Type of study- Cross sectional study

Utilization of Sealants and Conservative Adhesive Resin Restoration for Caries Prevention by Dental Students

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Abstract

The most prevalent dental caries is a preventable disease and established lesions can become arrested. Traditional restorative treatment has many limitations and there is a need for dentists to manage carious lesions as far as possible by preventive means. The aim of this study was to investigate the practice of dental students regarding pit and fissure sealants and conservaive adhesive resin restoration for caries prevention. Data was collected from 86000 patients' dental records in the department of pediatric dentistry to meet the inclusion and exclusion criteria. A total of 5637 records of children who had undergone either pit and fissure sealants or CARR in primary or permanent teeth were evaluated. Descriptive analysis and chi-square tests were performed. Pit and fissure sealants were done in 9637 teeth (882- primary teeth; 8755- permanent teeth) and CARR were done in 328 teeth (178- primary teeth; 150- permanent teeth) with statistically significant difference ($P<0.05$). Both sealants and CARR are more prevalent in males (5071-Sealants; 180-CARR) than in females (4566-Sealants; 148-CARR). Based on the findings of this study, sealant application is the most common treatment done than CARR for caries prevention in both primary and permanent teeth by dental students.

Key words: *Caries adhesive resin restoration; Dental students; Sealants; Prevention.*

Introduction

Dental caries is one of the most widely recognized childhood diseases worldwide which is a complex process of demineralization and dissolution of the substance of the teeth leading to cavitation.[1,2] Dental research has moved concern from reasons for dental caries to how dental caries impacts the quality of life of affected individuals.

Over the past decade, oral health has improved significantly. This improvement, however, has not been experienced similarly over the populace, being considerably greater among the better off. Oral health is consistently an indistinguishable part of general health.[3] The most recent two decades have seen an improvement in oral health among the children and youngsters in many industrialized nations, particularly as for dental caries.[4] The factors credited to this drastic change in the pattern might be adjustment in the dietary habits, improved oral hygiene, proper utilization of fluorides, and other professional practices along with the foundation of school-based preventive programs.[5,6-7,8] Additionally, a prominent improvement in the degree of oral health awareness, dental health knowledge, and attitudes among the dental professionals, children and parents has been referred to as a significant contributing factor for improved oral health.[9,10,11]

Preventive dentistry might be viewed as the summation of all endeavors to forestall dental diseases or to prevent the sequelae of a person's dental diseases

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and disorders. These endeavors incorporate primary prevention which alludes to any gauge applied in the pre pathogenic period before a preventable disease appears.[12] Therefore, there is an urgent need for oral health assessments, anticipatory guidance, prevention, and early intervention among young children for oral health care.

Prevention at the primary level is of extraordinary incentive in dentistry, particularly in pediatric dentistry. Since the utilization of preventive measures can forestall future intricacies, dental professionals share a significant obligation toward early screening, treatment, and this knowledge must be transferred into the practice of dentistry.[13] Oral health education and professional knowledge of preventive dentistry have empowered dental students to become good examples for the general population. To accomplish improved oral health in the society, dental healthcare personnel or dental students are required to have adequate knowledge and a positive attitude, towards diagnosis and treatment planning, yet in addition towards preventive oral healthcare to forestall any complications.[14–16,17]

The importance of maintaining the primary teeth in the oral cavity until physiological exfoliation has been stressed in various studies, as they act as the best space maintainer and preserve the arch integrity.[18,19,20,21,22,23,24] Thinking about the high costs of caries treatment, early execution of preventive dental care programs and clinical care management appear to be fundamental for all children.[25] In addition, for the provision of preventive dental treatment, the knowledge on the significance of preventive measures is of most extreme significance.[14]

Dental sealants can be a preventive measure used efficiently as part of a comprehensive approach to caries prevention on an individual basis or as a public health measure for at risk populations against pit and fissure caries.[26] Pit and fissure caries report for more than 80% of all caries in children and adolescents. Despite the fact that occlusal surfaces comprise only 12.5% of tooth surfaces, approximately 60% of dental caries are seen in these surfaces.[27] Due to the unique morphology of pits and fissures and lack of mechanical tooth cleaning for these sites, they are among the most susceptible sites to caries. The dental sealant material hardens after penetrating the pits and fissures, and acts as a physical barrier that inhibits the ingress of bacteria and nutrients.[28] The first clinical trial was conducted in the late 1960s and today there are multiple commercially available sealant materials that have been tired such as resin-based that are polymerized by chemical activation or light activation system; glass ionomer-based with fluoride releasing property; polyacid-modified resin sealants.[29,30]

With the proven results of etched resin techniques, there has been renewed interest in conservative cavity design with a view to the conservation of sound tooth structure.[31] Among the newer techniques indicating long-term success are preventive resin restorations (PRR), recently known as conservative adhesive resin restoration (CARR).[32] Minimal exploratory cavities in enamel are restored with pit and fissure sealants, whereas isolated carious lesions are removed without augmentation into the surrounding healthy tooth. The cavity is restored with filled resin and the unaffected pits and fissures are secured with pit and fissure sealant.[33] CARR is a secondary prevention which halts the progress of the disease at its incipient stage and forestalls further complication. Here, the pits and fissures are minimally prepared to remove demineralized enamel and dentin, and then filled with resin-based composite.[34]

Hence, the present study was conducted to investigate the practice of dental students regarding sealants and CARR for caries prevention.

Materials and Methods

This retrospective study was conducted in a university setting. The ethical clearance for the study was obtained from the Institutional Scientific Review Board. A total of 86,000 patient treatment records between June 2019 to April 2020 were assessed for the study. The data collection and analysis was done by two examiners.

The inclusion criteria were children between the ages of 3-17 years, children who underwent dental sealants and CARR treatment for primary or permanent teeth and complete records of the patient and treatment done in the case sheet with photographic evidence. Exclusion criteria for the study were patients above 17 years of age, incomplete case records and missing photographic proof of completed treatment. A third examiner reviewed the case records of the collected data

to confirm the validity of the data by confirming the data with the post operative photographs. To avoid sampling bias, simple random sampling was done. Based on the inclusion and exclusion criteria, dental records of 5637 children who had undergone pit and fissure sealants or CARR in the permanent or primary teeth from dental students were finalised for data analysis.

The extracted data was tabulated in a spreadsheet (Excel 2017: Microsoft Office) and analysed using SPSS 19.0 version software (SPSS, Inc., Chicago). Descriptive statistics and chi-square tests were performed with the level of significance at 5% (P<0.05).

Results and Discussion

In this study, based on the inclusion and exclusion criteria, dental treatment records of 5637 children were examined. Among the case records analysed, 51% were males and 49% were females within the age range of 6 to 15 years. A total of 9965 teeth were studied, of which 11% (1060) were primary teeth and 89% (8905) were permanent teeth. Table 1 shows the distribution of teeth included in the study.

Out of 9965 teeth, pit and fissure sealants were placed in 9637 teeth (9% (882)- primary teeth; (91% (8755)- permanent teeth) and CARR in 328 teeth (54% (178)- primary teeth; 46% (150)- permanent teeth). This result is statistically significant (P<0.05). Figure 1 depicts the distribution of type of teeth in relation to the type of treatment rendered.

Both sealant and CARR are predominantly placed in males (53% (5071)-Sealants; 55% (180)-CARR) than females (47% (4566)-Sealants; 45% (148)-CARR) and the result is statistically not significant (P>0.05) (Table 2).

Table 1: Distribution of teeth included in the study

Type of teeth	Number of teeth	Percentage
Primary maxillary molars	495	5
Primary mandibular molars	565	5.7
Permanent maxillary premolars	681	6.8
Permanent mandibular premolars	613	6.2
Permanent maxillary molars	3848	36.6
Permanent mandibular molars	3963	39.8
Total	9965	100

Table 2: Distribution of type of treatment based on gender

Gender	CARR	Sealants	P value
Males	180	5071	>0.05*
Females	148	4566	

*P>0.05; Not statistically significant

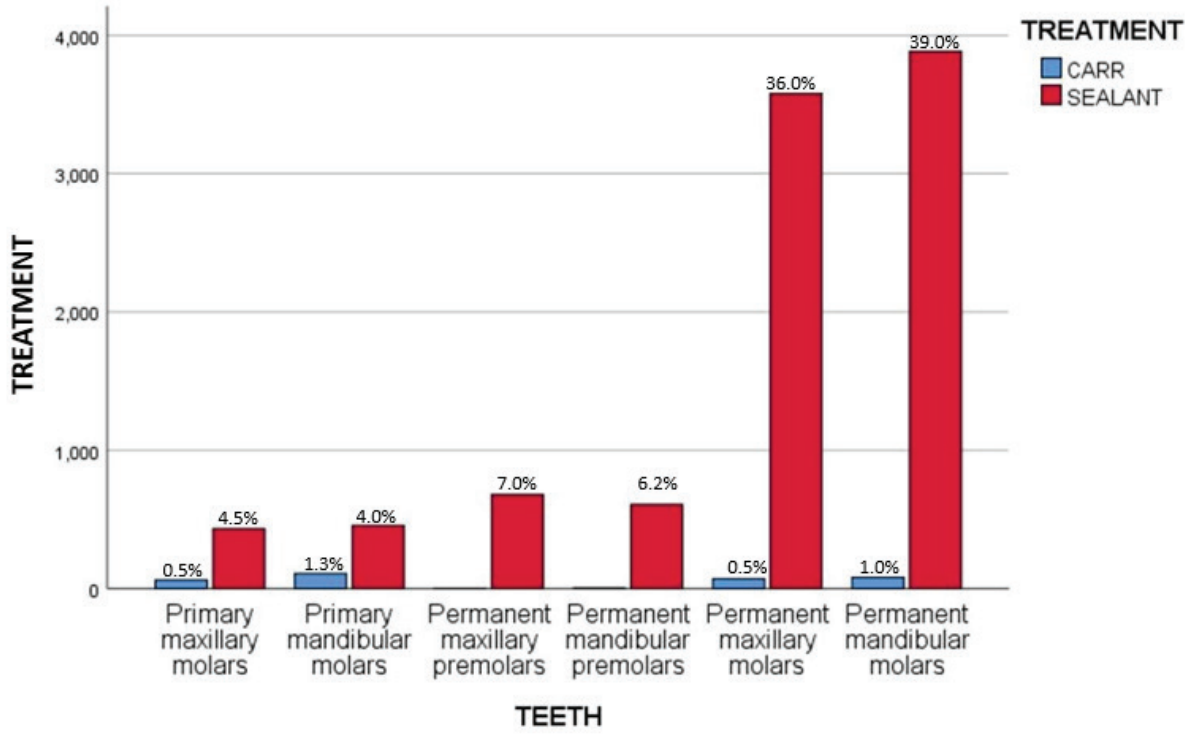

Figure 1 : The bar chart represents the correlation of type of treatment and type of teeth where X-axis denotes the type of teeth and Y-axis denotes the type of treatment. Blue color denotes CARR and red color denotes sealants. It shows that the most number of CARR was done in primary mandibular molars followed by permanent mandibular molars and most number of sealants was done in permanent mandibular molars followed by permanent maxillary molars. Sealants were performed more than CARR. Chi-square test; p value-0.001, hence it is statistically significant.

Preventive dental interventions, such as early and routine preventive care, fluoridation, and sealants are cost effective in reducing the disease burden and associated expenditures. Prevention is the backbone to avoid oral diseases and to have positive oral health. Dentists are in a key position to assist their patients with reducing the burden of oral disease and attain positive oral health behavior.[13] The attitude of dental practitioners toward preventive dentistry is a significant factor that can impact their choice to apply preventive dental care and may conceivably influence their ability to motivate patients to get preventive care measures.[15] The attitude towards improving oral health has changed with an accentuation on caries prevention. In view of current practice, non-invasive methods are preferred to invasive treatments. The current study was conducted to evaluate the practice of dental students regarding dental sealants and conservative adhesive resin restoration in primary and permanent teeth.

The sealant application was primarily indicated on the occlusal surfaces of permanent molars and premolars; and also being indicated in primary molars.[35] The disregarded carious primary teeth may further increase the risk of developing caries in permanent teeth and thus affect the quality of life. Sealants are reported to decrease the need for restoration by 75%.[36] CARR or preventive resin restoration was first suggested by Simonsen, whereby the susceptible fissures were opened up with a small tapered fissure prior to restoring the cavity with resin material. Fernandes et al.,[37] stated the benefits of sealing as the lower cost in comparison to that of restorations and nine fold decrease in the occurrence of caries in comparison to unsealed teeth. Rafatjou et al.,[27] reported CAR success rate to be 53.6% in one year for the treated teeth and Walker et al.,[38] reported a success rate of 83% over 6.5 year in pediatric patients. Pandiyan et al.,[39] compared the retention of sealants and PRR for a 2 year period and stated 10.7% complete loss and 21.4%

partial loss in sealants and 4.9% complete loss and 14% partial loss of PRR. This indicates that pit and fissure sealant has a marginally higher percentage of success in retention when compared to preventive resin restoration. Anson et al.,[40] stated that the poor placement techniques such as moisture contamination, improper sealing of all pits and fissures, inadequate etching, rinsing or drying, insufficient curing time which ultimately results in material wear as the reasons for failure. Manton et al.,[41] stated the faulty technique of sealant application to be the reason for initial loss and a secondary loss due to material wear under the forces of occlusion.

The placement of a resin is very technique sensitive and is influenced by various factors, that includes patient cooperation, operator variability, contamination of operating field, condition of included tooth. A newly erupted tooth has a lower chance of success as compared to a fully erupted tooth due to difficulty in isolation and salivary contamination.[30] In the current study, we observed that pit and fissure sealants are more commonly done than conservative adhesive resin restoration for preventing caries in both primary and permanent molars by dental students. This indicates more knowledge and positive attitude towards preventive dentistry than interceptive treatment. However, the presence of caries demands conservative preparation rather than sealant application alone.

There was no significant correlation between the application of sealants and CARR based on gender ($P>0.05$), which is in consistent with the studies by Rafatjou et al.,[27] and Memarpour el al.[42] In the present study, the maximum sealant application is done on the mandibular teeth than maxillary teeth in both primary and permanent dentition. This could be related to the higher caries susceptibility in mandibular arch due to the fissure topography of molars.[43] When comparing permanent and primary teeth, maximum sealant application is done on the permanent teeth by dental students. This can be correlated with the flatter fissures of primary teeth that do not support long-term sealant retention and also related to the uncooperative behavior of the children as the procedure is technique sensitive.[44] Whereas a report from the American Dental Association indicated that children with sealed pits and fissures in primary molars had a 76% lower risk of developing new caries than children without sealants.[45] When placed with care and then routinely maintained, sealants and CARR represent an extraordinary preventive service.[39]

A large sample size and multiple operators that improved the correlations of the study with general dental practice were the strengths of this study. The limitations of the study were, the treatment plan was not decided by a single operator and the reason for the selection of material was not included. Further research would be needed to assess the outcome and impact of such interventions. Greater effort ought to be made by the professional organization and governmental agencies to inform patients of the benefits of preventive practices.

Conclusion

Within the limits of the study, we can conclude that pit and fissure sealant application was the most common treatment done than conservative adhesive resin restoration for caries prevention in both primary and permanent teeth by dental students.

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