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Cariogenic Potential of Human Milk, Bovine Milk and Milk Substitutes in Early Childhood

Gisele Pedroso Moi[1,2]*, Clea Borges Santos e Silva[1], Eliane Silveira Garcia-Leite[1], Carla Andreia Veiga Bertaia[1], Rossimary Coelho de Freitas Santos[1], Patrícia Xavier da Costa-Nobre[1,2] and Ageo Mário Cândido Silva[2,3]

[1]*Brazilian Association of Dentistry, Mato Grosso Section - ABO.MT*

[2]*University Center of Várzea Grande - UNIVAG*

[3]*Institute of Public Health, Federal University of Mato Grosso - ISC.UFMT*

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***Corresponding author:** Gisele Pedroso Moi, Rua Nossa Senhora da Guia, 504. Apto. 901.2 - Jardim Santa Martha, 78043-605 - Cuiabá, MT – Brasil, Email: gisele.pedroso.moi@gmail.com

Abstract

Although the prevalence and incidence of caries have reduced in a significant way in the last decades, early childhood caries still is a public health serious problem that attacks specially the not supported groups in developed countries also in the ones which are being developed. Like this, the objective of this literature mini-review was to critically discuss the cariogenicity of different kinds of milk inserted in the early childhood diet. Bovine and human milk show anti-cariogenic potential therefore its concomitant administration with fermentable carbohydrates may cancel such potential. An important factor to be considered is that the milk substitutes show its cariogenic potential potentialized by the addition of sugar. So, pediatricians should make usage of these evidences to encourage parents to supply children with milk or milk substitutes without sugar. The cariogenic potential of milk and its substitutes directly depend on the way they are used. However, it is indispensable to emphasize that human, bovine milk and substitutes would not be risk factors for dental caries if used in a rational way, associated to an adequate oral hygiene and awareness on the usage a small amount of fluoride dentifrices containing 1100 ppm F-..

Keywords: Dental Caries; Infant; Child; Preschool; Milk; Human; Milk; Breast-Milk Substitutes

Introduction

Although the prevalence and incidence of caries have reduced in a significant way in the last decades [1], early childhood caries still is a public health serious problem that attacks specially the not supported groups in developed countries also in the ones which are being developed [2,3].

Among the factors related to the etiology of early childhood caries, frequent consumption of a rich diet in fermentable carbohydrates, represented by milk, juices rich in sugar or flavor substances, mainly when they are swallowed during the period in which the circadian rhythm of the saliva is reduced [4]. It is all because in this time salivary flow is reduced, benefiting the stagnation of this diet over the teeth elements [5].

Carbohydrates depict the main source of energy in a balanced diet [6], representing around 60% of its daily caloric value. In the child's first year of birth, lactose stands for the most important source of energy deriving from the diet, taking milk as the main source of nutrition along this period [7,8]. This is because it supplies about 50% of the total energy required in this phase.

Milk could show cariogenic potential due to the presence of lactose, considering it is metabolized by the bacteria of the dental biofilm and organic acids that are released because of this process, favoring the demineralization [9]. This data has a great clinical relevance because the caries progression rate in deciduous enamel is higher than the permanent enamel [10]. On the other hand, milk shows covering capacity and high levels of calcium and phosphate [11]. However, the presumable milk cariogenicity is a significant important matter because with its substitutes it could collaborate for the development of the caries sickness, making these foods one of the greatest responsible for the dental destruction [12].

Like this, the objective of this literature mini-review was to critically discuss the cariogenicity of different kinds of milk inserted in the early childhood diet.

Discussion

Early childhood caries could be associated to suckling when the standard consumption showed characteristics like

increased frequency of daily breastfeeding, during a long period of time, specially frequent night breastfeeding, leading to the accumulation of milk over the teeth which associated to the reduction of the salivate flow and absence of cleanliness, could cause the appearing of caries lesions [13]. In contrast to these arguments is the fact that milk has anti-cariogenic potential due to its covering capacity [14], its high concentration of calcium and phosphate [15] and the presence of enzymes capable of reducing the growth of cariogenic bacteria in dental biofilm [9]. Although there are controversies about the milk cariogenic potential, there are evidences in literature that suggest the true role of milk and its substitutes in the development of early childhood caries.

Human milk

Mother's milk offered to babies in the first months of life is considered an essential food for children in early childhood, benefiting the development of nutritional, emotional and immunological aspects [11]. On the other hand, literature suggests that the extended natural breastfeeding after 12 months might be a risk factor for the appearance of early childhood caries [15-17]. This is because the extended suckling in free search with high frequency of night breastfeeding may propitiate the accumulation of milk over the dental structures [18]. Lactose in milk over the dental surface could show cariogenic potential, once it is metabolized by the bacteria of dental biofilm and organic acids are released resulting from this process, benefiting the demineralization [9]. This fact associated to a careless oral hygiene and reduction of salivary flow when sleeping could increase mineral losses [11].

In contrast to these arguments is the fact that milk shows much anti-cariogenic potential due to its concentration of calcium, phosphate, casein, whey protein, and milk fat [19]. Besides, the protein covering capacity with the agglomerate of casein micelles by water present in milk allow the formation of very stable compounds of calcium phosphate [20]. Finally, enzymes present in milk may have an important role in the reduction of acidogenic bacteria growth present in dental biofilm [9]. This controversy in cariogenicity of human milk can be explained for the fact that diet in early childhood shows other kinds of fermentable carbohydrates, for instance, sucrose. Human milk only, does not have cariogenic potential [21].

Bovine milk

Some researches suggest that bovine milk have cariogenic potential, for lactose, when metabolized by the bacterium of the biofilm, reduces the dental biofilm pH favoring mineral loss from the teeth [17,18]. However, recent researches are opposite to such information emphasizing the cariostatic properties of bovine milk [22,23]. Just like the human milk, bovine milk shows anti-cariogenic effect due to the presence of high concentration of calcium and phosphate [17,24]. Besides, bovine milk has phosphoproteins with an emphasis on casein, that are strongly absorbed in the enamel, capable of reducing the adsortion and activity of glucosyltransferase enzymes [19,23], also preventing the dissolution of the enamel [25]. Milk still contains a group of anti-bacterial substances such as lactoferin, lysosin and peroxides that may affect the oral microbiote reducing the bacterial growth in the dental biofilm [26]. Bovine milk also shows approximately 3.5% of fat [15], that acts forming a protective membrane on the surface of the tooth and involves the carbohydrates in the diet making its removal of the oral mouth easier. The lipides effect in milk reduces the bacterial activity and consequently collaborates for the milk to have the cariostatic effect [11]. However, bovine milk when handled simultaneously with sucrose could have its anti-cariogenic potential canceled [27].

Milk substitutes

Milk substitutes are formulations categorized in three big groups [28]: 1) children's formulations, 2) transitional formulations for infant and 3) formula totally consisted of milk.

The first group has all nutritional necessities for infant during the first 4-6 months of life or until 12 months if used with other foods suggested by the pediatrician. The children's formulations may be classified by the protein compositions in three sub-groups [29,30]: a) formulations made of milk (bovine milk), b) formulations made of soy and c) formulations made of proteins. Formulations made of soy are suggested to children who are allergic or not adapted to lactose (human or bovine milk). Formula made of proteins in which proteins are hydrolized in fragments of proteins and aminoacids. This formulation is suggested to children who have proteic sensitivity such as galactosemia. Either formulations made of soy or the formulations made of proteins contain carbohydrates with extrinsic origin from milk such as sucrose and glucose [31].

Transitional formulations from the baby are consisted of bovine milk supplemented in order to supply the nutritional necessities from babies from the age of six months until the age of three years old. Such formulations may even contain up to 20% of sucrose [31].

The last group represented by the formula totally made of milk is basically made of bovine milk supplemented by necessary vitamins and shows mineral compositions with no limits of sugar concentrations. This formulation is indicated to children after the age of one year old [28].

A high cariogenic potential may be expected with the usage of children's formulations due to its high concentration of fermentable carbohydrates, however, there are controversies about the cariogenicity of these formulations [31]. A plausible explanation for this is that these formulations are constituted of a combination of nutrients. Do not showing the milk anti-cariogenic effect only, but also showing components with high cariogenic potential such as the fermentable carbohydrates. Among the fermentable sugar, sucrose is considered to be the carbohydrate with the most cariogenic potential in the diet [32-34].

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Despite lactose not being present in the formulations made of soy and proteins they have other sugar extrinsic from milk that show higher cariogenic potential than lactose [35].

Milk substitutes show cariogenic potential that are potentialized by the addition of sugar during the preparation [5].

Conclusion

Human and bovine milk show anti-cariogenic potential, however, simultaneous handling with fermentable carbohydrates can cancel this potential. An important factor to be considered is that milk substitutes show their cariogenic potential increased by the addition of sugar. So, pediatricians should take these evidences into account to encourage the ones in charge of children to supply milk or milk substitutes without the addition of sugar.

However, the milk cariogenic potential and its substitutes directly depend on the way they are used. That is why it is indispensable to emphasize that bovine, human milk and milk substitutes would not be risk factors for caries disease if used in a rational way, associated to adequate oral hygiene and awareness on the usage a small amount of fluoride dentifrices containing 1100ppmF-.

Conflict of Interest

The paper authors declare that not have any economic interest or any conflict of interest.

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