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Parent-child interaction and stimulation in early life can be related to caries in primary dentition? Hypotheses from a life-course approach

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ABSTRACT

Dental caries has common risk factors with impairments in growth, cognitive development and child general health. Identifying socioeconomic contexts and parental behaviors in early life that may be associated with negative outcomes in the child's future and their causal mechanisms can contribute to planning early interventions. Therefore, the aim of this paper is to propose and discuss possible ways to explain how early childhood stimulation may be associated with future oral health status, based on the life-course theory of chain-of-risk model and accumulation of risk model. Two hypotheses were suggested: (1) each social exposure or parental behavior in the child's first years of life increase the risk of chronic diseases, such as dental caries in primary dentition, in a simply additive effect; (2) parental factors could negatively influence the establishment of the pattern of child stimulation (child care) or lead to a modification of the established behavior on the risk of dental caries in the child primary dentition. Prevention of dental caries seems to be the most feasible way of solving this serious public health problem. It therefore justifies the importance of identifying exposures in the child's early life that may lead to the occurrence of chronic diseases in the future. The evidence seem to converge to the idea that child stimulation in early life may be associated with future health problems related to behaviors and care by parents, including caries.

Introduction

Dental caries is a known public health problem. It is the most prevalent oral disease and impacts negatively the oral health-related quality of life [1–3]. Primary dentition is also highly affected; about 620 million children worldwide are affected by untreated caries in primary dentition [1]. Moreover, dental caries in primary dentition was associated with pain [2,4,5], worse masticatory performance [6], learning problems [7], child school absenteeism and parent work absenteeism [8,9], poor school performance [10] and had impact on child growth [11].

Dental caries has common risk factors with impairments in growth, cognitive development and child general health. The *Common Risk Factor Approach* is widely accepted in public health and incorporates, in its theoretical lines, behavioral, psychosocial and social-related risk factors that are common to many chronic diseases [12]. Applying this concept, poverty, low educational status of the mother and maternal unemployment are known risk factors to child stimulation and cognitive development [13] and dental caries [14]. Thus, child stimulation may be a marker of dental caries in the primary teeth, since they share some risk factors [14–17].

In early life, child stimulation and care are directly linked to contextual factors and parents' behaviors [12,18]. Child care reflects any behavior, being them attentive, protective or behaviors antagonistic to these [19]. Although there is a clear influence of the social context on health care behaviors, parental involvement with child stimulation and parent-child interaction could be associated with the way the child is cared for, reflecting a number of aspects of their health, including oral health conditions.

To promote changes in health-related behaviors is extremely complex, especially in view of the current social inequality scenarios. A better understanding of the causal structure and relations of behaviors which parents adopt and social contexts in early life can be associated with negative outcomes in the child's future and contribute to the

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planning of early interventions. Then, the aim of this hypothesis study was to discuss the paths to explain how early childhood stimulation may lead to dental caries, based on a life-course approach.

The hypothesis

How child stimulation could be linked to dental caries in primary dentition from the perspective of the chain-of-risk model?

The life course models are extremely useful to understand the long-term effects of behavioral and social exposures during gestation, childhood, adolescence, young adulthood and later adult life on chronic diseases [20,21]. The critical period/biological programming model suggests that there is a specific and limited time to the exposure to act as a protective or risk factor. The critical period with modifier effect considers that early life events have a stronger effect, but they also interact with later events and then influence the outcome occurrence. The accumulation-of-risk model explains that different exposures in life (either beneficial or harmful ones) accumulate through life leading to effects in health. Finally, in the chain-of-risk model, different exposures are sequentially linked in an idea of 'chains of risk', where one adverse (or beneficial) exposure tends to lead to another, and so on [20,21]. The links are probabilistic rather than deterministic and sequential, involving "modifiers" and "mediators" factors. Considering these perspectives, the chain-of-risk model and accumulation of risk model seem to be good alternatives to understand how the pattern of child stimulation could affect or impact child oral health.

The first hypothesis proposed in this study was that each social exposure is related to parent behavior in the child's first years of life, increasing the risk of chronic diseases, as dental caries, in a simply additive effect. The second one suggests that factors related to parents, such as mental health or employment, could negatively influence the constitution of the pattern of child stimulation (child care) or lead to a modification of the established behavior on the risk of health outcomes of the child (Fig. 1).

There is substantial evidence that disadvantaged environments during the first years of life may influence the quality of child cognitive stimulation and cause negative outcomes in adolescence and adulthood, including occurrence of chronic diseases [13,22,23]. Children from economically disadvantaged families or children from parents with lower education tend to receive less stimulation for their cognitive development. Likewise, children with more siblings, especially those under five years of age, tend to be less stimulated, since they share the attention of the parents [24].

Studies have shown the impact of stimulation on cognitive development, as well as on other health-related outcomes. In fact, in general, suitable environments to stimulation tend to be healthier [13]. The association between cognitive stimulation at home and healthier habits was assessed in preschool children. Stimulated children were more likely to be physically active, being two and three times higher for those with moderate and high levels of cognitive stimulation, respectively, in comparison from those with low level of stimulation [25].

The evidences seem to converge to the idea that child stimulation in early life may impact future health problems related to behaviors and care by parents. Considering this perspective, oral health problems, such as dental caries in the primary dentition, could be affected by child stimulation in the first years of life, since child oral health is strongly influenced by the family context and parent's behaviors, mainly maternal ones [26]. Mothers from low socioeconomic position [16], with poor oral health [16], less knowledge about the child first visit to the dentist [27], which offer sweetened drinks in early life [27,28] and do not help or supervise teeth brushing [28] have children with greater incidence of dental caries in the primary dentition.

Considering the aforementioned, we propose a simplified chain-of-risk model to explain the use of child stimulation as an indicator of dental caries in primary dentition. We suggest that worse family and household socioeconomic condition would be associated with poor child stimulation, which could be considered as a proxy for a worse pattern of health care, which would then lead to an increased risk of dental caries in primary dentition.

The interaction between parents and children may be a determining factor for the establishment of care behaviors' and child stimulation. Intervention strategies focused especially on the quality of the interaction between parents and children have shown greater effects on the development of the child [29]. Parental warmth is related to emotion regulation of children; unsatisfying infant–caregiver interactions may lead to poorly developed stress regulation capacity [30]. Mäntymaa et al. [18] have found that poor dyad mother–infant interaction assessed at two months were associated with the physical health of the child. This finding suggests that this interaction may affect the reactivity of the children and increase their vulnerability to stressful conditions and experiences [31]. Therefore, unsatisfying mother-infant interactions build up an insecure attachment relationship [32] and could be associated with chronic or recurrent health problems in the child [30].

Even those children living in healthy and favorable environments for their growth and development could be submitted to changes in their family routines, especially due to changes in parental work status or the place where the children are having their care. The increase in maternal employment has been investigated regarding its impact on children's health and well-being [33]. Theoretical models suggest that maternal employment may be particularly influential in the first months of the child's life, but there is no consensus on this issue. Some theories point out that maternal employment increases mothers' economic resources but decreases time and energy to devote to parenting [34,35]. Regarding child development, Reynonds et al. [36] presented some pathways suggesting that earlier entries and greater time devoted to employment may be especially challenging for mothers and infants care; however, they were not able to find pathways sufficiently strong to generate an association between maternal work and child development in Chilean children.

Mahesh et al. [37] observed a 3.5 times higher risk of dental caries in children of unemployed mothers, as an indicator of low socioeconomic position. Sehrawat et al. [38], in a study with mothers of children between 2 and 5 years old, observed that mothers who worked showed better knowledge and attitude towards good oral health, but

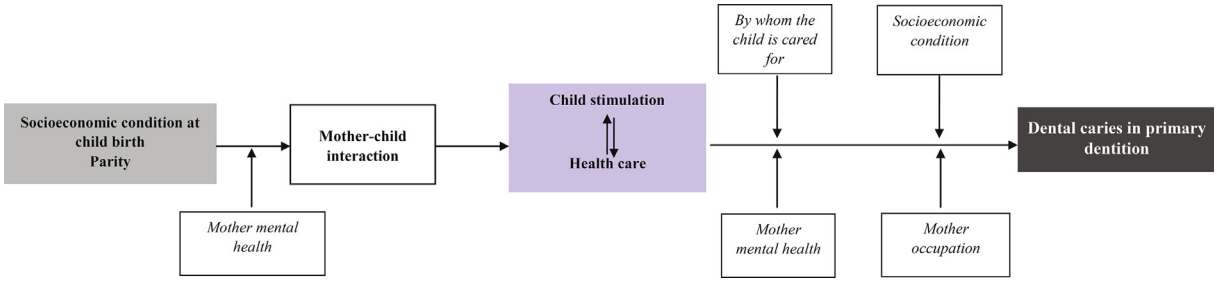

Fig. 1. The relationship between parent-child, stimulation and dental caries: a life course approach.

their practice was poorer than mothers who were not working. The authors attributed this finding to the lack of available time to perform adequate care. The relationship between who perform the care and the occurrence of caries could also be explained, where the prevalence of dental caries was higher in children who were cared by people other than their parents or grandparents [37]. Furthermore, Carvalho and Abanto [39] assessed parents' guilty feelings and its relation to possible oral problems of their children, showing that 54% of the parents from children with oral problems felt guilty, feeling that was greater when they knew that the problem could have been avoided. This finding deconstructs the idea that only lack of knowledge limits oral health care [16,40]. It is also important to highlight that children are more prone to exhibit dental caries when they are under care of individuals who also suffer from dental caries, meaning that individuals having difficulties to take care of their own oral health would likely be less careful when taking care of others [16,40,41].

Not only socioeconomic aspects but psychological factors could influence stimulation. Mother-child interaction and stimulation may be influenced by maternal mental health. In fact, mother's mental health plays an important role in many children's health outcomes related to health care. The care a mother gives to her child depends on how motivated they feel to carry them out, which may be related to their mental health condition. Perinatal depression and recurrent episodes of maternal depression throughout the child's life are related to poor child development, injuries and maltreatment [42,43]. Maternal mental health may also represent an important risk factor for both impaired oral health of the children and perception of a negative impact on the oral health-related quality of life [16,44]. Pinto et al. [16] observed that children whose mothers presented depressive disorders had four times greater risk of caries compared to those of mothers without depression. The effect of depression was even more evident when analyzing caries-free mothers, with those presenting depressive symptoms having children with dental caries at early ages in comparison to caries-free mothers without depression.

There are many factors associated with parent's behavior and child care which may increase the risk of child's negative health outcomes. The study of health behaviors is extremely complex. In the present manuscript, we have chosen to discuss some of the most important ones, either by the quality of available evidence or by the relevance within the parents and children context that could specifically affect dental caries in primary dentition. We recognize that working with behaviors, interactions and other relations must be developed in further prospective studies. However, it is well established that the child's economic and social context in early life is extremely relevant to the health-disease process and family health behaviors. Parent-child interaction is closely related to child health care and may be associated with maternal mental health. In addition, repeated episodes of mothers' mental health problems throughout the child's life, lower socioeconomic conditions, mother' occupation and child care could be associated with increased risk of dental caries in the deciduous dentition.

Consequences of the hypothesis to public health and discussion

Dental caries is still recognized worldwide as the most important oral health problem. Despite a decline in the prevalence of dental caries in Brazil, in 2010, 80% of deciduous teeth affected by caries remain as untreated [45]. Populations in vulnerable situations should be prioritized in view of all unequal access to dental services, contributing for the occurrence and severity of dental caries in children. The pain and all the consequences that the severity of dental caries imposes on children are clearly observed, especially in socioeconomically disadvantaged populations, contributing to poorer quality of life for the child and the family [2].

Considering the current scenario and the underfinancing of the public health system in Brazil, the prevention of dental caries seems to be the most viable way of solving this public health problem, which justifies the importance of identifying exposures in the child' early life as indicators of disease in the future and therefore justify the hypotheses raised in this study. In addition, if interventions are capable of modifying parental behavior to stimulate cognitive development [46], and if our hypothesis that the child stimulation reflects parental health care is confirmed, then it is feasible that these same strategies are capable of modifying behaviors associated with other child health-related care, hence different care-related diseases could be avoided based on a single preventive strategy.

There are no studies in the literature that assess the influence of early stimulation as a proxy for early childhood care and its relation with outcomes in oral health. It is known that interventions focused on the early stimulation of the children can contribute to their development and could have an important effect on economically disadvantaged populations. The study of these associations throughout the life course allows early-life exposures to be identified as indicators of disease in the future. Thus, longitudinal studies, due to the temporality attributed to them, allow measuring the early stimulation as an indicator or a cause of dental caries in the first years of life.

Declaration of Competing Interest

The authors declare that there are no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.mehy.2019.109291.

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