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Review Article

Role of School-Based Oral Health Programs in Reducing Dental Caries: Strategies and Outcomes

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ABSTRACT

School-based oral health programs (SBOHPs) have proven effective in reducing dental caries and improving oral health among children worldwide. Using preventive, educational and community strategies to respond to students' oral health needs, the programs serve students, particularly those in underserved communities. SBOHPs, including fluoride varnish, fissure sealants, and oral health education programs, help provide ongoing benefits for participants' dental hygiene and general health. Underfunding and logistical obstacles can compromise the programs, but there is now an abundance of evidence showing clear advantages for preventing dental disease. SBOHPs provide an effective model for the incorporation of oral health in school curricula to ensure long-term oral health promotion.

Keywords: Dental caries, Dental sealants, Fluoride varnish, Oral health education, Preventive services.

BACKGROUND

Prevalent dental caries is still listed as one of the most common chronic diseases in children across the globe, thus leading to limitations in their oral and general health [1]. However, there have been advances in access to oral health care and prevention; untreated dental caries can cause pain, infection, mastication difficulty, speech disturbances, and low academic achievement [2]. The early childhood and adolescence are two specific age groups that present greater importance, since the habits of oral health established at these stages can remain throughout adulthood [3]. Therefore, prevention strategies that focus on these age groups are critical to reduce the load of dental caries and maintain oral health throughout life [4].

Provision of oral health in schools. Schools provide a privileged and motivated setting for the delivery of oral health. They are an item of daily living in childhood that many socio-economically under- privileged homes can obtain. SBOHP drives are preventive, educational and curative interventions undertaken within the school [5].

These interventions commonly consist of oral health education, toothbrushing with supervision, fluoride varnish applications, dietary advice and clinical assessment. By incorporating these approaches within the school setting, SBOHPs strive to reduce dental caries while establishing positive oral hygiene behavior in young children [6].

The public health and behavioral science provide insight into why school-based programs are recommended. However, the data suggests that simply providing health-related information is not enough to change behavior; there needs to be reinforcement and monitoring of health promotion to ensure individuals have ongoing access to preventive care. SBOHP offers a far-reaching field of action that could address an individual's dental concerns at an earlier age, such as early exposure to oral health care [7]. In addition, such initiatives might contribute to decreasing inequality in oral health and in the prevalence of preventable dental diseases among the populations underprivileged without regular access to dental care [8].

There are many international studies that have shown the efficacy of SBOHPs on decreasing the prevalence and severity of dental caries. Fluoride varnish application, dental sealant placement (pit and fissure) programs, as well as regular oral hygiene instruction, have been able to consistently demonstrate positive dental outcomes [9]. Further, involving children, educators, and parents together increases exposure to oral health information as well as supports for healthy actions within a context of social support. Incorporation of oral health within all-encompassing school health programs allows other aspects of nutrition, hygiene, and general well-being to be addressed in a child-centered way [10].

Despite their proved advantages, there are difficulties in the application of SBOHPs. Restricted resources, shortage of trained staff, and logistical challenges could have an impact on the reach and effectiveness of programs, depending upon the extent of community involvement [11]. Thus, the identification of1. factors associated with successful program outcomes and perceived barriers and facilitators is necessary for the development process and maintenance of school-based interventions [12].

The present review intends to disseminate school-based oral health programs, with special emphasis on their methodology and outcomes related to the decrease of dental caries in children. By reviewing the evidence from worldwide studies, it draws attention to best practices, barriers and prospects for improvement of promotion of oral health in schools.

REVIEW

Strategies employed in SBOHPs

SBOHPs encompass a range of strategies designed to address the multifaceted nature of dental caries. Key components include:

Oral health education

Implementing curricula that educate students about proper oral hygiene practices, the importance of nutrition, and the risks associated with tobacco use.

Preventive services

Providing fluoride varnish applications, dental sealants, and regular dental screenings to prevent the onset of dental caries.

Referral and follow-up

Establishing systems for referring students with identified dental needs to appropriate dental care providers and ensuring follow-up to complete necessary treatments.

Parental and community engagement

Involving parents and community members in oral health education and program activities to reinforce healthy behaviors at home and within the community.

Policy integration

Collaborating with local health departments and policymakers to integrate oral health services into school health policies and curricula [13].

Examples of school-based oral health programs

Several SBOHPs have been implemented worldwide, demonstrating the effectiveness of school-based interventions in reducing dental caries:

Smiles across America (USA, 2004)

Initiated by Oral Health America, this program provides preventive dental services, including screenings and sealants, to underserved children in schools across the United States [14].

Seal America (USA, 2004)

A national initiative that supports the establishment of school-based dental sealant programs to reduce dental caries in children [15].

Healthy smiles, healthy children (USA, 1987)

A program by the American Academy of Pediatric Dentistry that offers preventive dental care and education to children in schools [16].

Path of smiles (India, 2025)

Launched in Madurai, this initiative offers free dental check-ups and education on oral hygiene to students in corporation-run schools, aiming to improve oral health among approximately 18,000 students across 49 schools [17].

Manistee area public schools dental services (USA, 2025)

Established through partnerships and funding from various organizations, this program provides dental services to students aged 3-21, including screenings and preventive care [18].

Tooth B.U.D.D.S. (USA, 2023-2024)

A nonprofit organization offering free, school-based preventive dental services to children in rural Arizona counties, utilizing telehealth platforms for follow-up care [19].

Regional initiatives in dental education (USA, 2024)

Developed by the University of Washington School of Dentistry, this program aims to increase the number of dentists prepared to serve in rural communities by providing education and training in dental public health [20].

School oral health learning community (USA, 2016)

A collaborative initiative supported by the Denta Quest Foundation and other partners, focusing on increasing access to oral health services in schools and improving consent rates for dental services [21].

Oral health resources for teachers (USA, 2020)

A program by Health and Human Services, North Dakota, providing teachers with resources and training to promote oral health education in schools [22].

School-based dental sealant programs (USA, 2016)

Certified by the Oregon Health Authority, these programs provide dental sealants to students in elementary and middle schools to prevent dental caries [23].

Mouth heroes for schools (Global)

An initiative by the FDI World Dental Federation that provides teachers with materials and support to teach students about good oral health practices [24].

Smiles ahead (USA, 2021)

A program that offers dental screenings, fluoride treatments, and sealants to students in schools, aiming to reduce dental caries and improve oral health outcomes [25].

Children's oral health initiative (COHI) (2004)

Implemented by the First Nations and Inuit Health Branch, this community-based program provides preventive oral health education and care through home and school visits in many First Nations and Inuit communities [26].

Peer-led oral health education model (2022)

In British Columbia, this program trains sixth graders as peer leaders to deliver preventive oral health education to elementary school-aged children, aiming to improve oral health knowledge and self-care behaviors [27].

School-based dental screening program (2007)

In Freiburg, Germany, all students aged 6–12 receive a uniform annual dental examination and oral health education program, aiming to assess and improve the oral health of school-age children [28].

DISCUSSION

Despite the positive impact of SBOHPs, many of these programs are restricted in their accessibility and longevity due to a range of barriers. There are also resource and funding limitations to developing and maintaining full programs [29]. Schools, especially those in low-income communities, may lack the funding to acquire dental supplies, including fluoride varnish or dental sealants and trained personnel to provide screenings and treatments. Lack of trained staff is also a frequent obstacle, since not enough dental professionals may have the skills to work in schools, especially in rural or underserved regions [30].

Logistical issues involved in working with local dental providers may also detract from the success of SBOHPs, including scheduling children to receive dental services and ensuring they receive timely follow-up appointments. Furthermore, children's parental/guardian permission may prevent access to these programs and some cultural beliefs or lack of knowledge regarding the benefits of healthy oral health could deter parents from enrolling their child in a dental preventive program [31].

Another issue is that there has been limited development of promoting oral health as part of overall school health policies. Without a conducive policy

environment, SBOHPs may not be well supported at the institutional level, and therefore, there is little guarantee of sustainability. For instance, schools are not legally required by policy to ensure that students have routine dental check-ups and care, so some schools do not address oral health in the context of general health [32].

SBOHPs can be enhanced through several approaches to overcome obstacles. While funding limitations may hinder progress, educational programs continue without interruption, including virtual options. Many individuals from rural and distant urban areas are unable to participate in lunchtime screenings. To address this, creativity in offering incentives and utilizing banners is essential. The first step is to maintain income by securing local grants and forming public-private partnerships. Close collaboration with local health departments and dental groups is also crucial. Are you prepared to measure and compare the results? Are your respective screenings the direct result of these partnerships, such as PUSD versus open-source programs, or do they represent added value? These partnerships provide schools with equipment, staff, and education, enabling them to deliver quality oral health care [33].

Second, additional large sample studies related to cost-effectiveness are also required in SBOHPs. Whilst some studies demonstrate the efficacy of these programs in caries prevention, there is a need for more robust cost-effectiveness assessments to determine how the resources could best be allocated and to support sustainability over time. Further research, looking at programmatic factors, including the frequency of fluoride varnish re-application or age to commence utilization of dental sealants, is warranted in the future [34].

Lastly, the promotion of integration of oral health within school health policies is imperative. Structured school-based oral health promotion programs must be included within the overall package of school health services, for which clear and specific objectives should be established; regular monitoring and assessment can also serve as an evaluation model. Both the state and local governments need to encourage integrating oral health into schools using funds for sustained programs. In addition, teacher training is necessary to equip teachers with the knowledge and skills to promote oral health and give students accurate, evidence-based information [35].

FUTURE AIMS AND SCOPE

The future of school-based oral health programs in reducing dental caries is highly promising and can be instrumental in advancing the provision of preventive oral health services at the global level. Since this intervention has demonstrated success, especially in low-income and resource-limited settings, some areas need further development and expansion. First, millions of children across the globe would benefit from SBOHPs if the interventions were systematically integrated into school health policies. This can promote further intervention sustainability and effectiveness by ensuring that this aspect of health remains a domain of focus in school health programs [36].

For example, the high prevalence of schools where preventive interventions such as fluoride varnish applications and screening are inconsistent can be legislatively addressed to provide such services at school regularly. Moreover, thousands of children living in rural and remote regions need such services to prevent caries, and including SBOHPs can guarantee that these vital services reach the most marginalized people or children in society. Therefore, health research can develop innovative models for schools that follow up on work online, such as using telehealth platforms for consultations and distributing educational resources virtually [37].

Second, there is a need to address the limited resources that most state schools have available. Such program funding should seek local government support and private partners' involvement to make them affordable and sustainable. Since most states lack funding, collaboration with local health departments, dentists, and other health professionals can reduce resource constraints and establish essential links for future program implementation. Moreover, schools lack long-term studies that monitor improvements in oral health and ensure sustained behaviors or reduced decay rates. Caries' economic cost to society can also be modeled robustly in future research to inform the economic value of investing in schools [38].

Third, education programs for parents and communities can make schools more successful by ensuring that school's success reaches the homes. Parental involvement can include additional workshops and resources that help them support the practices their children acquire at home and provide a holistic support system for the pupils. The community can also be informed and empowered to create intergenerational improvements in oral health practices beyond the school setting. Finally, schools may consider how digital technologies can improve these programs using apps or AI-based platforms that automate education or change the teaching for easier application or provision [39].

CONCLUSION

School-based oral health programs have demonstrated effectiveness in preventing and controlling dental caries in children. Second, because SBOHPs can generate a culture of preventive care, instruction and continuing support that will lead to lifelong oral health for some children (especially minority and underserved children), the effect they have on these children's oral health may be long-lasting. Although there are hurdles – including issues of resource availability, travelling hours and numbers of staff fluctuating from week to week – the evidence base would suggest that if properly supported, such initiatives can achieve a significant reduction in caries experience as well as disease prevalence loads. Moving forward, additional efforts to enhance the reach, sustainability and integration of SBOHPs are needed to ensure that all children have access to preventive oral health care and are able to achieve optimal oral health at an early age.

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Bhavana Vinod: Conceptualization, literature review, manuscript drafting, and final approval of the manuscript.

Gunjan Paliwal: Conceptualization, study design, literature review, critical revision of the manuscript, and final approval of the manuscript.

ABBREVIATIONS USED IN THE STUDY

a) SBOHPs: School-Based Oral Health Programs
b) SBOHP: School-Based Oral Health Program
c) USA: United States of America
d) FDI: FDI World Dental Federation
e) COHI: Children's Oral Health Initiative
f) PUSD: Pasadena Unified School District

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