J Pediatr (Rio J). 2013;**89(2)**:116–123

Jornal de Pediatria

www.jped.com.br

REVIEW ARTICLE

Influence of family environment on children's oral health: a systematic review☆

Aline Rogéria Freire de Castilho[a,*], Fábio Luiz Mialhe[b], Taís de Souza Barbosa[c], Regina Maria Puppin-Rontani[d]

[a]*PhD in Pediatric Dentistry, Departamento de Ciências Biológicas, Faculdade de Odontologia de Bauru, Universidade de São Paulo (USP), Bauru, SP, Brazil*
[b]*PhD, Associate Professor, Departamento de Odontologia Comunitária, Faculdade de Odontologia de Piracicaba, Universidade Estadual de Campinas (UNICAMP), Piracicaba, SP, Brazil*
[c]*PhD in Pediatric Dentistry, Departamento de Odontologia Pediátrica, Faculdade de Odontologia de Piracicaba, UNICAMP, Piracicaba, SP, Brazil*
[d]*PhD, Full Professor, Departamento de Odontologia Pediátrica, Faculdade de Odontologia de Piracicaba, UNICAMP, Piracicaba, SP, Brazil*

Received 8 October 2012; accepted 17 October 2012

KEYWORDS
Parental attitudes;
Parental knowledge;
Oral health;
Dental caries

Abstract
Objective: To review current models and scientific evidence on the influence of parents' oral health behaviors on their children's dental caries.
Sources: MEDLINE articles published between 1980 and June, 2012. Original research articles on parents' oral health behavior were reviewed. A total of 218 citations were retrieved, and 13 articles were included in the analysis. The studies were eligible for review if they matched the following inclusion criteria: (1) they evaluated a possible association between dental caries and parents' oral-health-related behaviors, and (2) the study methodology included oral clinical examination. The main search terms were "oral health", "parental attitudes", "parental knowledge", and "dental caries".
Summary of the findings: 13 experimental studies contributed data to the synthesis. Original articles, reviews, and chapters in textbooks were also considered.
Conclusion: Parents' dental health habits influence their children's oral health. Oral health education programs aimed at preventive actions are needed to provide children not only with adequate oral health, but better quality of life. Special attention should be given to the entire family, concerning their lifestyle and oral health habits.

☆Please, cite this article as: de Castilho AR, Mialhe FL, Barbosa TS, Puppin-Rontani RM. Influence of family environment on children's oral health: a systematic review. J Pediatr (Rio J). 2013;89:116–23.

*Corresponding author.
E-mail: acastilho@usp.br (A.R.F. de Castilho).

0021-7557
http://dx.doi.org/10.1016/j.jped.2013.03.014

PALAVRAS-CHAVE
Atitutes dos pais;
Conhecimento dos pais;
Saúde bucal;
Cáries dentárias

Influência do ambiente familiar sobre a saúde bucal de crianças: uma revisão sistemática

Resumo

Objetivo: Envolver modelos atuais e comprovações científicas sobre a influência de comportamentos de saúde bucal dos pais na cárie dentária de suas crianças.
Fontes: Artigos do MEDLINE publicados entre 1980 e junho de 2012. Foram analisados artigos de pesquisa originais tratando do comportamento dos pais quanto à saúde bucal. Um total de 218 citações foi analisado e 13 artigos foram incluídos na análise. Os estudos foram considerados elegíveis para análise se atendessem aos seguintes critérios de inclusão: (1) avaliassem uma possível associação entre cáries dentárias e o comportamento dos pais relacionado à saúde bucal; e (2) se a metodologia do estudo incluísse exame clínico bucal. Os principais termos de pesquisa foram "saúde bucal", "atitudes dos pais", "conhecimento dos pais" e "cáries dentárias".
Resumo dos achados: Ao todo, 13 estudos experimentais contribuíram com dados para a síntese. Também foram considerados trabalhos, revisões e capítulos originais em livros didáticos.
Conclusão: Os hábitos de saúde dental dos pais influenciam a saúde bucal de seus filhos. São necessários programas de educação em saúde bucal com ações preventivas para proporcionar não apenas saúde bucal adequada às crianças, mas também uma melhor qualidade de vida. Deve ser dada atenção especial a toda a família, com relação a seu estilo de vida e hábitos relacionados à saúde bucal.

Introduction

Parents' habits and knowledge about oral health have been found to influence their children's oral health status.[1-3] Children with poor oral health habits are more likely to develop dental caries when compared with those who have favorable habits.[4-6] Moreover, low socioeconomic status of the family[7-9] and parents' poor oral health habits[1,10] have also been found to contribute to the development of dental caries. In addition, other factors such as gender[11] and multiple levels of influence, including time or developmental dimensions,[12] have been observed.

Since oral hygiene is essential to oral health, it is wise to provide the population with adequate guidelines on children's oral health behavior and its relationship with dental caries. It is helpful to address the factors that influence children's oral health in order to develop and implement complementary public health actions focused on children and parental behaviors, in an endeavor to provide them with good oral health and better quality of life.

This literature review comprises a number of current models and scientific evidences regarding the influence of parents' oral health behaviors on their children's dental caries status.

Methods

Data sources and study selection

The authors searched the MEDLINE database for articles published from 1980 to the end of June 2012, supplemented by manual searching of the references from each relevant article identified.

The studies were eligible for review if they matched the following inclusion criteria: (1) they evaluated a possible association between dental caries and parents' oral health related behavior, and (2) the study methodology included oral clinical examination. Furthermore, original articles, reviews, and chapters in textbooks were also considered.

Data extraction and synthesis

The main search terms were "oral health", "parental attitudes", "parental knowledge", and "dental caries". A total of 218 records were originally retrieved. Two reviewers selected and reviewed the articles. First, each reviewer independently selected the articles based on their abstracts and checked their contents. Then, they looked for articles without abstracts. An agreement of 100% was obtained between the two reviewers.

Table 1 Summary of references appraised.

Reference	Source	Sample size	Age, years	Selected findings
1	Mattila et al.	1,074	7	Caries are related to parents' health habits, sugar consumption, and frequency of toothbrushing
2	Adair et al.	2,822	3-4	Caries are related to parent's ability to control children's toothbrushing and sugar consumption
3	Mattila et al.	828	5	Caries are related to sugar intake, rural domicile, and mother's age
9	Flinck et al.	3,373	12	Parents social group and sugar intake influence caries development
10	Okada et al.	296	7-12	Parents' oral health behavior affected their children's oral health behavior
13	Saied-Moallemi et al.	457	9	Mother's oral health knowledge and attitudes are associated with caries
14	Saied-Moallemi et al.	459	9	Mother's oral self-care is related to their offspring's oral health
15	Castilho et al.	200	5	Caries experience of mother's and practice of health knowledge affects their children's oral health
16	Poutanen et al.	489	11-12	Caries are related to parents' self-care oral health
17	Sundby et al.	794	3-5, 7, 15	Caries are related to parents' self-care practices
18	Paunio et al.	1,582	3	Consumption of sugar at night increases caries occurrence
20	Vanobberge et al.	1,500	7	Occupational status of the parents affects children's oral health
21	Paunio et al.	1,582	3	Caries are related to mother's age

A consensus was reached regarding the studies that fulfilled the inclusion criteria (13 articles), and which were included in this review.

Results

Of the 13 studies that met eligibility criteria, eight[1,2,10,13-17] related caries to parents' self-care practice, five described sugar as being responsible for caries,[1-3,9,18] two[19,20] described the influence of parents' socioeconomic status on children's oral health; and two[3,21] associated the mothers' age with caries in their offspring.

A summary of each selected article is presented in Table 1.

Background concepts

Parents harboring cariogenic bacteria

Negligence towards oral hygiene is widely known as the leading cause of dental caries. The oral cavity of a newborn is basically free of microbes. Soon after birth, numerous bacteria, including *Streptococcus mutans*, start to develop in their mouth. Since saliva flow is reduced during sleep, cariogenic bacteria gain prolonged access to fermentable substances, in a process that leads to dental decay.[22]

The colonization of mutans streptococci in a child's mouth is directly related to the risk of caries. It is known that *S. mutans* is the most decisive microorganism for the onset of caries, while *S. sobrinus* is related to the progression and development of carious lesions.[23] For this reason, children harboring both *S. mutans* and *S. sobrinus* species experience more caries than those only *S. mutans* or *S. sobrinus*.[24-26]

Maternal habits and behaviors may sometimes stimulate or increase microbial contamination in the child's oral cavity. The frequent contact between mother and child may cause early contamination and transmission of bacteria.[27]

Mothers are known to be the first to infect their children with cariogenic bacteria,[28] suggesting that their DMFS (number of decayed, missing, and filled surfaces of permanent teeth) might be a good indicator of caries experience in their children.[29,30] High levels of *S. mutans* in mothers increase their children's chance of developing dental caries by 11 times. A reduction in the number of *S. mutans* in the saliva of highly infected mothers is appropriate in order to avoid colonization by these microorganisms of their children's oral cavity. This is an important aspect that should be assessed, since the earlier the child is contaminated by cariogenic microorganisms, the higher the risk of early caries development.[27,31] Furthermore, the parents' previous caries experience has been found to have a negative impact on their child's oral health.[1,3]

Colonization with *mutans streptococci* leads to early caries development, and should be targeted for caries

prevention in clinical practice.[32] Although transmissibility is fundamental for the onset of caries, other factors, such as quality of oral hygiene, also influence the development of this disease.[33] Therefore, strategies for the prevention of dental caries should focus on controlling the colonization of cariogenic bacteria in young children,[34] and parents should be encouraged to have better oral health behaviors on a daily basis.[35]

Parents' toothbrushing habits and children's toothbrushing-related behavior

The association between parental toothbrushing and caries in children

Parents' toothbrushing habits were found to influence their children's toothbrushing behaviors. This hypothesis was confirmed by an international study involving 17 countries.[2]

Considering that regular toothbrushing and flossing eliminate cariogenic bacteria and fermentable substances from the tooth surfaces, good oral hygiene habits help prevent some oral pathologies, such as periodontal diseases and dental caries, which are considered common public health problems. At different ages in childhood, toothbrushing habits should be introduced to children by their parents or care-givers, and practiced on a daily basis.[36] Therefore, an educational approach targeting both children and their parents would help them to suffer fewer carious lesions, and to have better oral health and quality of life.[37]

Importance of interventions to improve parental toothbrushing

Parents' oral health behaviors have a direct influence on the number of decayed teeth of their children, indicating that oral health strategies should be focused not only on children but also on their parents.[10] Children of parents who control their children's toothbrushing and sugar intake have favorable oral health habits, demonstrating that parental attitudes have a positive impact on their children's oral health status.[2]

In fact, the higher the parents' education level, the more favorable the oral self-care of their children. Maternal oral health habits undoubtedly influence her children's oral self-care, emphasizing the mothers' role in the oral health of their offspring; therefore, oral health educational programs focusing on these aspects should be developed.[13,14]

Although most mothers (71%) are aware of the need for daily-supervised toothbrushing, only approximately 40% do so. Moreover, only 40% of the children were found to carry out their own oral hygiene.[38] While oral hygiene habits, frequency of dental visits, and consumption of healthy foods tend to be over-reported, the consumption of sugar-containing products is likely to be under-reported, since respondents often give socially expected answers.[39] When interviewed, most mothers appear to recognize the importance of oral hygiene and demonstrate some knowledge of oral health, as they provide satisfactory responses. However, the caries index observed for children and the oral health status of their mothers imply that this epidemiological approach has failed to assess the oral health of those attending the educational programs aimed to prevent oral diseases.[39]

Castilho et al. found that 47% of the mothers reported that their children brushed their teeth three times a day; only 32% of these mothers were found to brush the teeth of their children, while most (68%) only supervised the toothbrushing. However, a caries index (mean DMFT: 5.8) analysis revealed an incompatibility between the toothbrushing frequency performed by the children and that reported by their mothers.[15]

According to Finlayson et al., during the process of learning to brush, children only play with the toothbrush in their mouths, and do not actually clean their teeth.[40] Therefore, mothers play a key role in helping their children by teaching them favorable oral health habits.[40] Children born to mothers who are aware of the importance of oral hygiene are found to brush their teeth more frequently, because they develop better brushing habits.[40]

Interestingly, parental self-efficacy is associated with insecurity about correct toothbrushing techniques, but mostly, to a self-reported oversensitivity to the child's desires for some particular foods or not liking to brush.[41] Although parents try their best to adopt a healthy lifestyle, some similarities and differences towards oral health are found between genders. Favorable oral habits are more often reported by girls.[16] According to their self-reported behaviors, girls' parents belong to a more satisfactory lifestyle group when compared with boys' parents.[16] Furthermore, girls brush their teeth more regularly than boys,[11] probably due to the fact that they are more likely to follow the footsteps of their mothers, while boys tend to emulate their fathers. Therefore, more attention should be given to parents, since they influence their children's behaviors in a general way.[19]

Parental knowledge, attitudes, and socioeconomic status

Widely investigated parental characteristics such as knowledge, attitudes, and socioeconomic status influence children's oral health behaviors.

Cultural norms and practices influence a large variety of social factors, such as values, beliefs, and customs, affecting children's oral health. Culture comprises religion, health beliefs, language, diet, family structure, and medical and dental preventive approaches.[2,42]

The association between children's poor oral health and low socio-economic status of the family is clear.[7-9] According to Mattila et al., the mainly factors correlated with children's caries index (DMFT) at the age of 5 years are: mother's young age, parents' cohabitation, rural dwelling, parents' poor caries history, mother's poor dental hygiene habits, child's sugar consumption before the age of 18 months, and child's headache at the age of 5 years.[3]

The fact that mothers of children in ethnic minority groups often receive only a few years of education results in poor communication skills, and consequently poor dental health.[17] Likewise, woeful living conditions and irregular oral health practices also contribute to the differences in dental caries prevalence.[17] In addition, sociodemographic characteristics affect oral health knowledge and attitudes

of parents with a lower level of education, and negatively affect their oral health practices.[43] A higher prevalence of dental caries and lower toothbrushing frequency was found in 3-year-old children living in rural areas, when compared with those from urban settings.[18,21]

When considering socioeconomic status, children who have fathers with a high occupational status and stay-at-home mothers presented the lowest caries index values (DMFT = 1.3; DMFS = 2.5),[20] While children from higher social classes were shown to experience fewer caries,[44] children from lower classes have the poorest dental health.[45] In summary, parents' age and educational levels are important social background factors that directly influence their children's dental health.[46]

Based on several studies, the key elements that showed particular impact on children's oral health behavior and oral health status were: parents' oral health-related attitudes, general knowledge, and health status.[1-3] When all these key elements were compared, parents' behaviors appeared to be more strongly related to children's behavior than are parents' knowledge and attitudes, supporting the findings that children learn behaviors from their parents.[47] Mothers' oral health-related knowledge has been associated with dental caries in 3-year-old children.[48]

Although parental factors are known to influence children's dental health, there are differences between study models for boys and girls. Boys were influenced by their father's occupational level, while girls were influenced by their father's knowledge and behavior. Taking these findings into consideration, school health educational interventions involving the entire family are needed to provide children with more adequate preventive guidelines in order to ensure the success of their oral health.[16]

It is remarkable that the day-to-day life of families is largely influenced by social, cultural, environmental, and economic conditions. These social aspects play key roles in oral health, with positive or negative influence on the adoption of particular oral health attitudes and behaviors.[41]

Early education and implementation of preventive measures at home

Clearly, family environments encourage healthy choices and lifestyles.[49] Ideally, dental professionals should inform parents of the influence that their dental health behaviors and attitudes might have on their children's oral health, including the benefits of pediatric oral care, oral health educational programs, and other dental-health-related issues.[4]

Although parents play the most important role in the oral health of their children, schoolteachers are also important and should be involved in children's oral health education.[50,51] Children spend a considerable amount of time at school, where they can be taught good health habits.[50] Teachers could emphasize the importance of consuming fewer sugary foods and drinks, especially during school time, and oral health education activities should be included in the general curriculum.[51]

Early oral health education and preventive measures help reduce the need for future surgical interventions. However, the parents must be able to assimilate the information, understand the instructions provided, and implement them as part of the child's preventive oral health routine. Unfortunately, many adults are only partially literate, and consequently, have more difficulty in understanding the instructions on dental caries prevention.[52]

In summary, parents' dental hygiene habits, educational backgrounds, and child-rearing abilities have a favorable effect on their children's dental health status. Contextual aspects related to a family's capacity to develop and maintain good dental health behaviors are relevant in pediatric dentistry, since parents with poor dental health behaviors indicate caries risk in their children.[3]

Recommendations on children's oral health care

A better understanding of social, economic, belief, behavioral, and attitudinal factors is crucial in studies with the goal of oral health promotion.

A central model based on oral health promotion efforts (1970s–1980s) was developed to provide the population with substantial knowledge and guidelines on oral health-related behaviors. A wider outlook involving multiple determinants of oral health[53] is needed to encourage individuals from different backgrounds to adopt a healthy lifestyle.[54]

Socioeconomic disparities account for part of the oral health behaviors involving the whole family. Oral health policies designed to change behaviors are unlikely to completely eliminate disparities in oral health.[55-57]

According to Kay & Locker, health education is helpful in raising the level of knowledge, and in changing both attitudes and beliefs.[58] Health promotion programs provide not only schoolchildren, but also their parents, with adequate information on dental care involving oral health habits and attitudes. The entire family should take responsibility for their dental hygiene.[4]

Health-influencing factors are addressed at individual, family, and community levels.[59-61] In fact, simple models based on each individual are limited and no longer acceptable. Children live in families; families are included in communities. Therefore, effective community initiatives, such as oral health promotion and public approaches are related to children's oral health. Communities that value oral health lead to children with better oral health.[62]

Oral health is correlated with general health.[63] the mouth is part of the body and A child's risk of developing oral diseases is as high as his/her risk of developing overall illnesses.[64,65] Similarly, it is impossible to separate the family's and society's risks for disease from the child's risk for the development of both general and oral pathologies. Consequently, any approach to children's oral health must be based on a multilevel outlook as a means to achieve long-term effects.[66]

The idea behind motivating both the individual and community must be understood. Individuals at the highest risk of caries with the lowest motivation are the most difficult patients to work with during the practice of oral health education.[67]

The key concept of the health promotion approach is the empowerment of individuals. This strategy should be

implemented in order to improve the individual's control of his/her life.[68] Nevertheless, changing people's behavior and getting them to maintain it is a great challenge to health professionals. Poor parental oral health behaviors are likely to be caries predictors for their children.[35] Therefore, all aspects associated with the family's process of acquiring and maintaining good oral health behaviors are aspects with an impact on pediatric dental health care.[3,69]

Shared decision-making functions as a favorable communication tool between professionals and patients in health care.[70,71] Efforts to listen,[72] family dialogue, and evaluation of family resources are important factors, and contribute enormously to this interaction.[73] Furthermore, the dental staff should listen carefully to family members in order to provide them with adequate guidelines on dental care and oral health-related habits.

Caries, the most frequent oral disease, are preventable with the adoption of effective interventions in the individual's lifestyle and habits, including oral hygiene. However, the population's cooperation is a dominant factor in every preventive approach, because knowledge and information are not enough to promote oral health. In fact, oral health promotion is highly dependent on good health behaviors.[67] Unfortunately, the power of traditional health education is limited regarding pediatric oral care, and has sometimes failed to change health behavior.[58,74]

Successful preventive actions against oral diseases involve environmental modifications and development of strategies that enable people to choose a healthier lifestyle[75] by creating resources that guide them to a more active and productive life, resulting in good health status, and consequently, a satisfactory quality of life.[68]

Reducing inequalities in oral health continues to be the greatest dental public health challenge.[56] Individuals at the top of the social hierarchy experience better health conditions than those in the lower social hierarchy. This social gradient is constantly associated with minor illnesses and causes of death, affecting all age groups, genders, races, and countries.[76-79] When considering these oral health inequalities, an effective approach is necessary in order to identify and understand the fundamental causes of dental caries. According to public health studies, biological, psychosocial, behavioral, environmental, and political factors are observed to be the cause of dental diseases. Social determinants of oral health inequalities undoubtedly have some influence on oral health; however, the broader background that determines patterns of behavior must be deeply analyzed in order to create a social environment that supports good oral health habits.[56]

The development and implementation of satisfactory public health actions at different levels (local, national, and international) are essential for health promotion.[68] A longitudinal component is needed to measure the influence of time and the elements related to oral health at a variety of levels — individual, family, and community.[12] Complementary public health approaches, such as strategy development, organizational change, community action, and legislation,[62,74] focusing on both individuals and communities, not only on high risk individuals, would help to prevent carious diseases and to promote good oral health.

Conclusion

The adoption of consistent behavioral habits in childhood begins at home, with the parents, especially the mother, playing an important role in the child's oral health-behaviors. Parents should be informed that their dental health habits influence their children's oral health, and consequently, their quality of life. Therefore, a more soundly based health educational program involving all family members is needed to provide parents with adequate guidance on how to maintain the oral health of their children.

Conflicts of interest

The authors have no conflicts of interest to declare.

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