Chapter

Diet and Nutrition and Their Relationship with Early Childhood Dental Caries

Luanna Gonçalves Ferreira,
Giuliana de Campos Chaves Lamarque
and Francisco Wanderley Garcia Paula-Silva

Abstract

Early consumption of foods containing sugar is increasing and one of the consequences of this exposure is caries in early childhood, that is, in children under 6 years of age. Early consumption results in the child's taste and food choice throughout life, maintaining cariogenic dietary patterns. It is important to emphasize that most eating behaviors occur due to family influence. Therefore, an approach in dental prenatal care and consultations until the first year of age, allows the establishment of eating habits and oral hygiene, as well as guidelines and instructions for the adoption of certain measures that contribute to the health of pregnant women and babies. Based on the present study, we conclude the importance of establishing the relationship between the dentist and the pregnant woman, since early educational actions act directly on health in the gestational period and the child's growth. The early consumption of sugar is correlated with the occurrence of caries in early childhood due to family habits. Therefore, it becomes relevant instructions that help in maintaining healthy nutritional habits and correct oral hygiene practices, since focusing on educational actions increases the chances of healthy gestational and infant development.

Keywords: early childhood dental caries, diet, dysbiosis, sugar, oral health education

1. Introduction

In recent decades with the global nutritional transition, there has been an increase in the consumption of sugary drinks and processed foods rich in carbohydrates by children [1]. Cariogenic bacteria ferment sugar and carbohydrates from the diet, promoting a decrease in oral pH for values that favor demineralization and creating a favorable ecological environment for the survival of cariogenic microorganisms [2]. The acids produced by the fermentation of sugar by the bacteria that make up the biofilm cause an imbalance between demineralization and remineralization, leading

to the loss of minerals in the dental hard tissues, the important sign being white spot lesions followed by cavitation of a caries lesion [3].

It is noteworthy that the consumption of foods and beverages with sugar in early life has been associated with an increased risk of overweight, obesity, and non-communicable diseases, such as cardiovascular diseases, type 2 diabetes, and dental caries [4, 5]. The main oral disease in children is dental caries, often related to the consumption of free sugars contained in food or supplemented [6]. In addition, approximately 30% of children are born with development defects in tooth enamel, which favors the risk of caries in these children [7].

Dental caries is a dynamic and multifactorial disease mediated by biofilm, modulated by diet, and non-transmissible, determined by biological, behavioral, psychosocial, and environmental factors of caries [8, 9]. It is one of the most prevalent preventable diseases, being reported in more than 90% of children between 3 and 5 years in some countries [10].

Caries in early childhood are characterized by the presence of one or more cavities in one or more deciduous teeth in children under 6 years [11]. The International Association of Paediatric Dentistry (IAPD) recommends avoiding the ingestion of sugar by children under two years [12]. However, studies report large consumption of foods and beverages with sugar by children, before completing the first year of life [13, 14]. One of the main preventive strategies for the management of caries in early childhood is to provide caregivers with instructions on a balanced diet and effective strategies to prevent the accumulation of biofilm on the tooth surface [12].

2. Overview

The early and increasing consumption of sugar-containing foods and beverages in different communities of the world and the understanding of the role of sugar as a common risk factor for different adverse health outcomes indicate the need for urgent measures [13, 15, 16]. Caries in early childhood are the first clinically important result stemming from the early introduction of sugar and can affect children before they even complete the first year of life [12]. It is also essential to conduct an early dental consultation for follow-up and counseling before teeth eruption, in which parents and caregivers have the opportunity to receive information about oral health, which can increase awareness about appropriate oral hygiene behaviors and practices [17].

3. Diet and dental caries

The oral microbiota has a symbiotic relationship with the host, where it provides a favorable habitat for the growth of several microorganisms and in return, these microorganisms provide several benefits, such as the development of the immune system [18]. Its biological function and architecture are determined by the composition and properties of saliva and, more importantly, by the dominant nutritional source in the child's diet [19]. The mineralized surface of the teeth allows the colonization of several microorganisms, including *Streptococcus mutans and Streptococcus sobrinus*, which are acid-producing cariogenic bacteria [20].

Therefore, in the presence of fermentable carbohydrates, the acid produced by these bacteria begins to demineralize the surface enamel or the outermost layer of the teeth, initiating the caries lesion [20]. With this, biofilm alone is not able to provoke

dental caries, but exposure to dietary sugars and the individual's ability to overcome cariogenic challenges are determining factors for its occurrence [21].

Therefore, caries is a diet-related disease [22]. Other factors that contribute to the cause of dental caries are salivary flow rate, buffering capacity, i.e., saliva's ability to neutralize acids and maintain its pH, and the availability of some enzymes and protective molecules in saliva [11]. In the early stages of the disease, before cavitation, the progression of carious injury can be interrupted and even reversed, mainly by reducing the consumption of free sugar and encouraging behavioral changes that favor remineralization processes [23].

The risk of caries attributable to dietary factors is influenced by both food choices and eating behaviors. Three factors interact to determine the risk of caries associated with an individual's diet: sugar intake, frequency of consumption, and duration of the feeding [22]. Thus, the early supply of sweetened foods and beverages can have significant dental consequences, potentially laying the foundations for future cariogenic dietary patterns or dysbiosis in the oral cavity [15].

In relation to sugar intake, eating patterns in childhood, characterized by a greater number of highly sweetened foods and beverages in the first year of age, are strongly associated with the incidence of childhood caries in subsequent years [15]. The purchase of sugary foods by the family is a reflection of family consumption, not necessarily of the child. However, considering that young children quickly develop dietary patterns similar to those of their families, it is plausible that purchases interfered with sugar intake, reflected in the association with dental caries [24].

Moreover, the ubiquitous availability of sugary foods and beverages in contemporary household environments is associated with a decrease in balanced food meals, thus, the frequency of consumption becomes prolonged, increasing the opportunity for fermentation of carbohydrates in the oral cavity and subsequent risk of caries [22].

Therefore, the first years of life can represent a key opportunity for intervention, helping to establish a trajectory of low sugar content and low caries content throughout life, contrary to a trajectory intertwined between caries and sugar intake throughout life [25, 26].

4. Caries in early childhood

Caries in early childhood is defined as dental caries in children under 6 years of age, in which nutritional risk factors, such as bottle feeding and frequent consumption of sugary drinks and carbohydrate-rich snacks, as well as inadequate tooth brushing and limited access to fluoride and dental care, contribute to its occurrence [1, 12, 27, 28].

In addition to the consumption of fermentable carbohydrates with high frequency by children, other indicators of risk of caries in early childhood are if the mother or caregiver has active caries lesions, the situation and socioeconomic status of the family [29]. Epidemiological data from a 2011–2012 United States survey indicate that caries in early childhood remains highly prevalent in poor and almost poor preschool children [30]. The experience of caries in the deciduous dentition is one of the strongest predictors of caries experience in permanent dentition [31].

As a result, the American Academy of Pediatric Dentistry (AAPD) encourages professionals to adapt and instruct home preventive measures that provide evidence-based prevention of caries in early childhood, such as: establishing contact with

a dentist within 6 months after the eruption of the first tooth and at the latest at 12 months of age to perform caries risk assessment, parents' education and anticipatory guidance [32]. In addition, it is also necessary to modify diets to avoid frequent consumption of liquids and/or solid foods containing sugar [33]. The implementation of oral hygiene measures must be carried out at the time of the eruption of the first deciduous tooth [32].

5. Prevention of dental caries

Strategies to prevent caries in early childhood should begin with the education of the parents and/or caregivers during the prenatal period and progress through the perinatal period [28]. The family approach can be an effective solution, where families receive oral health education to ensure the early adoption of healthy behaviors, such as correct tooth brushing with toothpaste containing at least 1,100 ppm of fluoride and flossing, adoption of appropriate eating practices, reduction of the amount and frequency of sugar consumption and search for dental care before the baby's first tooth eruption [34, 35]. The International Association of Pediatric Dentistry (IAPD) recommends that this toothbrushing be performed at least twice a day with fluoride toothpaste, containing at least 1000 ppm F, since this amount is effective in reducing dental caries in children [36].

Within the cycle of health care for pregnant women, prenatal consultation comprises major functions, such as health promotion, disease screening and diagnosis, as well as disease prevention. Thus, prenatal dental care promotes maternal and child health [37, 38]. However, dental prenatal care is still highly neglected by pregnant women due to the lack of knowledge of the real importance of this attention [39].

In addition, it is valid to understand the profile of pregnant women seeking dental care in order to promote adequate guidance and treatment [40]. A question to be addressed in consultations concerns the knowledge of pregnant women about their own oral health and the interference that this fact may have in the oral health of the child in the first years of life, and in the relationship with caries in early childhood, in addition to its future implications, such as impairing the cognitive development and quality of life of the child [41]. It is important to highlight that professionals act with an important role in the deconstruction of incorrect perceptions about dental care during pregnancy, and a pleasant, calm, and quiet conversation during consultations can amplify the commitment of pregnant women to oral health [42].

Environmental factors present in the gestational period (unbalanced diet, stress, exposure to smoking and alcohol) may have negative impacts on pregnant women's health indicators, such as excessive weight gain, hypertension, gestational diabetes, and periodontal disease, among other chronic diseases [43–45]. That can result in negative events, both at the end of pregnancy, as prematurity (<37 weeks), large babies for gestational age or fetal macrosomia (≥4000 g), or after birth, such as asthma, delayed neuropsychomotor development and other chronic diseases [46, 47].

Knowing this, the dentist, together with other health care providers, can guide pregnant women to a healthier lifestyle, since their attitudes and behaviors in these first 1000 days of life are determinants for a healthier pregnancy, with repercussions on the health of the pregnant woman and the health of the baby [48].

6. Oral health education and dental consultation

The deficiency of knowledge in oral health can favor the occurrence of diseases and lead to the worsening of existing problems [49]. The lack of information causes dental services to be used mainly in precarious or urgent dental conditions when it has some associated painful symptomatology [50].

There is a substantial incompatibility between the oral health needs of communities and the availability, location, and type of dental services provided [51]. In high- and middle-income countries, young children, low-income families, marginalized groups, and people living with disabilities are generally poorly served, especially when compared to the access of wealthy families to dental services [52–55]. The current model of dental care and preventive clinical policy does not meet the global burden of oral diseases [29]. Although there are concepts to integrate primary oral health care into primary health care, they have not beeh fully expanded, which contributes even more to the challenge of providing access to even primary oral health care [56]. With this, oral health and the dental profession have become somewhat isolated and marginalized from the main developments in health policies and health care systems [29].

In addition, several studies have shown that oral hygiene instruction, dietary guidance, brushing with fluoridated toothpaste, flossing, and periodic follow-up with the dentist, for preventive prophylaxis and treatment, significantly increased the number of caries-free children [57, 58]. Continuous and periodic preventive consultations are extremely important because only with follow-up is it possible to evaluate family dental risk factors; parents' education about tooth eruption; oral hygiene, breastfeeding, and dietary counseling; if necessary, to carry out interceptive and preventive treatment; and establish a positive relationship between the family and the dental team [59, 60].

Current scientific evidence shows that the success of caries prevention and treatment also lies in the assessment of the risk of caries in the patient, in changing the dental biofilm complex, and in modifying oral factors [61]. A validated tool that was created to represent the multifactorial nature of dental caries disease is the management of caries by risk assessment (CAMBRA), as it emphasizes the balance between pathological and protective factors in the caries process [62–65].

Thus, it is possible to identify pathological factors such as inadequate oral self-care practices, frequency of fluoride exposure in the intake of carbohydrates, cariogenic bacteria and history of caries, and also protective factors such as ideal exposure to fluoride, dietary control of sucrose and good oral hygiene habits [66]. Using the knowledge acquired with an assessment and risk of caries, the dentist can implement a change of behavior to reduce risk factors, and increase individualized and standardized protection factors for each patient, resulting in disease control [61].

It is important that the health professional is aware of these measures to demystify beliefs and reinforce the guidelines for the family about the oral health of babies, since they can have repercussions on the development and growth of the child [41]. The efficient mechanical removal of dental biofilm is essential for the prevention of caries in early childhood, for this, it is necessary to perform the hygiene of the child's mouth, after the first tooth eruption with a brush and fluoridated toothpaste [41]. Thus, the professional should make parents and caregivers aware that caries disease is a disease that can be prevented and that the adoption of healthy habits, such as a balanced diet, hygiene, and maintenance of oral health is fundamental to avoid its occurrence [17].

7. Conclusions

Based on the present study, it is concluded the importance of establishing the relationship between the dentist and the pregnant woman, since educational actions initiated early act directly on health in the gestational period and in the child's growth. The consumption of early sugar in children, that is, before 2 years of age is correlated with the occurrence of caries in early childhood, due to family habits. Therefore, it becomes relevant instructions that help in the maintenance of healthy nutritional habits, and correct oral hygiene practices, since focusing on these educational actions increases the chances of healthy pregnancy and child development.

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Conflict of interest

The authors state that the literature review was conducted in the absence of commercial or financial relations that could be interpreted as a potential conflict of interest.

Author details

Luanna Gonçalves Ferreira, Giuliana de Campos Chaves Lamarque
and Francisco Wanderley Garcia Paula-Silva*
Department of Pediatric Clinics, School of Dentistry Ribeirão Preto, University of São Paulo, Ribeirão Preto, SP, Brazil

*Address all correspondence to: franciscogarcia@forp.usp.br

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