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ARQUIVOS EM ODONTOLOGIA

# Oral health promotion in schools: integrative review with experience report

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**Aim:** The aim of the present study was to explore and assess what is known about oral health promotion in primary schools, as well as provide scientific knowledge to guide future interventions for two-year-old children.

**Methods:** The electronic database search was conducted in PubMed, Embase, and Google Scholar as a grey literature. There was no limitation on publication year or language. Two reviewers independently and blinded selected the studies and extracted the data. Also, an experience report conducted in a school located at an inner city of southeast of Brazil was performed as part of curricular component of the undergraduate dentistry course.

**Results:** From the 1,309 potentially eligible articles, 30 were selected for full-text analysis and 11 included in the integrative review. Several oral health interventions were described in the literature such as playful techniques with drawings, puppet theaters and gamifications approach, assisted and instructed toothbrushing, lectures, audiovisual aids, booklets.

**Conclusion:** Evidence suggests that school is a suitable place to implement activities to improve the oral health knowledge. However, additional studies are required to determine the appropriate efficacy of interventions for each age group.

**Uniterms:** oral hygiene; health promotion; schools.

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## INTRODUCTION

Dental caries is a biofilm-mediated, sugar driven and a non-communicable disease, with multifactorial etiology, determined to psychosocial, biological, behavioral and even socioeconomic factors[1]. Bernabe et al., (2023)[2] showed that the peak of untreated caries in deciduous teeth occurred at the age of 5 years old, while in permanent teeth, it was around 20 to 24 years old. Moreover, the World Health Organization (WHO) estimated that about 514 million children worldwide suffer from dental caries and its consequences (WHO, 2022)[3]. Studies have shown a straight and clear association between caries experience and children's quality of life, including challenges related to chewing, sleeping, and socializing, missing days at school, verbal skills development problems[4,5]. Naavaal and Kelekar (2018)[6] has reported that over 50 million school hours are lost because of the poor oral health situations. Hence, meaningful have been taken to focus on the collective health and ensure everyone has access to oral health services by 2030[7].

The concept of oral health promotion remains the idea of implementing better behavioral changes in the society[8]. Likewise, school has proved to be a favorable environment to implement these oral health interventions, because the individuals spend part of their life in a school, which helps to model a citizen, improve, and develop their self-esteem, life skills and effective oral health habits[9,10].

De Silva et al., (2016)[11] has systematically reviewed 38 articles concerning the community-

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based population-level interventions for promoting children's oral health. Many approaches have been used in the attempt to promote oral health in these schools, such as cariogenic and non-cariogenic diet, oral health education alone, oral health education with a supervised toothbrushing program and combined with other interventions, motivational interviewing, professional oral care, and training educators. In the meta-analysis caried out by the same author, there was a significant beneficial effect on oral health education with supervised toothbrushing, which reports not only a huge declining in dental caries, but also induces a positive behavior change.

Thus, the combination of an integrative literature review with an experience report is justified by its comprehensive approach to addressing theoretical and practical evidence about the topic.

Given this, the aim of the present study was to explore and assess what is known about oral health promotion in primary schools, as well as provide scientific knowledge to guide future interventions for two-year-old children. The choice of this age group as the target population was based on the relevance of developmental stage for the establishment of lifelong health habits. Furthermore, early interventions allow for the implementation of preventive strategies aimed at reducing the risk of dental caries and other oral problems.

## MATERIAL AND METHODS

An integrative review was carried out due to its applicability in the health area[12]. This review followed the PRISMA-ScR guidelines, which provide recommendations for systematic review — with extensions for scoping review and meta-analysis — adapted here for the integrative review format. Moreover, an experience report was conducted about oral health promotion in primary schools with two-year-old children.

This integrative literature review involved more than two steps: definition of theme and guiding question, elaboration of the inclusion and exclusion criteria; surveying publications in database; categorizing and analyzing the studies; evaluating the selected studies; presenting the results with critical analysis and synthesis of review. For the conducting this, the guiding question was: What is the evidence in the literature regarding the effectiveness of activities to promote the oral health in schools?

### *ELIGIBILITY CRITERIA*

The following eligibility criteria was chosen for the study inclusion: 1) Intervention studies, with or without a control group, covering students under the age of 14; 2) Educational interventions regarding just the oral health; 3) Evaluating the effects of the educational interventions; 4) Interventions conducted, supervised, or trained by health professionals; 5) In which the school was the only interventional environment.

The following exclusion criteria were: 1) Interventions only for principals, teachers, and parents; 2) Only use of self-administrated survey questionnaires; 3) Promoting not only the oral health, but the general health, 4) Measurement of the progressive caries process; 5) Curative treatment was the main intervention; 6) No activities to promote the oral health.

### *INFORMATION SOURCES AND SEARCH STRATEGY*

A systematic computerized search of electronic databases was carried out in PubMed and Embase. Grey literature was searched on Google Scholar. From the articles found, a manual search was also carried out. The search was conducted by two authors (N.C.R.C and V.F.S.F) from June 2023 until August 2023, and an update was performed in May 2024. Neither publication year nor language restriction were applied. Details of the search strategy and how they were combined can be found in Appendix 1. All the references obtained in the search were imported to Mendeley's reference manager (Mendeley Desktop Software; V-1.18) for duplicate removal. The references were then imported to the web software Rayyan (Qatar Computing Research Institute, Doha, Qatar)[13], a mobile app for systematic reviews, to continue the selection phases.

### *STUDY SELECTION*

Three authors were participated in this process to minimize a potential selection bias. The selection of the studies was performed in two phases. In the first phase, titles and abstract were analyzed by two independent reviewers (N.C.R.C and V.F.S.F) to evaluate them according to the inclusion criteria. A third reviewer (L.R.D.M) was included when disagreements arose due to the differences in interpretation about whether the study should be included or not. In the second phase, the same criteria were applied to the full text to confirm its eligibility. All the reviewers also conducted the analyzes independently in the second phase. Any divergences that emerged among reviewers during each phase of the selection process were addressed through discussion and mutual agreement.

## DATA EXTRACTION

An author (V.F.S.F) managed to collect the data and a second reviewer (N.C.R.C) cross-checked it. The following data were extracted from the included articles: country and year of the study, study design, sample size, age range, gender, oral health intervention and the main conclusions. Two independent reviewers conducted the selection and in case of any bias, discussion and agreement were made.

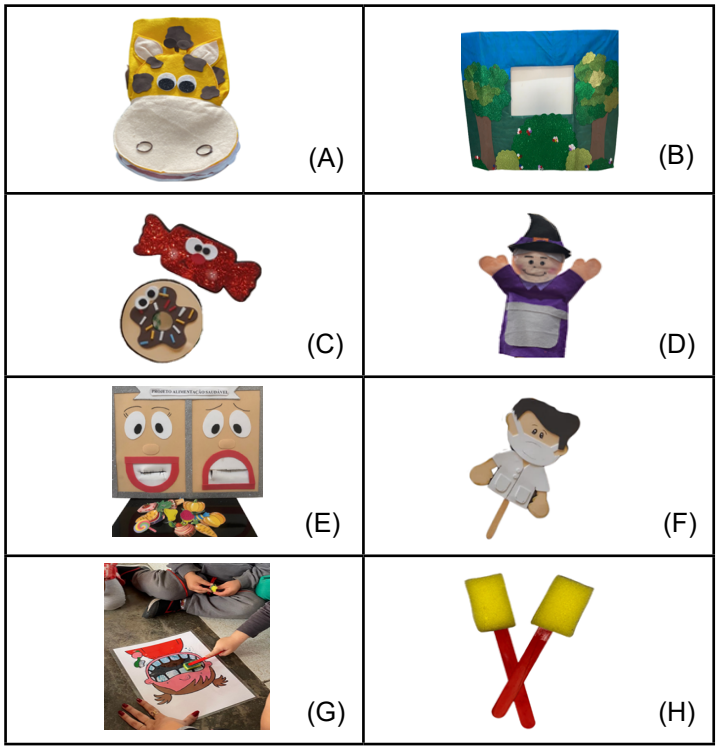
## EXPERIENCE REPORT

Oral health educational activities were conducted in three different classrooms with two-year-old young learners currently studying at a local school located in Sete Lagoas, Minas Gerais, Brazil. A total of 36 students participated in the activities on both days, May 22nd, 2023, and May 29th, 2023. These activities were part of a curricular component of the undergraduate dentistry course at a private university, in the state of Minas Gerais, Brazil.

On the first day, a theatrical play called "Lulu's Adventure with Her Little Teeth" was presented with a playful approach; using a straightforward language for children to understand. The main character, Lulu (Figure 1A), used to live in the woods (Figure 1B). Her diet mainly consists of sweets (Figure 1C) and does not have the habit of brushing her teeth. Furthermore, she was hunted by the antagonist called "Kéka Witch" (Figure 1D), given that she enjoyed engaging with children who did not have a good oral hygiene habit. Hence, the children had understood not only the importance of brushing their teeth, but also the need to pay attention to the excessive consumption of sweets, lest Kéka Witch go after them. Certainly, after the presentation, a practical activity (Figure 1E) was carried out, aiming to apply the knowledge acquired in the theater. It involved teaching children the concept of cariogenic and non-cariogenic food through pictures; they were supposed to place the health food into the box with a happy face, and unhealth food into the box with a sad face.

On the second day of the presentation, the play was reminded before its continuation began. Indeed, after the antagonist stopped chasing Lulu, the dentist represented by a character (Figure 1F) taught her how to brush her teeth correctly, by using the ones brushing technique, demonstrated though images, body movements and sounds of a broom, ball, and train. After the theater presentation, another practical activity (Figure 1G) was performed; the children were instructed to brush painted teeth using toothbrushes (Figure 1H) made from popsicle sticks and sponges. By doing that, they applied the correct toothbrushing technique and improved their motor coordination. Additionally, for the knowledge to wisely spread, a booklet was sent through the children's agenda, containing all the summarized information covered in two days. This way, the parents or guardians would have access to it, and could then implement in into their children's daily routine.

**Figure 1.** Oral health promotion for school children through theatrical approach.

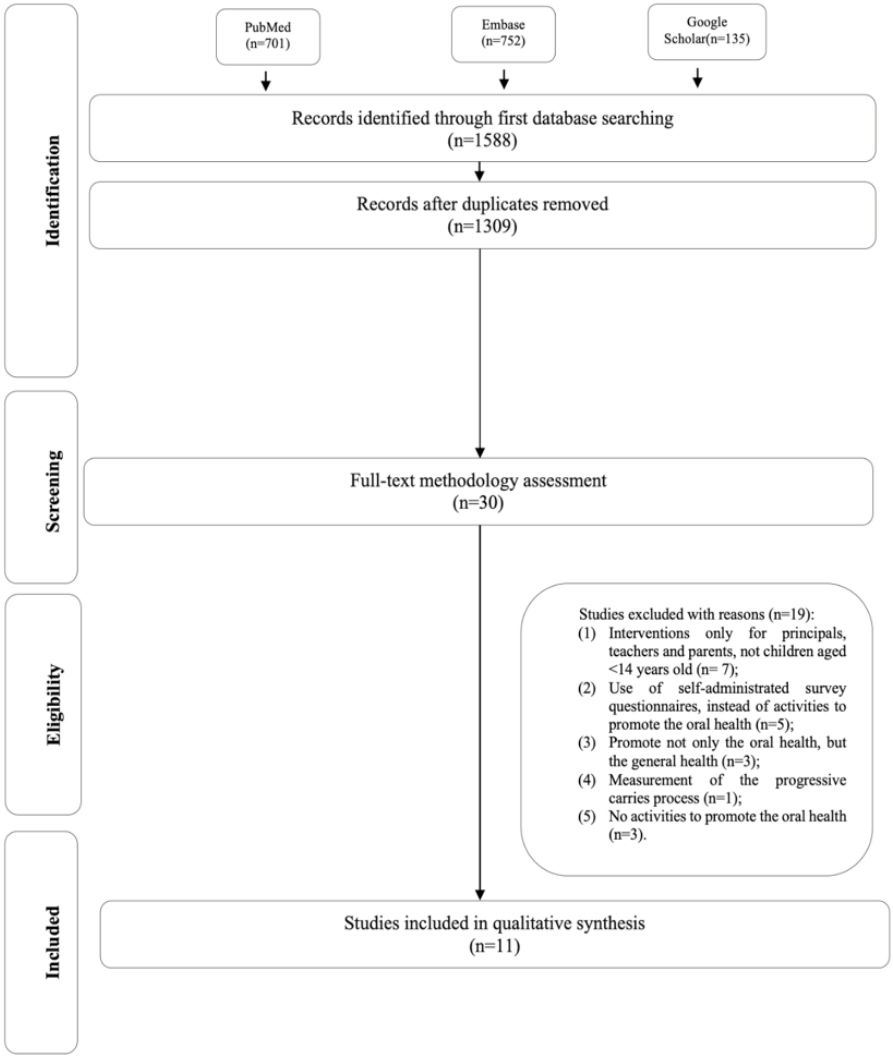



**A.** Main character "Lulu". **B.** Theatrical Scenario. **C.** Sweets. **D.** Antagonist "Kéka Witch". **E.** Cariogenic and non-cariogenic food. **F.** The dentist. **G.** Assisted toothbrushing using the Fones Brushing Technique. **H.** Toothbrushes made from popsicle sticks and sponges

## RESULTS

The first search strategy resulted in 1588 studies (Figure 2). After duplicate removal and considering the inclusion and exclusion criteria, 11 articles were selected. Figure 2 represents the flowchart with the searching strategies.

**Figure 2.** Flowchart depicting article selection process.




**Sources**: Adapted from PRISMA.

With first analyze of the selected studies, main information has been extracted, which is being represented in Table 1. The publication years were: 2013 (n=1), 2014 (n=1), 2015 (n=2), 2016 (n=1), 2019 (n=1), 2021 (n=1), 2022 (n=2), 2023 (n=2). The participating countries in the study were: Italy, United Kingdom, Jordan, Brazil, Iran, India and countries in Asia, Europe, Africa, and America. The articles in the final sample were published in English. From the selected articles, four were systematic reviews[14,15,16,17], two experimental studies[18,19], two randomized control trials[9,20], one cohort study[21], one pilot study[22] and one scoping review[23]. The sample size ranged between 120 and 1300 individuals, aged from 0 to 14 years old.

**Table 1.** Characteristics of the included studies.

(continues)

| Author, Journal | Year, Country | Study design | Sample Size | Age Range or Mean | Oral heath interventions | Main conclusion |
|---|---|---|---|---|---|---|
| Vozza et al. Annali di Stomatologia. | 2014, Italy. | Experimental study. | 1300 children. | 8 to 11 years old. | A multimedia game was created to bring children's attention to basic oral concepts and evaluate their knowledge about it, at the same time. | The school was an ideal environment to promote the oral health. Also, the multimedia game was a useful tool to get student's attention. |

(continues)

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|---|---|---|---|---|---|---|
| **Adair; Burnside; Pine.**<br><br>**Caries Research.** | 2013, United Kingdom. | Systematic review. | - | - | Behavior change techniques was used in the 5 articles analyzed. It included lectures, games, puzzles, painting activities. Additionally, toothbrushing was reinforced through interactive puppet plays. | Research suggests that employing a smaller number of behavior change techniques often yields superior results compared to a broader array of techniques. |
| **Bramantoro et al.**<br><br>**PLoS ONE.** | 2021, Asia, Europe, Africa and America. | Systematic review. | - | - | Several interventions were delivered in the 31 included articles such as: educational games, puppet shows, tooth-brushing instructions, supervised tooth brushing, methods of education delivered by trained teachers or health professionals and application of sodium fluoride phosphate. | Schools play a crucial role in promoting oral health as students spend a significant portion of their lives in these environments. Moreover, utilizing dramas and educational games has proven to yield superior results compared to conventional approaches. |
| **Chandio et al.**<br><br>**BMC Oral Health.** | 2022, Australia. | Systematic review. | - | 0 to 13 years old. | It included six articles to evaluate various perspectives on assisted toothbrushing activities. These perspectives included factors at the children, organizational, staff, and parental levels. | Prior to considering implementation of this program in primary schools, it is essential to analyze both the barriers and enablers. This ensures that the program can yield benefits and be implemented smoothly. |
| **Shirzard et al.**<br><br>**Health Promotion Perspectives.** | 2016, Iran. | Experimental study. | 120 children. | 5 to 6 years old. | The intervention consisted of six sessions, each lasting 45 minutes. Initially, the children engaged in discussions about the positive and negative aspects of oral health through an engaging story. In the second session, they expressed their understanding through drawing and painting various items related to oral health. The third session incorporated puzzles and connecting points to both entertain and educate the children. In the fourth session, they read a poem about oral health. The fifth session involved watching movies and animations that provided insights into maintaining optimal oral hygiene. | Schools are recognized as potentially advantageous environments for fostering the development of oral health knowledge in children. |
| Tomazoni et al.<br><br>JDR Clinical and Translational Research. | 2019, Brazil. | Randomized control trial. | 365 children, with 165 in intervention group and 191 in control group. | 8 to 14 years old. | Trained teachers used handbook containing some activities and instructions of how to deliver the lessons. The program lasted for 7 weeks, with 1 to 2 hours each lesson. Throughout the program, students learned about health improvement, social interaction, goal achievement, self-confidence building, and participated in a healthy school project. | The participants of the study showed fewer impacts of their oral health. Also, the school had a power influence on their development. |

(conclusion)

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|---|---|---|---|---|---|---|
| Aljafari et al. Dentistry Journal. | 2022, Jordan. | Randomized control trial. | 136. | 6 to 8 years old. | The intervention group played an oral health educational game in the school. It had proper animations for their ages, food and drinks commonly found in their environment. The game evaluated the idea of a cariogenic and non-cariogenic diet, correct tooth brushing steps and regular dental visits. | Three months post intervention, there was an observed enhancement in parental knowledge regarding fluoride varnish and fissure sealants, as well as an improvement in children's dietary knowledge. However, there was no change in behavior, highlighting motivation as a crucial factor. |
| Blake et al. Health Promotion Practice. | 2015, United Kingdom. | Cohort study. | 150. | 9 to 12 years old. | Three schools were invited to take part in the study with the goal of promoting positive oral health behaviors. To achieve this, a 60-minute session was conducted, focusing on the relationship between diet and tooth decay, as well as the mechanisms of plaque formation. | In a long term, oral health education provided by dentists or health professionals can contribute to enhancing children's understanding and attitudes toward oral hygiene. |
| Yusuf; Wright; Robertson. British Dental Journal. | 2015, United Kingdom. | Pilot study. | 698. | 3 to 7 years old. | The toothbrushing and fluoride varnish program was introduced in schools with parental consent. Assisted toothbrushing was viewed as a less intrusive method. As a result, some children who had never visited a dentist before gained a positive perception of dental visits. | However, several recommendations were outlined for potential future implementations, including utilizing existing resources and forming partnerships with other health sectors. |
| Elsadek; Baker. Community Dentistry and Oral Epidemiology. | 2023, United Kingdom. | Scoping review. | - | - | Ten articles were included in which they described several methods aiming to improve the oral health, such as: supervised toothbrushing, fluoride and cariogenic diet. | The author suggested the involvement of parents, teachers and children in the intervention. |
| Atif et al. International Journal of Paediatric Dentistry. | 2023, India. | Systematic review. | - | - | Use of leaflets/booklets/ flash cards at school and at home, audiovisual aids, games conventional teaching in the classroom by a dentist, smartphone-based interventions (e-learning). | Conventional teaching in the classroom using Microsoft Office PowerPoint presentation should not be a preferred method for children and adolescents because of it is a less engaging an interactive intervention. |

**Sources**: Own elaboration.

Moreover, aiming to show the importance of a good oral hygiene and its relation to a cariogenic diet, five articles used playful techniques, such as gamifications, drawings, puppet theaters, puzzles and brushing instructions to bring students' attention[14,15,18-20]. Four studies used assisted and instructed brushing[9,16,22,23]. One article promoted the oral health through a 60-minute lecture[21]. One study compared the use of booklets, audiovisual aids, smartphone-based intervention, and conventional teaching by using Microsoft Office PowerPoint presentations[17]. The most prevalent interventions were the playful activities, consequently the school has proved to be a conducive environment, considering that it enhances memory and promotes inclusion into the healthcare.

## DISCUSSION

In the present study, several oral health interventions have been found, and when well conducted, its benefits are easily seen. Within the huge variety of interventions, the most typical ones were playful activities, considering the current target audience requires not only a simple approach, but also meaningful in their reality. Gamification and puppet theaters have proved to be useful in conveying accurate information in a fun and effective way. Supervised brushing was also present in the selected studies, what can be identified as a key intervention in the attempt of improving the health. These interventions are important to boost an efficacious oral health in the population. Furthermore, when implemented during the school time, the chances of a child growing up with correct habits tends to be higher.

In the systematic review performed by Adair; Burnside; Pine (2013)[14], one of the articles analyzed focused on the diet and oral hygiene as the targeted interventions, using diagrams and plastic models to carry out the activity. Besides, they have returned to the school after 30 days, looking for reinforcing and checking students' knowledge. Likewise, the present intervention used dynamic structures, such as the box, where students were supposed to categorize the food items based on whether they were cariogenic or not, and following the same idea, the intervention was divided into two days, so the delivered information would have a logical sequence. The same authors analyzed an intervention by Zanin et al. (2007)[24] that used puppet play to introduce the correct toothbrushing steps. Equally, the current intervention adopted playful tasks involving dances and sounds to achieve an understanding of the Fones Brushing Technique.

Since the emergence of the internet, new technologies have become part of people's day-to-day, and in the healthcare, it is not different. Then, Aljafari et al. (2022)[20] designed an intervention that would be part of this new technological era. The game, played at the school's computer lab, has proved to be as effective as a professional in delivering lessons about healthy food and the importance of decreasing the sugar consumption. In the game, the author covered some recommendations about toothbrushing and visiting the dentist, as well. While the children's dietary knowledge improved, there were no significant changes in their toothbrushing and dietary habits. Moreover, Vozza et al. (2014)[18] tested the effectiveness of a multimedia game developed to bring the digital natives' attention. The children showed great interest, curiosity and enjoyment while playing and answering the questions, what may have led to a better understanding on the basic concepts of oral hygiene. The author also elicited the extreme importance of parent's presence. Although the intervention presented in the present study was not based on a multimedia game, combined techniques were used in order to widespread information about oral health habits to both children and parents. After the oral health activities performed at the school, a booklet was sent to the parents, intending to spread the knowledge and help them become aware of their children's health.

Unlike Blake et al. (2015)[21], the present study did not use lecture as an intervention, since it would not be attractive to two-year-old children, and consequently could not be effective, as well. Moreover, Shirzad et al. (2016)[19] promoted oral health through encouraging an open discussion about positive and negatives aspects of the student's oral hygiene, paintings, solving puzzles, watching movies and demonstrating tooth brushing. Even though those activities were not performed with the schoolchildren in the present study, the whole theatrical play requested the child's help to solve challenges that the protagonist had faced.

Atif et al. (2023)[17] have carried out a systematic review that has analyzed 10 studies on educational interventions. The authors described the game-based approach as an engaging and innovative way of getting students' attention, and consequently improving their oral hygiene and knowledge score. Moreover, the lectures delivered by dentists using slides program such as the Microsoft Office PowerPoint was considered a monotonous method with a very low efficiency, probably due to the insufficient interactivity. For this reason, this was not the chosen method for the current target audience in the experience report. Atif et al. (2023)[17] also evaluated the use of audiovisual or video tapes to complement other interventions. Because of it, songs, images, and dances were used in the present experience report to enhance understanding of the correct brushing technique.

Some limitations of the present study should be acknowledged. First, there is a lack of scientific evidence concerning which should be the best oral health promotion intervention to be performed to schoolchildren. There are insufficient number of randomized controlled clinical trials and longitudinal studies addressing the target audience (two-year-old children) and oral health activities that could not only bring the children's attention, but also have the long-term effects in their lives. For this reason, further studies with representative samples and robust methods are needed.

The present study showed the importance of introducing the concepts of tooth brushing, cariogenic and non-cariogenic diet in the early ages, as well as playful activities to enhance content memorization. Furthermore, through the integrative review and the experience report it was evident that the school is a suitable place to conduct these activities aiming to achieve an oral health improvement.

## CONCLUSION

The evidence suggests that schools are a suitable environment to promote the oral health. Interactive activities may be particularly effective with children and teenagers, but further studies with a robust methodological quality should be necessary to test the efficacy.

## DESCRIPTION OF THE AUTHORS CONTRIBUTION

Valder Ferreira da Silva Filho: Conceptualization, Methodology, Writing – Original Draft Preparation, Visualization. Letícia Rocha Dias da Motta: Conceptualization, Methodology, Writing – Original Draft Preparation, Visualization. Clarice Luiza de Paula Ribeiro: Writing – Original Draft Preparation. Ellen Cristine Siqueira Toledo: Writing – Original Draft Preparation. Stéphanie da Silva Fraga Fernandes: Writing – Original Draft Preparation. Brenda Ribeiro Prado Soares: Writing – Original Draft Preparation. Leonardo Nogueira Rodrigues: Conceptualization, Methodology, Writing – Review & Editing, Visualization and Supervision. Natália Cristina Ruy Carneiro: Conceptualization, Methodology, Writing– Review & Editing, and Supervision.

## DECLARATION OF INTEREST CONFLICT

“No conflicts of interest to declare”.

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# Promoção de saúde bucal nas escolas: revisão integrativa com relato de experiência

**Objetivos:** O objetivo do presente estudo foi de explorar e avaliar o que se sabe sobre promoção de saúde bucal no ensino básico, bem como providenciar conhecimento científico para guiar futuras intervenções para crianças de dois anos de idade.

**Métodos:** Foi conduzida uma pesquisa nas bases de dados PubMed, Embase, e Google Acadêmico como literatura cinzenta. Não houve limitação quanto a ano ou língua de publicação. Dois revisores independentes e cegos selecionaram os estudos e extraíram as informações. Além disso, um relato de experiência foi conduzido em uma escola localizada no interior do sudeste brasileiro como atividade parte do componente curricular do curso de graduação em Odontologia.

**Resultados:** Dos 1309 artigos potencialmente elegíveis, 30 foram selecionados para análise do texto completo e, então, 11 incluídos. Várias intervenções em saúde bucal foram descritas na literatura, como atividades lúdicas, desenhos, teatros de fantoches, abordagens gamificadas, escovação assistida e instruída, palestras, recursos audiovisuais e cartilhas.

**Conclusão:** As evidências sugerem que a escola é um ambiente apropriado para implementar essas atividades e assim melhorar o conhecimento sobre saúde bucal. No entanto, mais estudos são necessários para determinar a eficácia das intervenções para cada faixa etária.

**Descritores:** higiene bucal; promoção da saúde; instituições acadêmicas.

## APPENDIX 1

| Database | Search (May 2nd, 2024) | |
|---|---|---|
| **PubMed** | ((((((((("oral hygiene") OR "dental hygiene") OR "toothbrushing") OR "dental caries") OR "carious lesion") OR "'dental decay") AND "dental health promotion") OR "health promotion") OR "health promotion") OR "preventive health services") AND "primary schools" | **701**<br>**No duplicate** |
| **EMBASE** | (('oral hygiene'/exp OR 'oral hygiene' OR 'dental hygiene'/exp OR 'dental hygiene' OR 'toothbrushing'/exp OR 'toothbrushing' OR 'dental caries'/exp OR 'dental caries' OR 'carious lesion' OR 'dental decay'/exp OR 'dental decay') AND 'dental health promotion' OR 'health promotion'/exp OR 'health promotion' OR 'preventive health services'/exp OR 'preventive health services') AND ('primary schools'/exp OR 'primary schools') | **752**<br>**After first duplicate: 745** |
| **Google Scholar** | "oral hygiene" OR "dental hygiene" OR "toothbrushing" OR "dental caries" OR "carious lesion" OR "dental decay" AND "dental health promotion" OR "health promotion" OR "preventive health services" AND "primary schools" | Last 135 published between 2013-2024<br>**After first duplicate: 70** |

**Sources**: Own elaboration.