

The importance of promoting oral health in schools: a pilot study

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Abstract

Promotion of oral health has an essential role in the maintenance of teeth in adults. However, health education must start from an early age, in order to monitor the child's growth and prevent pathologies. Schools are in charge of the overall education of children and of guidance to parents but could also be engaged in the promotion of oral health, supported and counseled by pediatricians and dentists. The purpose of this pilot study is to evaluate whether school age children could be taught, successfully, basic oral sciences and dental hygiene, by a professional, during school hours. In this pilot study, an anonymized test was administered to 45 children of age between 8 and 10, both before and after an interactive lecture on oral health, to assess the effectiveness of the lesson and acquisition by the children of knowledge on oral health. After the presentation, the majority of the children were able to answer correctly to the questionnaire that was given to them (test, retest) which was related to dental anatomy and pathology (number of teeth, cavities, halitosis), and dental hygiene tools and practices (brushes, floss, mouth wash, tongue scrapers). The children seemed to be receptive to learning while in school, and a specific educational session of dental hygiene and oral health seems to be the right approach to ensure children can identify dental hygiene tools and use them appropriately.

Key Words: Caries; epidemiology; pediatric dentistry; prevention; questionnaire; primary school; malocclusion; tooth.

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Oral health is closely related to general health and the well-being of our body and it's not just tooth health. Being able to improve oral health could have great benefits for the organism,¹⁻⁵ in the prevention of pathologies and in the improvement of quality life for individuals.^{6,7} Therefore, oral health promotion is fundamental, starting from childhood because poor oral health impacts both the children's lives and their families's as well.^{8,9} The World Health Organization (WHO) had promulgated several goals for oral health to be achieved by 2020. However, among these goals there is a forecast that is too optimistic and does not coincide with the current reality: that 95% of 5-6 year old subjects may be exempt from caries, when this goal, in reality,

differs from recent surveys.⁸ Suffice to say that tooth decay (dental caries) is the most prevalent and chronic disease affecting infants and children. Therefore, prevention programs have the objective to provide training and information for parents and caregivers, which makes it possible to identify and intercept all potentially harmful factors to the child's development at an early stage. In fact, early childhood cavities is one of the most severe forms of dental disorder affecting children younger than 3 years. Though dental caries is preventable, the burden of disease is very high. This is because of lack of preventive oral health education. Scientific literature reveals that poor knowledge and attitudes among the caregivers are the major reasons for poor oral health status among children.¹⁰ Tooth decay is

also the most common reason for 5–9-year-old British children admission to the hospital (Health and Social Care Information Centre (HSCIC), 2015).¹¹ Early Childhood Caries (ECC) prevalence in Italy, in 2019, was 8.2% overall, 2.9% in 0–23-month-old children, 6.2% in 24–47-month-old children and 14.7% in 48–71-month-old children (p for trend < 0.001).⁴ The carious process starts when *S. mutans*, the principal bacterial component implicated in the initiation of dental caries, colonizes the oral cavity of infants/children following the eruption of primary teeth. Colonization of *S. mutans* in infants takes place through their mothers around 2 years of age; especially during the first 26 months, which is the window of infectivity. In a study reported by Alaluusua and Renkonen, children who harbored *S. mutans* at age 2 had a significantly higher decayed, missing or filled teeth surface (DMFS) score than those children who acquired this bacterium at age 4 (DMFS 10.6 vs 3.4).¹² A child's degree of colonization of cariogenic bacteria is dictated by the mother's *S. mutans* level at the time of transmission, suggesting that mother/caregiver's oral health status has a direct influence on child's oral health. Together with parents, who are primarily responsible for growth and education of a child,¹³ primary guidance and medical assistance is given by the pediatrician.¹⁴ This important figure of reference for childhood accompanies the entire growth of the child, by preventing, diagnosing, and treating childhood diseases, to ensure adequate psychophysical development of the little patient.¹ Pediatric dentists can be the ones to support parents and dentists identify and fill in the gaps in the mother/parents's knowledge about health and oral hygiene. And yet, despite the significant progress in terms of oral hygiene, known since last century, caries remains one of the most prevalent diseases in the world.¹⁵ Recent Italian research demonstrates a strong association between the prevalence of ECC and bad habits assumed by parents.^{4,16} Moreover, a 2014 study showed how the level of education of parents and their socio-economic conditions greatly affect the education that children receive on oral health, and their consequent state of health; in fact, children of parents with a higher educational background tend to implement better oral hygiene). Educating children in schools now will make more informed parents in the future and this was the underlining philosophy behind this pilot study. Because studies indicate over and over again that the parents cannot convey to their children what they themselves do not know, it makes sense for the school system to step in a fill the knowledge gap. The collaboration between specialists, such as pediatric dentists, and the school seems to benefit all parties: schools offer much needed information to children already primed to learn, clinicians get the opportunity to disseminate important preventative instructions, children learn in a fun atmosphere, and parents are left with only the task of supervising the children's oral and dental care. It is important to have highly interactive sessions, in which

the instructors show children various methods, techniques and tools for oral hygiene aimed at keeping at bay pathogenic oral bacteria. Oral health education programs have been conducted in schools in many countries because these interventions are effective in increasing oral health knowledge, attitudes, and dental hygiene among children. Early childhood is an important period, an indicator of the oral health of the growing patient: in fact, children between 6 to 7 years of age can acquire efficient oral hygiene habits,¹⁷ and that's the age in which almost all children worldwide are already in school. According to the results of De Sousa Né YG et al.,¹⁸ a plan for supervising school brushing could be effective in preventing tooth decay. In fact, schoolchildren demonstrated a significant improvement in tooth brushing skills when practical demonstration has been provided followed by supervision during oral hygiene maneuvers. Once the school-age children learn proper oral hygiene, a support for families is needed to direct them towards early interventions,¹⁸⁻²² so that parents will be able to prevent their children's oral health problems, thus also reducing the economic burden of care.⁹

The aim of this pilot study was to assess the feasibility of an interactive session in schools to promote oral health by testing the children's awareness of oral care tools and techniques, and general knowledge about the teeth and the mouth.

Materials and Methods

The study was conducted at the S. Antonio Primary and Infant School in Rome. All procedures were in accordance with the Helsinki Declaration and informed consent was obtained from parents of all students to be included in the study. The chosen sample consisted of a total of 45 children aged between 8 and 10 years, all Italian speaking. The written test was previously shown to a sample of 5 children, not from the school, for field testing, to ensure that the questions were understandable. The questionnaire of 12 questions (in Italian) was then submitted to the children to be answered in 5 minutes.

The questions are listed below:

- Age
- Gender
- Do you know how many basic tastes are there?
- Do you know many deciduous teeth are there?
- Do you know how many permanent teeth are there?
- What does it mean diphodont?
- Do you know what teeth look like?
- How many main parts are in a tooth?
- Do you know what tooth decay is?
- Do you know what foods give you halitosis?
- Do you know what are the tools for teeth cleaning?
- How many teeth cleaning tools do you know?

After carrying out the questionnaire, a lesson was held regarding the topics that were mentioned in the previous questionnaire. The title of the lesson was "Let's get to know our mouths". The explanation was accompanied by

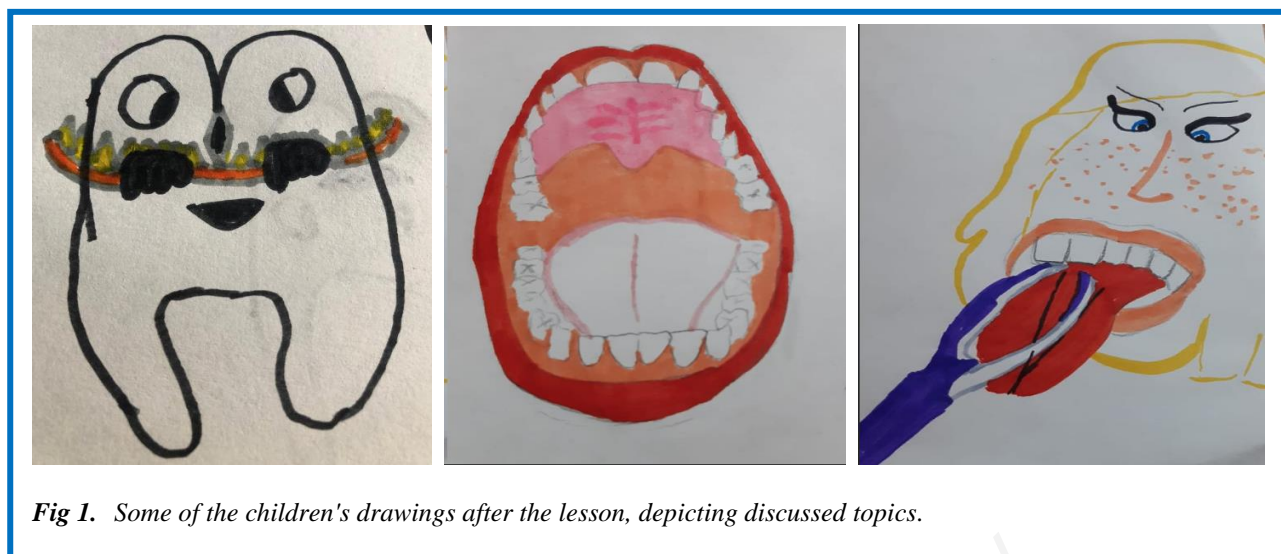


Fig 1. Some of the children's drawings after the lesson, depicting discussed topics.

the support of a powerpoint presentation composed of 50 slides structured with many images to facilitate the understanding of the topic. Questions were encouraged to increase interactivity and promote learning. Following the lesson, the questionnaire was re-submitted to assess the effectiveness of the children's learning. The children were reassured that they would not receive a score on the tests and the results would be anonymous. The anonymized questionnaires were then uploaded on to Google form. At the end of the lesson, the children were also asked to draw what they had learned from the lesson and the drawings demonstrated correct learning by them (Figure 1).

Statistical analysis: Age was expressed as mean+SD, dichotomic answers were expressed as absolute (percentage), while for multiple choice were considered the proportion of correct answers; these variables were confronted using Fisher exact test for dichotomic variables. The number of known hygiene tools were confronted using Kolgomorov-Smirnov test for paired samples. Significance was set at $p < 0.05$. All the statistical procedures were performed with the Statistical Package for the Social Sciences (SPSS 25.0, SPSS Inc., Chicago, USA”.

Results

Our sample was composed of children of mean age 9.64 ± 1.73 , 17 girls (37.8%) and 28 boys (62.2%) with a M:F ratio of 1.64. Comparing pre-test and post-test regarding the knowledge of basic tastes (sweet, salty, bitter, acidic and umami or fat) there was an improvement, from 30/45 (66.6%) correct answers versus 45/45 (100%), $p < 0.01$ (Table 1). The correct answers regarding the number of deciduous teeth went from 2/45 (4.4%) to 44/45 (95.6%) $p < 0.01$. Regarding the number of permanent teeth, the pre-test answers varied wildly from 12 to 32, with only 5/45 (11.1%) children giving the correct answer at the pre-test versus 44/45 (97.8%) $p < 0.01$ at post-test. At the beginning, 20/45 (44.4%) children were confident about knowing the teeth

structure (how the teeth look like), while all of them answered positively at the post-test ($p < 0.05$); 41/45 knew what teeth decay is, while all of them answered positively at post-test (results non-significant). The question “Do you know what diphodont means?” was devised to verify if the children were answering truthfully. In fact, being diphodont a difficult term, children were not expected to know its meaning, and therefore tick the “NO” box as an answer to the question. Only 2 (4.4%) children reported being familiar with the concept of diphodont at pre-test compared with 37/45 (82.2%) at post-test ($p < 0.05$). Regarding the identification of teeth structures (crown, roots, enamel, dentin, and pulp) at pre-test, 5/45 (11.1%) children identified two parts, 20/45 (44.4%) three, 3/45 (6.7%) four, and 17 (37.8%) did not respond, while at post-test 37/45 (82.2%) answered two, 4/45 (8.9%) three and 4/45 (8.9%) four. In terms of what foods caused halitosis, 33/45 (73.3%) children already were able to name some foods (such as onion, garlic, or fish) versus 44/45 (95.6%) at post-test (non-significant). The term halitosis was chosen in the test over the expression bad breath because the children are familiar with it due to TV advertisements using the word halitosis. A large number of children, 41/45 (91.1%), knew which teeth cleaning tools are used (such as toothbrush, toothpaste, floss or toothpick), while all of them were aware of them at the post-test (non-significant). In terms of how many teeth cleaning tools did they know, at the pre-test 9/45 (20.0%) knew one tool, 17/45 (37.8%) answered two, 15/45 (33.3%) answered three, while 4/45 (8.9%) did not respond. At the post-test, 2/45 children answered two and the other 43/45 (95.5%) answered three ($p < 0.05$).

Discussion

Oral health education is an important step in the education of the child. Initially it was thought that only biological and dietary determinants were responsible for oral health in children, but in 2007 a new, more complex framework of interaction between different factors was

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Table 1. Correct and positive answers were expressed as frequency (percentage) while the two questions with no correct answers are plotted with proportion and percentage for all answers.

	Initial test (pre-test)	Final test (post-test)	Significance
Do you know how many basic tastes are there?	30/45 (66.6%)	45/45 (100%)	p<0.01
Do you know how many deciduous teeth are there?	2/46 (4.4%)	44/45 (95.6%)	p<0.01
Do you know how many permanent teeth are there?	5/45 (11.1%)	44/45 (97.8%)	p<0.01
What does it mean diphodont?	2 (4.4%)	37/45 (82.2%)	p<0.01
Do you know what your teeth look like?	20/45 (44.4%)	45/45 (100%)	p<0.05
How many main parts are in a tooth?	Two: 20/45 (44.4%) Three: 20/45 (44.4%) Four: 3/45 (6.7%) No answer: 17 (37.8%)	Two: 37/45 (82.2%) Three: 4/45 (8.9%) Four: 4/45 (8.9%) No answer: 0	
Do you know what tooth decay is?	41/45 (91.1%)	45/45 (100%)	N.S
Do you know what foods give you halitosis?	33/45 (73.3%)	44/45 (95.6%)	p<0.05
Do you know what are the tools for cleaning teeth?	41/45 (91.1%)	45/45 (100%)	N.S
How many teeth cleaning tools do you know?	One: 9/45 (20.0%) Two: 17/45 (37.8%) Three: 15/45 (33.3%) No answer: 4/45 (8.9%)	Two: 2/45 (4.4%) Three: 43/45 (95.5%)	P<0.05

N.S. stands for not significant.

proposed to include the determinants related to the social and physical environment, and last but not least, to the behaviors that influence health. Precisely for this reason, parents have a very important role, but pediatricians and pediatric dentists should not be underestimated. Schools have the task of supporting these figures in the child's growth path, promoting projects aimed at deepening and improving children's knowledge of oral health. It is also necessary to periodically strengthen educational programs as it is very important to maintain the motivation of children and that of their parents.²³ The study shows that 40.9% of parents were unaware of the hygiene situation of their child's mouth. In addition to oral hygiene, the degree of awareness was related to the level of employment and education of the parents, as well as the socio-economic condition of the family unit. However, opinions are not always in agreement: a study on Colorado caregivers, who looked after children up to 6 years of age, shows how, despite a certain degree of understanding of odontostomatological problems by the

adult, children did not always adopt positive behaviors towards one's oral hygiene. Therefore, leaving the task of oral education only to parents might not be fair or feasible.²⁴ It also emerged that children and / or caregivers were not aware of the qualitative characteristics of the toothbrush, of the most suitable manual techniques for the age of the little patient, of the use of plaque-detecting tablets, at the time necessary to brush the teeth and finally to the use or abuse of fluoride toothpaste.²⁵ In the last decade, means of transmission of knowledge and information have multiplied exponentially, with the advent of social media such as Facebook, Twitter, Instagram or TikTok, which are easy and quick to use as the information can be transmitted via videos within a few seconds. However, often these media give the opportunity to share information which may be fact-checked, verified and correct, or not, which could be a problem for those patients who do not consider the dentist as an authoritative source of information for their oral health and that of the child. Getting information

prevalently from “Dr. Google” is not affecting only the medical profession but the dental professions as well. Unfortunately, there is still a lot of confusion and disagreement on dental and oral hygiene practices even among practitioners.¹⁹ This type of disagreement on prevention rules, especially in the first 3 years of life leads to further confusion among parents.¹⁴ Precisely, for this reason it is important to emphasize once again the importance of the disclosure of the Italian Ministerial Guidelines aimed at oral hygiene in developmental age (2017).²⁷ This large gap between recommendations from different professionals, once again underlines the importance of transmitting clear and comprehensive information and leaves the door open to a more standardized set of instructions provided directly by the schools. In 2020 Menegaz demonstrated how after practicing targeted educational programs in a Brazilian school, positive effects were found on behaviors related to the oral health of children and the knowledge of caregivers, improving the use of fluoride toothpaste in the right amount based on the 'age'.¹¹ In a 2021 study, Andrew L., et al., reports how the lack of oral hygiene care in children not only reflects a lack of knowledge of the professional guidelines, but it is also the result of personal barriers or external constraints such as the emotional reactions of children that cannot be controlled (aversion of having a toothbrush or tooth paste in the mouth), or the manual skills required for proper oral hygiene are not exercised and reinforced.²⁸ Other external constraints can be a hectic lifestyle, with strict deadlines and schedules that take away needed time for personal care. Oral health education is an important step in the child's education. Parents are the first figures responsible for this task, along with the pediatrician and the dentist, as they are the enforcers of the rules and the supervisors of the implementation of oral and dental hygiene daily. The schools have the task of supporting parents and professionals, in promoting projects aimed at improving the knowledge of children about oral health, by including it into their curriculum. The present pilot study led to some interesting results, as it made it possible to evaluate the effectiveness of communicating principles of oral and dental health to primary school children. In fact, the lesson including the explanation and the visual support of the slides showed an immediate improvement in the children's knowledge compared to the pre-test, at least for the short-term results. We did not investigate the information retention in a longer interval of time between education and post-test. However, the understanding of the concepts taught in session was confirmed by the drawings that the children made after the lesson, a method previously used in other studies.⁵ A limitation of this pilot study, which can be addressed in a later version, was asking the children how many dental hygiene tools they knew about, without giving them the chance to identify them immediately, and the lack of images on the pre-test, which make understanding much easier. Building on the method applied in this work, further

studies should investigate: the long-term retention of dental hygiene concepts by children of same age range; expand the study to include a greater age range; assess whether learning could be equally effective in very young children, for example from the age of 6 instead of 8; the feasibility of oral health training in the whole school system. and the gap of knowledge between parents and children. In conclusion, considering the results obtained, this pilot study underlines the usefulness of oral health education programs in young children. Children were able to listen and interact during a one-hour lesson and demonstrate that they learned the principles of basic oral and dental hygiene, documented by pre- and post-test in the form of a questionnaire. The school is the right place for education, not just for science in general but most importantly for personal health. For this reason, it is appropriate and necessary to educate children at school on how to prevent dental and oral issues, which will bring benefits not only for the well-being of children but also reduce or eliminate any future economic costs to the parents.

List of acronyms

DMFS - decayed, missing or filled teeth surface

ECC - Early Childhood Caries

HSCIC - Health and Social Care Information Centre

SD – standard deviation

WHO - World Health Organization

Contributions of Authors

All authors gave substantial contributions to the conception, design and acquisition of the data, analysis, and interpretation of data. Authors participated in drafting the article and in revising it critically for important intellectual content. All authors have read and approved the final edited typescript.

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Conflict of Interest

The authors declare that they have no competing interests. The authors have stated clearly that there are no competitive financial interests in connection with this article.

Ethical Publication Statement

We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

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References

- Boyd KL, Saccomanno S, Coceani Paskay Hv L, Quinzi V, Marzo G. Maldevelopment of the craniofacial-respiratory complex: A Darwinian perspective. *Eur J Paediatr Dent.* 2021 Sep;22(3):225-229. doi: 10.23804/ejpd.2021.22.03.9. PMID: 34544252.
- Fraihat N, Madae'en S, Bencze Z, Herczeg A, Varga O. Clinical Effectiveness and Cost-Effectiveness of Oral-Health Promotion in Dental Caries Prevention among Children: Systematic Review and Meta-Analysis. *Int J Environ Res Public Health.* 2019 Jul 25;16(15):2668. doi: 10.3390/ijerph16152668. PMID: 31349691; PMCID: PMC6696287.
- Lombardo G, Vena F, Negri P, Pagano S, Barilotti C, Paglia L, Colombo S, Orso M, Cianetti S. Worldwide prevalence of malocclusion in the different stages of dentition: A systematic review and meta-analysis. *Eur J Paediatr Dent.* 2020 Jun;21(2):115-122. doi: 10.23804/ejpd.2020.21.02.05. PMID: 32567942.
- Colombo S, Gallus S, Beretta M, Lugo A, Scaglioni S, Colombo P, Paglia M, Gatto R, Marzo G, Caruso S, Paglia L. Prevalence and determinants of early childhood caries in Italy. *Eur J Paediatr Dent.* 2019 Dec;20(4):267-273. doi: 10.23804/ejpd.2019.20.04.02. PMID: 31850767.
- Lucas EAJCF, Adorno RCF, Santos AEVD, Tyrrell MAR, Halfoun VLRC. Os significados das práticas de promoção da saúde na infância: estudo do cotidiano escolar pelo desenho [The significance of health promotion practices in childhood: a study of daily school life through drawing]. *Cien Saude Colet.* 2021 Sep;26(9):4193-4204. Portuguese. doi: 10.1590/1413-81232021269.21882020. Epub 2020 Jul 14. PMID: 34586271.
- Gelb M, Montrose J, Paglia L, Saccomanno S, Quinzi V, Marzo G. Myofunctional therapy Part 2: Prevention of dentofacial disorders. *Eur J Paediatr Dent.* 2021 Jun;22(2):163-167. doi: 10.23804/ejpd.2021.22.02.15. PMID: 34238010.
- Sacomanno S, Di Tullio A, D'Alatri L, Grippaudo C. Proposal for a myofunctional therapy protocol in case of altered lingual frenulum. A pilot study. *Eur J Paediatr Dent.* 2019 Mar;20(1):67-72. doi: 10.23804/ejpd.2019.20.01.13. PMID: 30919648.
- Botzer E, Quinzi V, Salvati SE, Coceani Paskay L, Saccomanno S. Myofunctional therapy Part 3: Tongue function and breastfeeding as precursor of oronasal functions. *Eur J Paediatr Dent.* 2021 Sep;22(3):248-250. doi: 10.23804/ejpd.2021.22.03.13. PMID: 34544256.
- Boyd K, Saccomanno S, Lewis CJ, Coceani Paskay L, Quinzi V, Marzo G. Myofunctional therapy. Part 1: Culture, industrialisation and the shrinking human face. *Eur J Paediatr Dent.* 2021;22(1):80-81. doi: 10.23804/ejpd.2021.22.01.15. PMID: 33719489.
- Featherstone JD, Adair SM, Anderson MH, Berkowitz RJ, Bird WF, Crall JJ, Den Besten PK, Donly KJ, Glassman P, Milgrom P, Roth JR, Snow R, Stewart RE. Caries management by risk assessment: consensus statement, April 2002. *J Calif Dent Assoc.* 2003 Mar;31(3):257-69. PMID: 12693825.
- Menegaz AM, Quevedo LÁ, Muniz LC, Finlayson TL, Ayala GX, Cascaes AM. Changes in young children's oral health-related behaviours and caregiver knowledge: A cluster randomized controlled trial in Brazil. *Community Dent Oral Epidemiol.* 2020 Feb;48(1):81-87. doi: 10.1111/cdoe.12507. Epub 2019 Dec 15. PMID: 31838759.
- Alaluusua S, Renkonen OV. Streptococcus mutans establishment and dental caries experience in children from 2 to 4 years old. *Scand J Dent Res.* 1983 Dec;91(6):453-7. doi: 10.1111/j.1600-0722.1983.tb00845.x. PMID: 6581521.
- Naidu RS, Nunn JH. Oral Health Knowledge, Attitudes and Behaviour of Parents and Caregivers of Preschool Children: Implications for Oral Health Promotion. *Oral Health Prev Dent.* 2020 Apr 1;18(1):245-252. doi: 10.3290/j.ohpd.a43357. PMID: 32618448.
- Wagner Y, Heinrich-Weltzien R. Risk factors for dental problems: Recommendations for oral health in infancy. *Early Hum Dev.* 2017 Nov;114:16-21. doi: 10.1016/j.earlhumdev.2017.09.009. Epub 2017 Sep 9. PMID: 28899616.

15. Frencken JE, Sharma P, Stenhouse L, Green D, Laverty D, Dietrich T. Global epidemiology of dental caries and severe periodontitis - a comprehensive review. *J Clin Periodontol.* 2017 Mar;44 Suppl 18:S94-S105. doi: 10.1111/jcpe.12677. PMID: 28266116.
16. Casamassimo PS, Lee JY, Marazita ML, Milgrom P, Chi DL, Divaris K. Improving children's oral health: an interdisciplinary research framework. *J Dent Res.* 2014 Oct;93(10):938-42. doi: 10.1177/0022034514547273. Epub 2014 Aug 13. PMID: 25122218; PMCID: PMC4212323.
17. Kamińska A, Szalewski L, Batkowska J, Wallner J, Wallner E, Szabelska A, Borowicz J. The dependence of dental caries on oral hygiene habits in preschool children from urban and rural areas in Poland. *Ann Agric Environ Med.* 2016 Dec 23;23(4):660-665. doi: 10.5604/12321966.1226863. PMID: 28030940.
18. De Sousa Né YG, Frazão DR, Bittencourt LO, Fagundes NCF, Marañón-Vásquez G, Crespo-Lopez ME, Maia LC, Lima RR. Are Dental Caries Associated with Oxidative Stress in Saliva in Children and Adolescents? A Systematic Review. *Metabolites.* 2022 Sep 13;12(9):858. doi: 10.3390/metabo12090858. PMID: 36144263; PMCID: PMC9502212
19. Ghaffari M, Rakhshanderou S, Ramezankhani A, Noroozi M, Armoon B. Oral Health Education and Promotion Programmes: Meta-Analysis of 17-Year Intervention. *Int J Dent Hyg.* 2018 Feb;16(1):59-67. doi: 10.1111/idh.12304. Epub 2017 Aug 24. PMID: 28836347.
20. de Silva AM, Hegde S, Akudo Nwagbara B, Calache H, Gussy MG, Nasser M, Morrice HR, Riggs E, Leong PM, Meyenn LK, Yousefi-Nooraie R. Community-based population-level interventions for promoting child oral health. *Cochrane Database Syst Rev.* 2016 Sep 15;9(9):CD009837. doi: 10.1002/14651858.CD009837.pub2. Update in: *Cochrane Database Syst Rev.* 2016 Dec 22;12 :CD009837. PMID: 27629283; PMCID: PMC6457580.
21. Saccomanno S, Martini C, D'Alatri L, Farina S, Grippaudo C. A specific protocol of myo-functional therapy in children with Down syndrome. A pilot study. *Eur J Paediatr Dent.* 2018 Sep;19(3):243-246. doi: 10.23804/ejpd.2018.19.03.14. PMID: 30063159.
22. Saccomanno S, Deli R, DI Cintio G, DE Corso E, Paludetti G, Grippaudo C. Retrospective epidemiological study of mandibular rotational types in patients with orthodontical malocclusion. *Acta Otorhinolaryngol Ital.* 2018 Apr;38(2):160-165. doi: 10.14639/0392-100X-1682. PMID: 29967561; PMCID: PMC6028816.
23. Levrini L, Salone GS, Ramirez-Yanez GO. Pre-Fabricated Myofunctional Appliance for the Treatment of Mild to Moderate Pediatric Obstructive Sleep Apnea: A Preliminary Report. *J Clin Pediatr Dent.* 2018;42(3):236-239. doi: 10.17796/1053-4628-42.3.13. Epub 2018 Apr 26. PMID: 29698145.
24. Calderón Larrañaga S, Expósito Ruiz M, Cruz Vela P, Cuadrado Conde A, Alquézar Villarroya L, Garach Gómez A, Ruiz Hernández A, Toral López I. Assistenza primaria e promozione della salute orale: valutazione di un intervento educativo nei bambini in età scolare. *Aten Primaria.* 2019 Agosto-Settembre;51(7):416-423. Spagnolo. DOI: 10.1016/j.aprim.2018.05.003. EPUB 2018 Ottobre 11. PMID: 30316564; PMCID: PMC6839536.
25. Wilson AR, Brega AG, Campagna EJ, Braun PA, Henderson WG, Bryant LL, Batliner TS, Quissell DO, Albino J. Validation and Impact of Caregivers' Oral Health Knowledge and Behavior on Children's Oral Health Status. *Pediatr Dent.* 2016 Jan-Feb;38(1):47-54. PMID: 26892215; PMCID: PMC4762180.
26. Naidu RS, Nunn JH. Oral Health Knowledge, Attitudes and Behaviour of Parents and Caregivers of Preschool Children: Implications for Oral Health Promotion. *Oral Health Prev Dent.* 2020 Apr 1;18(1):245-252. doi: 10.3290/j.ohpd.a43357. PMID: 32618448.
27. Giannattasio A, Poggi E, Migliorati M, Mondani PM, Piccardo I, Carta P, Tomarchio N, Alberti G. The efficacy of Italian guidelines in promoting oral health in children and adolescents. *Eur J Paediatr Dent.* 2015 Jun;16(2):93-8. PMID: 26147812.
28. Andrew L, Wallace R, Wickens N, Patel J. Early childhood caries, primary caregiver oral health knowledge and behaviours and associated sociological factors in Australia: a systematic scoping review. *BMC Oral Health.* 2021 Oct 13;21(1):521. doi: 10.1186/s12903-021-01887-4. PMID: 34645446; PMCID: PMC8513214.

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