand replacement, which necessitates further tooth structure removal, repeating the restorative cycle. Patient-related factors including risk of tooth caries and socio economic considerations can affect the longevity of restorative materials.

## **CONCLUSION**

Thus in this study it was determined that the most preferred material for class restoration of class 1 caries at age of 3 years was found to be composite and at other ages was found to be Type 2 GIC and there is statistically significant Type 2 GIC predominance of about 48.16% ( $p=0.028$ ) and mostly Type 2 GIC was the choice of restoration for both male and female children who had class 1 caries in Mandibular secondary molars.

Our team has a wealth of research and knowledge that has resulted in high-quality publications (Subramanyam et al. 2018; Ramadurai et al. 2019; Ramakrishnan et al. 2019; Jeevanandan and Thomas 2018; Princeton et al. 2020; Saravanakumar et al. 2021; Wei et al. 2021; Gothandam et al. 2019; Su et al. 2019; Mathew et al. 2020; Sekar et al. 2020; Velusamy et al. 2021; Aldhuwayhi et al. 2021) (Sekar et al. 2020; Bai et al. 2019; Sekar 2019; Sekar et al. 2019; Duraisamy et al. 2019; Parimelazhagan et al. 2021; Syed et al. 2021)

## **Clinical Significance**

This study served as a beneficial tool for the identification of choice of restoration for class 1 caries in Mandibular molars. The data derived from the study is of high clinical value for evidence based practice and also can be used for implementation of correct preventive strategies and imparting awareness among dentists as well as the general population.

**Ethical Clearance:** It is taken from “Saveetha Institute Human Ethical Committee” (Ethical Approval Number- SDC/SIHEC/2020/DIASDATA/0619-0320)

## REFERENCES

- Alkarimi, H. A. *et al.* (2014) ‘Dental caries and growth in school-age children’, *Pediatrics*, 133(3), pp. e616–23.
- Anderson, R. M. (no date) ‘Epidemiology’, *Modern Parasitology*, pp. 75–116. doi: 10.1002/9781444313963.ch4.
- Black, G. V. (1936) *Technical procedures in making restorations in the teeth*.
- Buerkle, V. *et al.* (2005) ‘Restoration materials for primary molars-results from a European survey’, *Journal of dentistry*, 33(4), pp. 275–281.
- Burke, F. J. T. *et al.* (2002) ‘Materials for Restoration of Primary Teeth: 2. Glass Ionomer Derivatives and Compomers’, *Dental Update*, pp. 10–17. doi: 10.12968/denu.2002.29.1.10.
- Casagrande, L. *et al.* (2013) ‘Randomized clinical trial of adhesive restorations in primary molars. 18-month results’, *American journal of dentistry*, 26(6), pp. 351–355.
- Dhar, V. *et al.* (2015) ‘Evidence-based Update of Pediatric Dental Restorative Procedures: Dental Materials’, *The Journal of clinical pediatric dentistry*, 39(4), pp. 303–310.
- Dodes, J. E. (2001) ‘The amalgam controversy. An evidence-based analysis’, *Journal of the American Dental Association*, 132(3), pp. 348–356.
- Fernandes, I. B. *et al.* (2017) ‘Severity of Dental Caries and Quality of Life for Toddlers and Their Families’, *Pediatric dentistry*, 39(2), pp. 118–123.
- Fukuyama, T. *et al.* (2008) ‘Clinical survey on type of restoration in deciduous teeth’, *The Bulletin of Tokyo Dental College*, 49(1), pp. 41–50.
- Gift, H. C. (1992) ‘Research directions in oral health promotion for older adults’, *Journal of Dental Education*, pp. 626–631. doi: 10.1002/j.0022-0337.1992.56.9.tb02678.x.

Guelmann, M. and Mjör, I. A. (2002) 'Materials and techniques for restoration of primary molars by pediatric dentists in Florida', *Pediatric dentistry*, 24(4), pp. 326–331.

Kilpatrick, N. M. and Neumann, A. (2007) 'Durability of amalgam in the restoration of class II cavities in primary molars: a systematic review of the literature', *European archives of paediatric dentistry: official journal of the European Academy of Paediatric Dentistry*, 8(1), pp. 5–13.

Lenzi, T. L. *et al.* (2016) 'Adhesive systems for restoring primary teeth: a systematic review and meta-analysis of in vitro studies', *International journal of paediatric dentistry / the British Paedodontic Society [and] the International Association of Dentistry for Children*, 26(5), pp. 364–375.

Mickenautsch, S., Yengopal, V. and Banerjee, A. (2010) 'Atraumatic restorative treatment versus amalgam restoration longevity: a systematic review', *Clinical oral investigations*, 14(3), pp. 233–240.

Pair, R. L., Udin, R. D. and Tanbonliong, T. (2004) 'Materials used to restore class II lesions in primary molars: a survey of California pediatric dentists', *Pediatric dentistry*, 26(6), pp. 501–507.

Peretz, B. and Ram, D. (2002) 'Restorative material for children's teeth: preferences of parents and children', *ASDC journal of dentistry for children*, 69(3), pp. 243–8, 233.

Pires, C. W. *et al.* (2018) 'Is there a best conventional material for restoring posterior primary teeth? A network meta-analysis', *Brazilian oral research*, 32, p. e10.

Pizzo, G. *et al.* (2009) 'Genetic disorders and periodontal health: a literature review', *Medical science monitor: international medical journal of experimental and clinical research*, 15(8), pp. RA167–78.

Qvist, V. *et al.* (1997) 'Longevity and cariostatic effects of everyday conventional glass-ionomer and amalgam restorations in primary teeth: three-year results', *Journal of dental research*, 76(7), pp. 1387–1396.

Yengopal, V. *et al.* (2009) 'Dental fillings for the treatment of caries in the primary dentition', *Cochrane database of systematic reviews*, (2), p. CD004483.

Subramanyam D, Gurunathan D, Gaayathri R, Vishnu Priya V. Comparative evaluation of salivary malondialdehyde levels as a marker of lipid peroxidation in early childhood caries. *Eur J Dent*. 2018 Jan;12(1):67–70.

Ramadurai N, Gurunathan D, Samuel AV, Subramanian E, Rodrigues SJL. Effectiveness of 2% Articaine as an anesthetic agent in children: randomized controlled trial. *Clin Oral Investig*. 2019 Sep;23(9):3543–50.

Ramakrishnan M, Dhanalakshmi R, Subramanian EMG. Survival rate of different fixed posterior space maintainers used in Paediatric Dentistry – A systematic review [Internet]. Vol. 31, *The Saudi Dental Journal*. 2019. p. 165–72. Available from: <http://dx.doi.org/10.1016/j.sdentj.2019.02.037>

Jeevanandan G, Thomas E. Volumetric analysis of hand, reciprocating and rotary instrumentation techniques in primary molars using spiral computed tomography: An in vitro comparative study. *Eur J Dent.* 2018 Jan;12(1):21–6.

Princeton B, Santhakumar P, Prathap L. Awareness on Preventive Measures taken by Health Care Professionals Attending COVID-19 Patients among Dental Students. *Eur J Dent.* 2020 Dec;14(S 01):S105–9.

Saravanakumar K, Park S, Mariadoss AVA, Sathiyaseelan A, Veeraraghavan VP, Kim S, et al. Chemical composition, antioxidant, and anti-diabetic activities of ethyl acetate fraction of *Stachys riederi* var. *japonica* (Miq.) in streptozotocin-induced type 2 diabetic mice. *Food Chem Toxicol.* 2021 Jun 26;155:112374.

Wei W, Li R, Liu Q, Devanathadesikan Seshadri V, Veeraraghavan VP, Surapaneni KM, et al. Amelioration of oxidative stress, inflammation and tumor promotion by Tin oxide-Sodium alginate-Polyethylene glycol-Allyl isothiocyanate nanocomposites on the 1,2-Dimethylhydrazine induced colon carcinogenesis in rats. *Arabian Journal of Chemistry.* 2021 Aug 1;14(8):103238.

Gothandam K, Ganesan VS, Ayyasamy T, Ramalingam S. Antioxidant potential of theaflavin ameliorates the activities of key enzymes of glucose metabolism in high fat diet and streptozotocin - induced diabetic rats. *Redox Rep.* 2019 Dec;24(1):41–50.

Su P, Veeraraghavan VP, Krishna Mohan S, Lu W. A ginger derivative, zingerone-a phenolic compound-induces ROS-mediated apoptosis in colon cancer cells (HCT-116). *J Biochem Mol Toxicol.* 2019 Dec;33(12):e22403.

Mathew MG, Samuel SR, Soni AJ, Roopa KB. Evaluation of adhesion of *Streptococcus mutans*, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: randomized controlled trial [Internet]. Vol. 24, *Clinical Oral Investigations.* 2020. p. 3275–80. Available from: <http://dx.doi.org/10.1007/s00784-020-03204-9>

Sekar D, Johnson J, Biruntha M, Lakhmanan G, Gurunathan D, Ross K. Biological and Clinical Relevance of microRNAs in Mitochondrial Diseases/Dysfunctions. *DNA Cell Biol.* 2020 Aug;39(8):1379–84.

Velusamy R, Sakthinathan G, Vignesh R, Kumarasamy A, Sathishkumar D, Nithya Priya K, et al. Tribological and thermal characterization of electron beam physical vapor deposited single layer thin film for TBC application. *Surf Topogr: Metrol Prop.* 2021 Jun 24;9(2):025043.

Aldhuwayhi S, Mallineni SK, Sakhamuri S, Thakare AA, Mallineni S, Sajja R, et al. Covid-19 Knowledge and Perceptions Among Dental Specialists: A Cross-Sectional Online Questionnaire Survey. *Risk Manag Healthc Policy.* 2021 Jul 7;14:2851–61.

Sekar D, Nallaswamy D, Lakshmanan G. Decoding the functional role of long noncoding RNAs (lncRNAs) in hypertension progression. *Hypertens Res.* 2020 Jul;43(7):724–5.

Bai L, Li J, Panagal M, M B, Sekar D. Methylation dependent microRNA 1285-5p and sterol carrier proteins 2 in type 2 diabetes mellitus. *Artif Cells Nanomed Biotechnol.* 2019 Dec;47(1):3417–22.

Sekar D. Circular RNA: a new biomarker for different types of hypertension. *Hypertens Res.* 2019 Nov;42(11):1824–5.

Sekar D, Mani P, Biruntha M, Sivagurunathan P, Karthigeyan M. Dissecting the functional role of microRNA 21 in osteosarcoma. *Cancer Gene Ther.* 2019 Jul;26(7-8):179–82.

Duraisamy R, Krishnan CS, Ramasubramanian H, Sampathkumar J, Mariappan S, Navarasampatti Sivaprakasam A. Compatibility of Nonoriginal Abutments With Implants: Evaluation of Microgap at the Implant-Abutment Interface, With Original and Nonoriginal Abutments. *Implant Dent.* 2019 Jun;28(3):289–95.

Parimelazhagan R, Umapathy D, Sivakamasundari IR, Sethupathy S, Ali D, Kunka Mohanram R, et al. Association between Tumor Prognosis Marker Visfatin and Proinflammatory Cytokines in Hypertensive Patients. *Biomed Res Int.* 2021 Mar 16;2021:8568926.

Syed MH, Gnanakkan A, Pitchiah S. Exploration of acute toxicity, analgesic, anti-inflammatory, and anti-pyretic activities of the black tunicate, *Phallusia nigra* (Savigny, 1816) using mice model. *Environ Sci Pollut Res Int.* 2021 Feb;28(5):5809–21