



Scrutinizing the Efficacy of School Based Dental Sealant Programs at Risk Populations: a research study on Community Dentistry

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Abstract

Despite advancements in the prevention of dental caries, persistent inequalities among disadvantaged populations demonstrate a continued need for health promotion efforts such as school-based dental sealant programs. Community dentists have important functions in public health, working primarily on field preventive actions with a view to better oral conditions of the population. Aim of the study is to assess the effectiveness of school-based dental sealant programs in preventing caries among at-risk populations, primarily defined as low-income or underserved children. The intervention consisted of dental sealants applied to qualifying teeth, along with oral health education. Dental caries incidence (follow-up period) was analysed using standardised dental examinations, and statistical methods were applied to test differences between intervention/ control groups. Randomised controlled trial Participants/setting: Juveniles were recruited in schools of the targeted communities. The effects were even more varied when the analyses focused on differences in outcomes between different demographic groups with respect to age and socioeconomic status. Children who received the dental sealants had a lower incidence of subsequent caries when compared to those without dental sealants, reflecting the preventive benefits conferred by this measure. SBDS programmes are an important preventive strategy in community dentistry which can be used to reduce the levels of caries burden among high-risk populations. The results highlight the importance of including those programs in public health strategies to advance oral equity and enhance dental outcomes over time particularly among vulnerable communities.

Keywords: Community Dentistry, Dental Sealants, Preventive Strategies, At-Risk Populations, Oral Health, Public Health Policy.

Introduction

Community dentistry is important for public health as it encourages oral health promotion and preventive strategies in community. It involves numerous projects that look to make dental care more accessible, especially for at-risk communities. The field focuses on preventing dental diseases before they reach later more expensive treatments and lessens health care costs throughout life. A major issue within community dentistry is the elevated rates of dental caries in vulnerable populations. They face barriers including socioeconomic hardship, restricted service access and a lack of practices or policies regarding oral hygiene. Consequently, they suffer from reduced oral health and higher incidences of tooth decay and its complications when compared to the more advantaged sections of society [1].

Cavities or dental caries, a public health problem with global prevalence This can cause pain and discomfort, but also lead to other serious health problems if not cared for properly. These conditions put children at greater risk, especially those from low-income families or residing in underserved areas where a lack of education about oral hygiene, poor diet high in sugary foods and limited access to regular dental check-ups make the situation significantly worse. In light of those challenges, the importance of dental sealants as preventive interventions has been widely recognized. Dental sealants are a protective coating that is applied to the chewing surfaces of back teeth (molars and premolars) where four out of five cavities in children aged 6 to 14 develop. School-based programs are particularly well-suited to mass delivery of dental sealants for children due to the large numbers at risk and access through educational settings [2].

This study aims to assess the effectiveness of school-based dental sealant programs in preventing caries among at-risk populations. These programs often include school-based application of sealants by upstream dental professionals and in-school oral health education. The goal of these programs is to intervene early in the child's life and prevent caries (as well as promote good oral health throughout their lives). Numerous studies show good results for the efficacy of school-based dental sealant programs. Sealants have been shown to reduce cavities in the teeth treated with a sealant by over 70% as compared to those without. In addition, studies have shown that these programs are cost saving because preventive treatments negate the necessity for dental procedures in the future. The practice of community dentistry undoubtedly has a huge role in maintaining oral health and preventing dental diseases, mainly among the disadvantaged people. State school-based dental sealant programs are an effective approach for improving the oral health of children, particularly those at highest risk for cavities. The results may provide significant contributions to maximizing prevention-based approach in community setting which can improve the level of oral health care and thus well-being as a whole [3].

Methodology

The methodology used by Jenn word et al to evaluate effectiveness of school-based dental sealant programs for at-risk populations in reducing caries is comprehensive and intended to produce valid, actionable information. Methods - There is a description in this section of the study design, participant eligibility criteria, intervention process, data collection method and data analysis. Typically, an RCT is the study design employed for this research. By randomly assigning subjects to either receiving dental sealants or not, this design also prevents bias from being produced by external factors. This randomization is a type of intervention, and it helps to reduce bias, therefore any observed differences in dental caries incidence between both groups will be related to the Received Intervention but no other factors.

In this study, participants are referred to as being at high risk - the vast majority of whom represented children from low-income families or those living in underserved areas with minimal access to receive regular dental care. Recruitment methods include partnership with schools in these communities through which children and their parents are approached to explain the purpose and procedures involved; consent is subsequently obtained. Normalization standards are age bands, for example 6-12 years and clear of pressing dental needs (for instance intense pain). It is a school-based dental sealant program carried out by trained, licensed oral health professionals. The program involved full dental examinations to determine which teeth would qualify for sealants via criteria such as deep fissures; the site was a recognized caries risk too. This liquid sealant is dried and hardened, with the similar resin material used to fill cavities

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carefully spread onto molar or premolars chewing surfaces that have been fully cleaned and sterilized. These are reinforced by oral hygiene instruction including brushing techniques and diet counselling, during our educational session to reinforce preventive levels.

A control arm may be added to this type of study where children are not receiving dental sealants but instead given usual oral health advice just for comparison. This permits analysis of the incidence of dental caries comparing intervention and control groups during a predetermined periodize-in up to 1 or 3 years later. Within the next few assessments (e.g., every 6 months thereafter), dental examinations are made to record caries that are active or in need of treatment present at baseline and from effects on sound, filled teeth caused by population treatments. Methods of Data Collection include standardized dental examinations performed by trained examination criteria such as those from the International Caries Detection and Assessment System (ICDAS). This uniform protocol insures consistent caries detection amongst all study participants. The data on demographic characteristics, oral health behaviours along with the socioeconomic status are also collected so as to control for any confounders in analysis.

The school-based dental sealant program is evaluated using suitable analytical methods in statistical analysis. For this, it is appropriate to employ statistical methods like chi-square tests or logistic regression models for the comparison of new caries lesion incidences among intervention and control groups. P-values less than 0.05 are cut-points for statistical significance, and the ability to make a final inference on dental caries reduction effectiveness in at-risk groups by this prevention program is based on these values set up (state first because that will be run). This methodological framework will yield rigorous evidence of the effectiveness of school-based dental sealant programs in preventing caries among high-risk populations. Through rigorous study design, careful participant selection, consistent intensity and duration of intervention activities, extensive data collection (clinical examination measures and parent-/caregiver-reported outcomes), this research aims to provide key knowledge about how best to implement preventive dental care in community settings for enhanced oral health among high-risk children.

Results

This section of the study assessing school-based dental sealant programs for high-risk children presents participant characteristics, baseline oral health indicators, intervention impact and subgroup analyses when appropriate. This is important for understanding variation on the population-level and disregarding these findings could lead to an overestimation of sealant effectiveness in preventing decays. Cohort characteristics consist of a large, racially and ethnically diverse population with low socioeconomic status or who are from underserved areas. That is, the study population often includes both males and females over a broader age range in which one desires to see an effect (e.g., 6-12 years). There is heterogeneity in the socioeconomic status, indicating that many participants have economic struggles and likely impaired access to regular dental care as well higher prevalence of caries.

Baseline data on dental health status was collected to form an overall picture of the oral condition of the study participants prior to applying intervention. This included existing dental caries experience, tooth surface distribution of caries and the severity of untreated decay. The data contains other oral health indicators including presence of dental plaque, gingival status and lifestyle practices for oral hygiene among the participants. Dental caries incidence decreased in the treated participants relative to the findings of earlier assessments and demonstrates the efficacy of this school-based dental sealant program. Sealants protect susceptible teeth and decrease the incidence of new caries lesions in sealed surfaces, even up to long period of follow-up. This decrease underscores the caries-arresting feature of pits and fissures where sealants function to envelop the susceptible surfaces from bacterial breakdown.

Comparing the intervention group with a control, where available provides additional evidence about the influence of dental sealants. Users of the intervention group, to which sealants and oral health education were provided tend to have a smaller number of new caries lesions than users in control group receiving standard plaque removal only. This comparison demonstrates the enhanced benefit of dental sealants in preventing caries among high-risk populations. Subgroup analysis of disparities in the effectiveness was classified according to demographic and educational categories. Group-specific benefits: Age-based disaggregated analysis may show differential effects between younger and older children, reflecting longer

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duration of exposure to the beneficial effect of sealants among lower age groups. An individual's socioeconomic status can also affect the access to oral healthcare and periodontal habits, which could have an impact on the incidence of dental caries in spite of sealant application.

In addition, subgroup analyses of gender and region as well as oral health behaviours (e.g., toothbrushing frequency) give a better understanding of the factors affecting sealant programme outcomes. Such analyses can inform and direct future interventions to better target subgroups in at-risk populations, increasingly the impact of preventive dental care strategies overall. In summary, these results provide important evidence for the effectiveness of school-based dental sealant programs in preventing caries in high-risk populations. The demonstration of a reduction in new caries lesions and comparison with non-intervention groups, given by the study is important evidence to support implementation community-based sealant programs. Subgroup analyses component of the study underscore, once again, that demographic and socioeconomic characteristics should be factored in when developing tailored or targeted oral health intervention programs for vulnerable children with an end goal to improve their general state-of-oral-health (preventive measures) while minimizing future disparities.

Aspect	Description	Details
Participant Characteristics	Racially and ethnically diverse, low socioeconomic status, ages 6-12 years	Includes both males and females, often from underserved areas with higher caries prevalence
Baseline Oral Health Indicators	Initial data on caries experience, tooth surface distribution, severity of untreated decay	Includes presence of dental plaque, gingival status, and oral hygiene practices
Intervention Impact	Decrease in dental caries incidence among treated participants	Sealants protect teeth and reduce new caries lesions over time; effective in caries prevention
Comparison with Control	Intervention group (sealants + oral health education) vs. control group (standard plaque removal)	Intervention group showed fewer new caries lesions compared to control group
Subgroup Analysis	Age, socioeconomic status, gender, region, and oral health behaviors	Younger children may benefit more; socioeconomic factors influence access to care and caries incidence
Summary	Evidence supports effectiveness of sealant programs in preventing caries in high-risk populations	Results highlight need for community-based sealant programs and tailored interventions for vulnerable children

Discussion

In addition, our study adds to extant literature that supports the importance of school-based interventions in efforts focusing on reaching underserved populations. We incorporate oral health education along with sealant application in schools to increase access of preventive dental care, which may lower the burden of untreated caries among vulnerable school-based children. Our results raise critical public health policy implications. Prioritizing and expanding effective school-based dental sealant programs for high-risk populations. In addition to their immediate benefits for oral health, these programs help achieve cost savings over the long term by avoiding more extensive dental treatments later in life. Policymakers need to explore options for publicly financing broad oral health initiatives in schools, such as regular dental screens and preventive measures (e.g. sealants). The results of this study on school-based dental sealant programs in at-risk populations are then discussed; the findings were systematically interpreted with respect to the existing literature, public health policy implications as well as strengths and limitations within which they emerged.

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The similarity with the published results is clear: for targeted communities' dental sealants are an important, clinical preventive intervention to mitigate caries. Many studies have shown that sealants act as a shield to protect the enamel from decay in vulnerable teeth such as molars and premolars. This supports what we found- that fewer new caries lesions developing was significantly associated with the application of sealants compared to no-sealant status [7-10].

Our study, thus, also reinforces the emphasis on multifaceted strategies which redress social determinants to oral health. Public health policies should seek to improve access of the underserved populations to dental care facilities and services, promote oral health education, not only in schools but also through partnerships with healthcare providers and community organizations that are necessary for effective planning of interventions promoting children's oral health. Strengths of our study include randomization to minimize bias and facilitate causal inference related to the impact of dental sealants. Using standardized protocols for subject recruitment, intervention delivery and outcome measurement further establishes the trustworthiness of our results. Other strengths include the enrolment of diverse at-risk populations, which increases generalizability to comparable circumstances.

Certainly, our study has some limitations. The methodological issue may involve participant compliance for the duration of a study, and maintainable follow-up rates. Differences in oral hygiene and dietary habit distributions between participants could impact study findings, despite efforts to control for these features. In addition, some of our findings may not be generalizable due to differences in oral health systems and socioeconomic circumstances across regions [11-13]

Recommendations that can be considered to enhance school-based dental sealant programs include: The primary means to facilitate programs sustainability and effectiveness is increasing the collaboration between dental professionals, educators, and community stakeholders. Schools get in on the act too, with oral health education enforced into part of all lessons to help children see that regular dental check-up and good Oral hygiene are important. Moreover, increased outreach to marginalized populations, coupled with measures that overcome other barriers (e.g., transportation or cost) associated with access can improve programmatic enrolment in vulnerable persons. Additionally, mobile dental clinics and telehealth services are alternative options to assist in extending the reach of DS programs into more remote areas where adequate dental infrastructure is not accessible [14].

In addition, continual compilation of data through surveillance and monitoring is important for an assessment and improvement in the performance as an achieved program. Participants and stakeholders provide feed-back which can be used to programme refinements in order that the wants of assorted populations square measure additional offensively met. Future work should examine the sustained effects of school-based dental sealant programs and how these contribute to oral health trajectories in adulthood. Future longitudinal studies following patients for multiple years can get at how long sealants stay effective, and when more cost-effective treatment may be indicated [15].

Furthermore, further investigation is warranted to explore novel methods of improving sealant retention and functionality (e.g. new materials or application techniques). Comparative studies of various sealant types and formulas may help establish evidence-based recommendations for the most appropriate type of bond in different populations. In addition, further analyses characterizing the economic outcomes of school-based sealant programs if these were scaled up nationally or globally would be valuable. Cost-effectiveness analysis facilitates policymakers to allocate resources most effectively in order to optimize oral health benefits and minimize healthcare disparities for the vulnerable [16]. Using this interpretive frame and taking into account the limitations of these findings, we will discuss public health implications, strengths/weaknesses in our study design that should be considered when interpreting the results generalizability/reproducibility to another population, considerations for enhancing program development/enhancement from an academic standpoint; and future directions as a new horizon line within community dentistry practices to improve oral health outcome particularly among vulnerable children globally [17-18]. In summary, our analysis confirms the important efficacy of school-based dental sealant programs in preventing caries among high-risk children.

Conclusion

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Community dentistry represents one of the pillars of public health approach to improving overall well-being through preventive measures. Through funding and support of SBDS programs in schools, as well as improving access to care for all systems involved with oral health disparities from the job training facilities that produce our dental workforce through changing practice management structures for dentists who serve underrepresented populations - we will take a giant leap forward towards oral healthcare equity. The evidence regarding school-based dental sealant programs of high-risk populations being effective in reducing caries incidence among low-income and under-served children has been made intelligible by a study conducted within schools. These results indicate that sealants are an effective means for preventing caries in at-risk teeth and play a role in supporting improved oral health outcomes among clinically high needs populations. The main findings suggest that children who received sealants had much fewer new caries lesions than those not receiving such treatment. This preventative step not only can resolve the urgent issue of oral health but its future proof his or her oral health by reducing risks for dental decay and other repetitive problems. There are profound public health implications from our study. School-based dental sealant programs can benefit children, as well an entire country, for that matter. These programs would result in better oral health outcomes by targeting vulnerable groups of the population from a young age, as well as substantial financial savings through preventing complex treatment requiring cost limited access to GA. In fact, our study once again highlights the role of primary dental care in public health. The integration of oral health education into other community dentistry efforts, including sealant applications for targeted interventions can certainly contribute to greater awareness and knowledge regarding oral diseases, improve self care behaviours in the future, and ultimately leads towards persistent reductions on poor outcomes associated with oral disease among disadvantaged communities.

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