

RESIN-BASED SEALANTS VS. GLASS IONOMER SEALANTS: A SYSTEMATIC REVIEW TO DETERMINE THE CLINICAL EFFICACY AND LONGEVITY

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ABSTRACT

Resin-based sealants and glass-ionomer-based sealants have emerged as the two sealants that can be relied upon to prevent dental caries. Resin-based sealants have been considered the most effective when it comes to the prevention of occlusal carious lesions. Despite this consideration, the literature highlights that these sealants are characterized by hydrophobic properties that necessitate a “near-total moisture control,” an aspect that limits the clinical application of Resin-based sealants. This study aimed to compare the longevity of two pit and fissure sealants: Resin-Based Sealants and Glass Ionomer Sealants. A systematic review approach was used. The PRISMA guidelines guided the literature search to obtain reliable information based on the metrics for exclusion and inclusion of studies. The current study established to despite the widespread use of different pit and fissure sealants, resin-based sealants are better than glass ionomer sealants based on retention. Resin-based sealants are more successful than glass ionomer sealants founding on efficacy and longevity.

Key words: Resin-based sealants, Glass ionomer sealants, Efficacy, Longevity, Systematic-review.

Introduction

The modification in the conformation of the bacteria plaque can result in dental caries, which is an ailment of the oral cavity. This change in composition can lead to an imbalance between the “demineralization and remineralization cycle” that manifests clinically as a non-cavitated/ cavitated caries lesion [1]. Despite data revealing that there has been a declining trend in the prevalence of dental caries, the drift has not been uniform across sociodemographic status, age groups, and tooth surface sites. Regarding tooth surface sites, further assessment of the vulnerability reveals that the declining trend was minimal on the occlusal surfaces compared to smooth surfaces [1]. The high susceptibility of occlusal surfaces to decay is attributed to its anatomical nature, which favors plaque retention.

Different populations may be affected differently by dental caries. As indicated in the literature, dental caries affect more than 60 percent of school kids [2]. The caries lesions that manifest due to the imbalance between demineralization and remineralization teeth process may have subclinical characteristics in the early stages. However, the persistence of the biofilm over the teeth as a result of poor oral hygiene as well as the regular intake of fermentable carbohydrates can lead to a reduced PH of the oral surrounding. Such environments allow dental caries to become clinically visible, taking the form of white spot lesions [3].

Addressing the concern of dental caries has seen the use of fissure sealants since they are the most effective tool to

thwart dental caries, especially on occlusal surfaces. Leveraging fissure sealants establishes a physical barrier that cuts off the supply of nutritional components to the bacteria [1]. Resin-based sealants and glass-ionomer-based sealants have emerged as the two sealants that can be relied upon to prevent dental caries. Resin-based sealants have been considered the most effective when it comes to the prevention of occlusal carious lesions [1]. Despite this consideration, the literature highlights that these sealants are characterized by hydrophobic properties that necessitate a “near-total moisture control,” an aspect that limits the clinical application of Resin-based sealants [1]. On the other hand, glass ionomer sealants can be utilized in situations where it is difficult to attain profound control since they are naturally hydrophilic. However, these sealants also have shortcomings such as high solubility in oral fluids and low abrasive strength. Therefore, this systematic review aims at determining the clinical efficacy and longevity of resin-based sealants and glass ionomer sealants.

Materials and Methods

This paper followed a systematic review to explore more details about the topic. The Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used to identify and screen eligible resources that can be included for review. The PICO question that guided the research is: In school children aged 18 years and below, how can the use of resin-based sealants in place of glass ionomer sealants help to prevent dental caries? This question helped to focus the research on the relevant details that address

topics related to dental caries, precisely the use of pit and fissure sealants.

Search strategy

Articles that address the topic of resin-based sealants and glass ionomer sealants were obtained from reliable databases on the internet. The search strategy entailed formulating keywords that were used to isolate articles that have focused on the topic of interest. The keywords used include “dental caries,” “pit and fissure sealants,” “resin-based sealants,” and “glass ionomer sealants.” The databases searched include PubMed, Google Scholar, and EMBASE. These databases avail crucial and verified information through scholarly and peer-reviewed articles.

Inclusion criteria

The criteria for inclusion of materials for review entailed meeting the set standards based on factors such as the listed keywords. Another strategy that was used for inclusion in the language that the articles are written. All non-English articles did not meet the inclusion criteria; hence, they were not reviewed. Also, articles published before 2019 were not included for review since only those from 2019 to 2021 passed the set standards for inclusion. Most importantly, all articles to be reviewed must have addressed either resin-based sealants, glass ionomer sealants, or both. The final criteria for inclusion were to check whether the articles can

be accessed in full text or abstract. In this case, only full-text studies qualified to be reviewed.

Exclusion criteria

The criteria of exclusion entailed various metrics. For instance, articles that addressed dental caries without concentrating on pit and fissure sealants did not meet the criteria for review. Also, articles that mentioned other pit and fissure sealants apart from resin-and glass ionomer sealants were not considered for review. Another criterion for exclusion included resources that did not focus on dental caries among children since this current study focus specifically on schoolchildren aged 18 years and below.

The inclusion and exclusion criteria were crucial to identify the desired articles that could be used to provide more insights about the efficacy and longevity of pit and fissure sealants, explicitly glass ionomer and resin-based sealants. Articles were screened either through the topic or the abstract to understand the details that writers have focused on. The eligibility criteria helped to identify materials that either compared the efficacy and longevity of glass ionomer and resin-based sealants or discussed each of the two sealants separately. The PRISMA flowchart in **Figure 1** below shows a summary of the search procedure and the selection criteria.

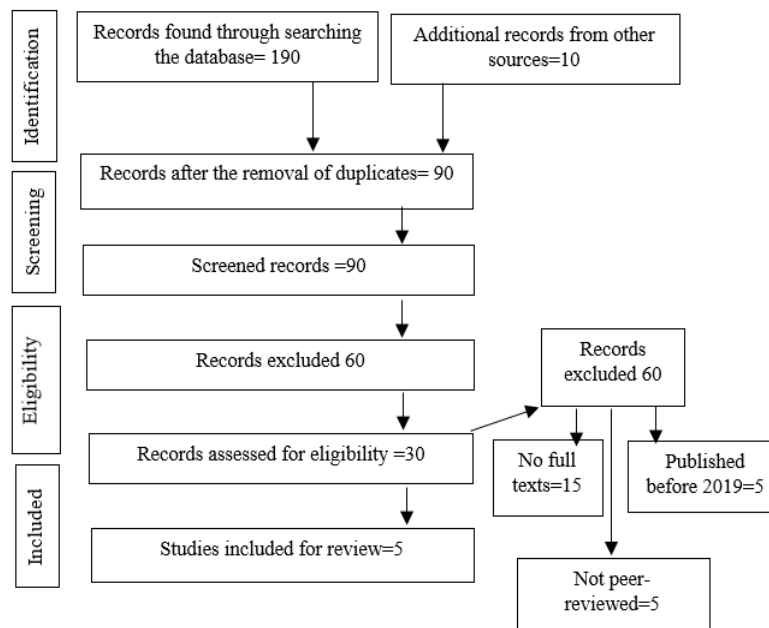


Figure 1. Eligibility criteria for inclusion and exclusion based on PRISMA guidelines

Bias risk assessment

There is a need to perform a bias risk assessment to pinpoint any form of bias that the studies included for review may exhibit. This process was crucial to ascertain that all the information included in the systematic review is free from performance, reporting, selection, attrition, and other bias. The Cochrane risk of bias assessment tool was used to

scrutinize bias, with the evaluation rating articles based on the three domains: unclear, high, or low bias. In **Table 1** below, the Cochrane risk of bias assessment tool has been expounded in detail. **Table 2** below, on the other hand, shows how the selected articles were judged regarding the overall risk of bias.

Table 1. Cochrane Risk of bias assessment

Domain	Description	High risk of bias	Low risk of bias	Unclear risk of bias	Reviewer assessment
Selection bias <i>Random sequence generation</i>	Define the approaches to creating allocation sequences to understand whether analogous groups should be produced.	Inadequate formation of random sequence implies selection bias	Similar groups should be formed for random sequence generation.	Details provided not enough to describe bias	Judgment
Allocation concealment	Address means used to conceal allocation described	Insufficient concealment infers selection bias	A likelihood of failing to anticipate intervention allocations	Insufficient details	Judgment
Reporting bias <i>Selective reporting</i>	Should address how selective outcome reporting was evaluated	Selective outcome reporting results in reporting bias	No detection of reporting bias related to selective outcomes	Insufficient details	Judgment
Other bias	Any other bias not addressed	Bias worries from issues not addressed in another place	No detection of other bias	Inadequate evidence to reveal other bias	Judgment

Table 2. The overall risk of bias judgment

Study	Risk of bias judgment	Justification
Haricharan <i>et al.</i> (2020)	Low risk of bias	Selection and reporting bias not spotted in the study
Prathibha <i>et al.</i> (2019)	Unclear risk of bias	Not enough details
Uchil <i>et al.</i> (2020)	Unclear risk of bias	Not enough details to reveal selection, reporting, and other biases.
Bekmezoğlu <i>et al.</i> (2019)	Low risk of bias	No detection of any form of bias for the study.
Alkhodairi <i>et al.</i> (2019)	Low risk of bias	Describes how the different forms of bias have been addressed.

Results and Discussion

The literature search yielded a total of 200 articles, among which 190 were obtained from the designated databases while the remaining 10 were got from additional sources. These articles were selected based on the keywords used since they matched the keywords of interest. Based on the PRISMA guidelines, the first step was to remove duplicates. After the removal of duplicates, 90 articles passed the criteria and were considered for screening. The screening was done on the abstracts and titles to establish whether the studies qualify the eligibility criteria. At this point, only 30 articles were eligible for review. The remaining 60 articles failed to meet the eligibility criteria due to factors such as not discussing resin-based sealants and glass ionomer sealants. Also, during the screening, articles that did not address dental caries were among those excluded at this point.

The 30 articles that had passed the eligibility criteria were subjected to the final stage, which was to check whether they meet the exclusion and inclusion criteria. Among these studies, only five were picked for review since they met all the set metrics for inclusion. For the eliminated 25 articles, 5 of them were published before 2019, which makes them ineligible for inclusion. Furthermore, 15 of the 25 excluded articles did not have full texts, an aspect that meant only an abstract could be accessed. As a result, the studies were not selected since an abstract does not provide enough information to scrutinize the topic. The remaining 5 articles among the 25 excluded were not peer-reviewed. Therefore, the 5 articles that met the exclusion and inclusion criteria checked all the necessary boxes, hence, making them appropriate to provide additional information about resin-based sealants and glass ionomer sealants. The summary of the selected studies is shown in **Table 3** below.

Table 3. A summary of the studies

Author and year	Inclusion criteria	Findings
Haricharan <i>et al.</i> (2020)	Concentrated on glass ionomers and resin sealants	Resin sealants were better in retention than ART sealants
Prathibha <i>et al.</i> (2019)	Addressed resin and glass ionomer sealants	Glass ionomer less retentive than resin sealants
Uchil <i>et al.</i> (2020)	Focused on glass ionomer sealants	Glass ionomers have an advantage over resin since the latter is more sensitive to moisture.

Bekmezoğlu <i>et al.</i> (2019)	Concentrated on resin and glass ionomer sealants	Glass ionomer cement can be used as alternatives to monomers in resin
Alkhodairi <i>et al.</i> (2019)	Addressed resin and glass ionomer sealants	Regarding retention, resin-based sealants are superior to glass ionomers.

The literature revealed numerous facts about the efficacy and longevity of resin-based sealants and glass ionomer sealants. The developed PICO question guided the literature search, with a thorough process of scrutinizing and appraising the literature helping to point out crucial facts about the topic of interest. Despite the focus on resin-based sealants and glass ionomer sealants, different authors concentrated diverse aspects revolving around the topic, hence, availing the needed information to help the successful completion of this systematic review. The themes and meanings that emerged from the literature are discussed below.

Haricharan *et al.* assert that the widely utilized resin-based sealants in preventive dentistry have limitations that restrict their applicability in moisture-laden settings [1]. As a result, hydrophobic resin-based sealants cannot be used in an area where there is no electrically powered equipment. An alternative to resin-based sealants is the glass ionomer sealants, which have improved retentive properties [1]. On the downside, glass ionomer sealants cannot resist occlusal forces since they are not adequately abrasive. Another study established that high viscosity ionomer-based sealants produced good sealing routines following an experiment that was conducted for eight months [4].

Gorseta *et al.* claim that a combination of “self-etching flowable composite” and an adhesive resin enhances the strength of the dentin bond and minimizes microleakage to hard dental tissue [5]. The authors further posit that heating glass ionomer recorded better outcomes compared to other sealants owing to the slight nano-leakage observed. A different study compared the performance of resin-based sealants and ART sealants and established that the former is better than the latter in the field of retention [6]. However, regarding the prevention of fissure caries, there was no significant difference in the performance of the two materials. A study by Schraeverus *et al.* found out that glass ionomer cement sealants can be used to prevent dental caries in molars [7].

Compared to resin sealants, the glass ionomer sealants are less retentive [8]. Uchil *et al.* also agree that resin-based sealants are superior to glass ionomer sealants in retention and caries prevention [9]. In their study, Bekmezoğlu *et al.* also concluded that the most appropriate material that has shown success in thwarting occlusal surface caries is a fissure sealant based on resin [10]. The authors further note that despite the success of resin-based sealants, the release of residual monomers from the material is a disadvantage to its functionality. In school-based caries prevention efforts, Alkhodairi *et al.* report that resin sealants are superior in regards to retention compared to glass ionomer sealants [11]. Şişmanoğlu *et al.* investigated fluoride release between

resin-based sealants and glass ionomer sealants and uncovered that the former was associated with a slightly lower fluoride release [12, 13]. Finally, Kumar *et al.* highlight the advantage of glass ionomer sealants over resin-based sealants, which is being less sensitive to moisture [14].

Conclusion

The systematic review has revealed that resin-based sealants and glass ionomer sealants are among the most used pit and fissure sealants. However, resin-based sealants have shown superior traits over glass ionomer sealants. The most notable area that puts resin-based sealants at an advantage is their high retention ability.

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