WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Awareness of Glass Ionomer Cement Among House Surgeons – A Survey

B. Arunsurya [a], P. J. Sophia Pricilla [b], Joyson Moses [c], Sharanya [d]

[a] Dental Resident, Thai Moogambigai Dental College and Hospital
[b] Dental Resident, Thai Moogambigai Dental College and Hospital
[c] HOD, Department of Pedodontics, Thai Moogambigai Dental College and Hospital
[d] Professor, Department of Pedodontics, Thai Moogambigai Dental College and Hospital

INTRODUCTION:

Glass ionomer cement (GIC) is a self-adhesive restorative material [1;2]. Glass-ionomer cements belong to the class of acid-base cements. They are based on the product of reaction of weak polymeric acids with powdered glasses of basic character [3]. The term “glass-ionomer” was applied to them in the earliest publication [1;4], but is not strictly correct. The proper name for them, according to the International Organization for Standardization, ISO, is “glass polyalkenoate cement” [1;5], but the term “glass-ionomer” (including the hyphen) is recognised as an acceptable trivial name [1;6], and is widely used within the dental profession.

KEYWORDS: Glass-ionomer cement; fluoride release; bioactivity; clinical applications; resin-modified; glass carbomer.

METHODOLOGY:

A questionnaire survey was conducted among the CRRI to assess their awareness and knowledge about the glass-ionomer cement. After obtaining the Ethical clearance, the survey was conducted by generating online google forms and circulated through social media platforms. The questionnaire comprised of 10 questions which has the combination of both selected responses to certain questions and some close ended questions (yes/no/not aware of). After agreeing to an informed consent form, the questionnaire was given to each volunteer. Each respondent was given a brief explanation of the study's objectives before responding to the questionnaire, and information confidentiality was assured. A total of 50 dental residents participated in this survey. All the participants were briefed about the purpose of the study and an informed consent was obtained before the survey through Google forms and assured that their participation was purely voluntary.

STATISTICAL EVALUATION;

Non - probability, convenient stratified sampling technique was employed in this observational study having a cross - sectional design. Responses were noted among the selected population group under the study and evaluated for statistical analysis by PSPP software Version 3.0.

RESULT SUMMARY:

A majority of 27 (54%) of 50 study participants strongly agree that Glass ionomer cement is the best restorative material for children because (Q1) it can bond enamel and dentin and 52% (26 out of 50) are aware that (Q2) Glass ionomer cement is composed of Aluminosilicate powder and polyacrylate. Carbonyl group (Q3) is the reason for the mechanism of GIC restoration adhesion with tooth surface, and 28 (56%) of 50 participants were aware of it. On the other hand, the vast majority of 40 (80%) of study participants are aware that Glass ionomer cement bonds to tooth structure, has an anticariogenic effect, a degree of translucency, and does not irritate the pulp (Q4). Around 19 (38%) of the 50 respondents were unaware that (Q5) the benefit of Glass ionomer cement Reinforced with metal particles is increased abrasion resistance, while the remaining 62% were aware.

About 60% (30 out of 50) of the participants aware that Ionic bond is found in Glass ionomer cement (Q6) while 46% (23 out of 50) were unaware that Silicate cement, Glass ionomer cement, Polycarboxylate cement are fluoride rich materials (Q7). A majority of 28 (56%) participants are aware that Glass ionomer cement & Polycarboxylate cement are the two cements which hold with tooth (Q8) and the remaining 44% were unaware about it. Only 6 (12%) out of 50 participants were aware that (Q9) Zinc oxide eugenol cement is the cement which is most compatible with the pulp and a majority of 88% (44 out of 50) were unaware of it. According to the overall knowledge analysis, the majority of respondents are familiar with Glass ionomer cement, with less than half being unfamiliar.

DISCUSSION:

The questionnaire – based survey was conducted amongst the dental students in Tamilnadu to assess their knowledge, awareness, and perspective about Glass ionomer cement. Dental students must have adequate knowledge about Glass ionomer cement as they are future clinicians, pediatric dentist or Pedodontists.

The most common form of supply for glass ionomer cement is a manually mixed powder-liquid system. The powder is mostly fluoro-aluminosilicate glass, and the liquid is a polyacrylic acid aqueous solution. To control viscosity and stabilise the liquid, polyacrylic acid is copolymerized with carboxylic acid, maleic acid, tartaric acid, and itaconic acid. The liquid has thixotropic properties, which means that its thickness can be changed by shaking or warming the bottle. Capsules, twin syringes, and single bottle water settable form are some of the other modes of supply [1;7;8]. **About 52% of CRRI's were aware that the Glass ionomer cement is composed of aluminosilicate powder and polyacrylate.**

Because of its ease of placement and superior marginal adaptation, glass ionomer cement is widely used in paediatric restorations. Because of the fluoride release, it is the preferred material in high-caries-risk patients.[1] Glass ionomer has the distinct advantage of being the only restorative material with a true chemical bond to tooth structure. Despite the fact that the measured in vitro bond strength of glass ionomer to tooth structure is significantly lower than the bond strengths of the other materials, clinical experience indicates that glass ionomers are well retained. This could be because the chemical bond is different from the purely mechanical bond of the other materials [9;10;11]. **More than half about 54% stated GIC bonds enamel to dentine and a majority of 56% participants are aware that Glass ionomer cement & Polycarboxylate cement are the two cements which hold with tooth.**

Glass ionomer cement forms chemical (ionic) bonds with the tooth structure (enamel and dentin). Because enamel has a higher inorganic content than dentin, Glass ionomer cement bonds to it better. The mechanism of Glass ionomer cement adhesion to the tooth's inorganic structure involves a chelation reaction between the carboxyl groups of the polyacrylic acid and the calcium in the tooth's hydroxyapatite crystals [1]. Glass ionomer cements and modified Glass ionomer cements are materials of choice in repairing carious teeth in high-caries-risk individuals due to their ability to attach to dentin surfaces without removing the smear layer, biological compatibility, and fluoride release [17]. Light-cured Glass ionomer cements are the material of choice for paediatric repair due to their simplicity of installation and snap-set properties [18]. **Carbonyl group is the cause for the mechanism of GIC restoration attachment with tooth surface, and around 56% of participants were aware of it, with approximately 40% unsure. The advantage of Glass ionomer cement Reinforced with metal particles is greater abrasion resistance, which the remaining 62% were aware of.**

Among all dental materials, the coefficient of thermal expansion (COTE) of glass-ionomer materials is the most similar to tooth structure, particularly dentin. If the COTE of the material and the tooth structure differ significantly, temperature-related expansion/contraction could eventually lead to fracture or other failure of the restoration [12]. Various forms of fluorides (CaF2, SrF2, LaF2, Na3AlF6, AlF3) were added to the powder of Glass ionomer cement during manufacture as a flux, and their antibacterial properties were observed later [1]. To explain the fluoride release from Glass ionomer cement into an aqueous solution, two mechanisms have been proposed. The first mechanism involves the fast dissolution of fluorides from the solution's outer surface over a short period of time. The second mechanism is continuous and gradual fluoride diffusion through the cement [13]. Fluoride's anti-cariogenic action can be explained by several mechanisms, including decreased demineralization, increased remineralization, increased enamel resistance to acid attack via hydroxyapatite to fluorapatite conversion, and inhibition of enolase enzyme, thereby interfering with microbial replication and metabolism [1]. Glass ionomer cement is biocompatible as well as bioactive. Despite the fact that the pH of freshly mixed Glass ionomer cement ranges between 0.9 and 1.6, the pulp response to Glass ionomer cement is considered mild [14]. Polyacrylic acid's high molecular weight and large-sized molecules prevent acid molecules from penetrating deep into the dentinal tubules. When the remaining dentinal thickness (RDT) is greater than 1 mm, there is no need for pulpal protection when restoring with Glass ionomer cement. **Majority of 80% study participants are aware that Glass ionomer cement bonds to tooth structure, has an anticariogenic effect, a degree of translucency, and does not irritate the pulp and on the other hand, a majority of 88% respondents were unaware that Zinc oxide eugenol cement is the most compatible cement with the pulp.**

The hybrid ionomer chemically bonds to the tooth structure. The presence of resin, however, reduces ionic activity. As a result, the bonding tendency is reduced. The fluoride release is slightly lower than in standard Glass ionomer cement. The formation of intricate fluoride derivatives during a reaction with polyacrylic acid affects the fluoride release. It may also be influenced by the type and quantity of resin used. The initial pH of hybrid ionomer (pH=3.5) is higher than the initial pH of conventional Glass ionomer cement (pH=2), which reduces pulp irritation [15].

Hybrid ionomers have better compressive strength than conventional GIC, but inferior wear resistance, fracture toughness, flexural strength, and diametral tensile strength [16;7]. The hybrid ionomer has more translucency than standard GIC. Because of the polymerization of the resin component, it has a little shrinking tendency. **46% of study participants were unaware that fluoride-rich materials include silicate cement, glass ionomer cement, and polycarboxylate cement.**

CONCLUSION:

Glass-ionomer cements are acid-base materials that have a wide range of applications in modern dentistry. Several advances in restorative dentistry have occurred in recent years. To be able to apply the appropriate material to the appropriate scenario, one must first have a thorough understanding of the specific qualities, strengths, limitations, and requirements of each material available. Among undergraduate dental students, there was a significant lack of knowledge on clinical aspects of Glass ionomer cement use in the paediatric population, despite the study's limitations. Implementing Glass ionomer cement teaching in undergraduate dental curriculum, as well as professional development through continuing dental education programmes, training

workshops, dental journals/other publications, and updating online resources by increasing self-reporting of Glass ionomer cement, would improve knowledge, attitude, and its use in paediatric dentistry.

REFERENCES:

1. Sikka N, Brizuela M. Glass Ionomer Cement. 2022 Sep 12. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan–. PMID: 35881750.
2. Wilson AD. Glass-ionomer cement--origins, development and future. Clin Mater. 1991;7(4):275-82
3. Mount, G.J. Color Atlas of Glass Ionomer Cement, 2nd ed.; Martin Dunitz: London, UK, 2002.
4. Wilson, A.D.; Kent, B.E. The glass-ionomer cement, a new translucent cement for dentistry. J. Appl. Chem. Biotechnol. 1971, 21, 313
5. ISO 9917–1: Dental Water Based Cements; International Organization for Standardization: Geneva, Switzerland, 2003
6. McLean, J.W.; Nicholson, J.W.; Wilson, A.D. Guest Editorial: Proposed nomenclature for glass-ionomer dental cements and related materials. Quintessence Int. 1994, 25, 587–589.
7. Nicholson JW. Maturation processes in glass-ionomer dental cements. Acta Biomater Odontol Scand. 2018;4(1):63-71.
8. Sidhu SK, Nicholson JW. A Review of Glass-Ionomer Cements for Clinical Dentistry. J Funct Biomater. 2016 Jun 28;7(3)
9. Mount GJ: Clinical placement of modern glass-ionomer cements. Quintessence Int 2:99-107, 1993
10. Mount GJ: Glass ionomer cements and future research. Am J Dent 7:286-92, 1994
11. Berg JH. The continuum of restorative materials in pediatric dentistry--a review for the clinician. Pediatr Dent. 1998 Mar-Apr;20(2):93-100. PMID: 9566012.
12. McLean JW, Powis DR, Prosser HJ, Wilson AD: The use of glass-ionomer cements in bonding composite resins to dentine. Br DentJ 158:410-14, 1985.
13. Wiegand A, Buchalla W, Attin T. Review on fluoride-releasing restorative materials--fluoride release and uptake characteristics, antibacterial activity and influence on caries formation. Dent Mater. 2007 Mar;23(3):343-62.
14. Khoroushi M, Keshani F. A review of glass-ionomers: From conventional glass-ionomer to bioactive glass-ionomer. Dent Res J (Isfahan). 2013 Jul;10(4):411-20.
15. Mousavinasab SM, Meyers I. Fluoride release by glass ionomer cements, compomer and giomer. Dent Res J (Isfahan). 2009 Fall;6(2):75-81
16. Ching HS, Luddin N, Kannan TP, Ab Rahman I, Abdul Ghani NRN. Modification of glass ionomer cements on their physical-mechanical and antimicrobial properties. J Esthet Restor Dent. 2018 Nov;30(6):557-571.
17. Kampanas NS, Antoniadou M. Glass Ionomer Cements for the Restoration of Non-Carious Cervical Lesions in the Geriatric Patient. J Funct Biomater. 2018 Jul 08;9(3)
18. Francisconi LF, Scaffa PM, de Barros VR, Coutinho M, Francisconi PA. Glass ionomer cements and their role in the restoration of non-carious cervical lesions. J Appl Oral Sci. 2009 Sep-Oct;17(5):364-9.