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ORIGINAL ARTICLE

Changes in Oral Health-Related Behaviors and Oral Health of Children in Early Childhood during Social Isolation Caused by COVID-19

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ABSTRACT

Objective: To assess changes in oral health-related behavior and oral health status in Brazilian children in early childhood perceived by their parents/caregivers during social isolation caused by COVID-19. **Material and Methods:** A cross-sectional study with parents/caregivers of children in southeastern Brazil aged 0-5 years who responded to an online questionnaire about sociodemographic data, dietary changes, oral hygiene, and oral health status of children during the COVID-19 pandemic. **Results:** Of the 119 parents/caregivers, 54.60% did not observe any changes in eating habits, and 81.50% maintained their children's oral hygiene. Associations were observed between the impact of the pandemic on the family income and changes in eating habits (p=0.02) and between lower family income and dental caries perceived by parents/caregivers (p=0.05). Z tests with Bonferroni correction showed that families with drastic income reduction were more likely to consume lower-cost foods (62.50%) than families with no impact or slight reduction on family income. Parents/caregivers did not identify dental caries (89.10%), toothache (92.40%), and dental trauma (92.40%) in their children. **Conclusion:** Parents/caregivers of children in southeastern Brazil aged 0-5 years observed behavioral changes in the dietary habits of families whose income was impacted by the pandemic, and their perception of dental caries was significantly associated with family income.

Keywords: Oral Health; Parents; Child; COVID-19.

Introduction

The new coronavirus (SARS-CoV-2; Coronavirus disease – COVID-19) is part of a family of viruses that cause respiratory infections [1]. COVID-19 infection has a wide range of clinical manifestations and represents one of the main medical emergencies of recent years, so much so that in the first months of 2020, the World Health Organization (WHO) characterized COVID-19 as a pandemic [2].

Due to its long incubation period (average of 6.57 days) [3] and easy transmission chain, mainly through respiratory droplets suspended in the air and by direct or indirect contact, the control of SARS-CoV-2 is a significant challenge for health systems [2]. Thus, many governments declared a state of emergency, enacting measures to control the spread of the disease [4,5]. Policies were established to combat the pandemic, such as encouraging hand hygiene and using face masks [4-6]. In Brazil, in addition to these measures, social distancing, a ban on mass events and agglomerations, restriction of travel and public transport, awareness of the population to stay at home, and closure of daycare centers, schools, and universities [7] were also implemented. Given this, the COVID-19 pandemic had a massive impact on the population with consequences for each one's lifestyle.

The suspension of school programs meant that children and adolescents had idler time at home [4,5,8,9]. The new routine may result in increased food intake [8]. Studies with children and adolescents aged 0 to 16 showed a change in the dietary pattern of families during social isolation [4-6,10,11]. The most consumed foods were those of low nutritional quality, higher caloric content, and high content of saturated fats, sugars, sodium, and refined carbohydrates [4-6,10,11]. A diet rich in carbohydrates can lead to several health problems, such as obesity and diabetes mellitus, as well as poor oral health [8]. The frequent sugar intake favors the accumulation of dental biofilm and contributes to the development of dental caries and periodontal disease [4,8,10,11]. A previous study also showed that family routine changes affected children's oral hygiene since concerns about other situations can prevent correct brushing and flossing practices. Due to increased responsibilities and activities, including work, child care, and household chores, parents may need help supervising their children's oral hygiene [4]. Additionally, this modified routine could also lead to an increase in the rates of traumatic dental injuries (TDI) since data from epidemiological studies have shown that most traumatic accidents in early childhood occur in or around the home and are the leading cause of falls [12,13]. In addition, fear and concerns about the safety of dentists and patients have led to a reduction in routine oral health care [4,6,14], which can compromise the prevention of oral health in children, which is based on periodicity and health education through adequate information to parents or guardians about oral diseases [3,14].

Therefore, social isolation restrictions may be related to changes in the behavioral patterns of individuals subjected to confinement during the COVID-19 pandemic [4,9,15]. Few studies have evaluated the effect of COVID-19 on children's oral health during isolation [4,8,11,16,17]. It is understood that with the closure of schools, kindergartens, and establishments, children started to have all their meals at home. These restrictions of social isolation may have increased the consumption of sugar and processed foods by children [4,9], who may have been at higher risk of developing new carious lesions [6,11]. On the other hand, parental presence at home during social isolation may have improved oral hygiene habits and consumption of more healthy food [4,8,11,16-18].

Furthermore, the behavioral pattern of children subjected to confinement during the COVID-19 pandemic could have changed the pattern of TDI occurrence. As TDI occurs more often at or around the home [19], children would be at a higher risk of most traumatic accidents. In this way, social isolation was unlikely to decrease the incidence of TDI requiring treatment [18,20]. Therefore, this study aimed to assess changes in behavior related to oral health and oral health status in Brazilian children in early childhood, perceived by their parents/caregivers during the COVID-19 pandemic.

Material and Methods

Ethical Aspects

The study protocol was approved by the Human Research Ethics Committee of the Federal University of Juiz de Fora (Protocol No. 4.699.355). Participants received an online invitation letter explaining the purpose, importance, and study methods, as well as the Free and Informed Consent Form, through which parents/caregivers consented to their participation in the study.

Study Design and Sample

This cross-sectional study included the participation of parents/caregivers of Brazilian children aged 0-5 years from Juiz de Fora, Minas Gerais, Brazil, who are in social isolation due to the COVID-19 pandemic. Parents/caregivers of children with disabilities were excluded. A combination of convenience and snowball sampling was used to recruit participants. Sample power calculation was done using the G*Power Statistics software (G*Power, version 3.1.9.7, Düsseldorf, Germany).

Data Collection

Participants invited to participate in the study answered a questionnaire on the Google Forms platform (Google Inc., Menlo Park, CA, USA) from 11 May 2021 to 11 December 2021. The link to access the questionnaire was made available through the social networks (WhatsApp, Instagram, Facebook) reached by several groups known to the researchers.

The questionnaire used in this research was adapted from an instrument used in a previous study [8]. The questionnaire consisted of questions related to the sociodemographic data of children and their families (city, state, age, family income, schooling, and number of children), the impact of the COVID-19 pandemic on family routine, income, eating habits, oral hygiene practices, demand for dental care for children, and children's oral health condition perceived by parents/caregivers and the period of social isolation prevented the face-to-face application of the questionnaires.

A pilot study was conducted with 25 parents/caregivers not included in the final sample. The pilot study was carried out to evaluate the methodology and the instrument that would be used and to carry out the possible necessary modifications according to the feedback obtained. The data analysis from the pilot study showed no need for any changes in the questionnaire.

Data Analysis

Data was analyzed using the Statistical Package for the Social Sciences software (SPSS for Windows, version 21.0, SPSS Inc., Armonk, NY, USA). Descriptive analysis (absolute and relative frequencies) was performed for all variables. Pearson's chi-square test, Fisher's exact test, and linear trend were used to assess the association between dependent variables and each independent variable. Z-tests with Bonferroni correction were performed to detail the results obtained in the contingency tables. The significance level was $p \leq 0.05$. Cronbach's alpha coefficient with a recommended value above 0,5 was used to assess the instrument's reliability [21].

Results

A total of 119 parents/caregivers responded to the questionnaire. For this sample, the power of the test was 85.6%, considering a β error of 0.05, a minimum effect of 0.30, and a β/α ratio of 1. Among the participants, 89.90% were mothers, with a mean age of 33.42 (±6.05) years. The minority (6.70%) of participants reported not avoiding usual activities aborded in the questionnaire during the pandemic due to fear of getting COVID-19, such as going to health offices/clinics, grocery stores, work, and schools, and visiting relatives and friends. Almost half of families (47.90%) had income slightly reduced with the pandemic. Just over half of children had no change in eating habits (54.60%) during social isolation, and 81.50% maintained regular oral hygiene. The vast majority (84.00%) of parents/caregivers responded that they would take their child to a dental appointment only in case of emergency. Of the total number of parents/caregivers, 89.10% did not notice dental caries, 92.40% did not observe toothache, and 92.40% did not identify dental trauma in their children (Table 1).

Table 1. Descriptive analysis of sociodemographic characteristics and changes in behavior and oral health condition of early childhood children during social isolation caused by COVID-19, perceived by their parents/caregivers.

Variables	Frequency	
	N	%
Demographic Data		
Number of children aged between 0-5 years		
Average (+/- DP)	1.21 (0.53)	
Kinship's degree		
Mother	107	89.90
Father	7	5.90
Grandparents	5	4.20
Socioeconomic Data		
Family income*		
≤2 Brazilian minimum wage	36	30.30
>2 minimum wage	83	69.70
Caregiver's schooling		
≤8 years	6	5.00
>8 years	113	95.00
Impact of the Pandemic		
Family routine		
Performed social isolation	111	93.30
Did not perform social isolation	8	6.70
Family Income		
Non impacted	39	32.80

Slightly reduced	57	47.90
Dramatically reduced	20	16.80
Total loss	1	0.80
Increase	2	1.70
Eating Habits		
Eating cheaper food	24	20.20
Eating more than before	29	24.40
Eating less than before	1	0.8
No change in eating habits	65	54.60
Food Consumption		
Consuming more healthy food	26	21.80
Consuming less healthy food	39	32.80
There was no change	54	45.40
Children's oral hygiene		
Possible to perform	97	81.50
Not possible to perform	2	1.7
Possible sometimes to perform	20	16.80
Children's dental appointment		
Wouldn't take the children to the dentist	12	10.10
Would take the children to dental appointments only in case of emergency	100	84.00
Would take children to dental appointments for any procedure	7	5.90
Presence of dental trauma in children		
No	110	92.40
Yes, the children were treated shortly after dental trauma	7	5.90
Yes, there was no search for a dental appointment	2	1.70
Yes, there was a search, but no dental appointment was performed	0	0.00
Presence of dental caries in children observed by the caregiver		
No	106	89.10
Yes, I sought care, and my child was attended	9	7.60
Yes, there was no search for a dental appointment	4	3.40
Yes, there was a search, but no dental appointment was performed	0	0.00
Presence of toothache in children		
No	110	92.40
Yes, I sought care, and my child was attended	9	7.60
Yes, there was no search for a dental appointment	0	0.00
Yes, there was a search, but no dental appointment was performed	0	0.00

*Brazilian minimum wage is equivalent to R$1.212,00 or US$214,89.

An association between the impact of the pandemic on family income and changes in eating habits was observed (p=0.02). Z tests with Bonferroni correction showed that families with drastic income reduction were more likely to consume lower-cost foods (62.50%) than families with no impact or had a slight reduction in family income (Table 2). An association between family income and dental caries perceived by parents/caregivers was observed (p=0.05). For 72.60% of children in which dental caries were not noticed by their parents/caregivers, family income was greater than two minimum wages (Table 3).

The instrument showed acceptable reliability. Cronbach's alpha coefficient was 0.56 for the entire questionnaire.

Table 2. Association between family socioeconomic conditions and changes in diet and oral hygiene habits of early childhood children perceived by parents/caregivers during social isolation caused by COVID-19.

Socioeconomic Variables	Changes in Eating Habits					Changes in Oral Hygiene Habits			
	No change N (%)	Lower cost foods N (%)	Higher consumption N (%)	Lower consumption N (%)	p-value	It was not possible N (%)	It was possible N (%)	Possible sometimes N (%)	p-value
Family income									
≤2 wage	13 (20.00)	16 (66.70)	7 (24.10)	0 (0.00)	0.63†	2 (100.00)	29 (29.90)	5 (25.00)	0.23†
>2 wage	52 (80.00)	8 (33.30)	22 (75.90)	1 (100.00)		0 (0.00)	68 (70.10)	15 (75.00)	
Caregiver's schooling									
≤8 years	4 (6.20)	2 (8.30)	0 (0.00)	0 (0.00)	0.32†	0 (0.00)	6 (6.20)	0 (0.00)	0.34†
>8 years	61 (93.80)	22 (91.70)	29 (100.00)	1 (100.00)		2 (100.00)	91 (93.80)	20 (100.00)	
Impact of the pandemic on income									
No impact	29 (44.60)	1 (4.20)	9 (31.00)	0 (0.00)	0.02‡	0 (0.00)	31 (32.00)	8 (40.00)	0.73‡
Slight reduction	32 (49.20)	7 (29.20)	17 (58.60)	1 (100.00)		1 (50.00)	49 (50.50)	7 (35.00)	
Drastic reduction	4 (6.20)	15 (62.50)	1 (3.40)	0 (0.00)		1 (50.00)	15 (15.50)	4 (20.00)	
Total loss	0 (0.00)	1 (4.80)	1 (3.40)	0 (0.00)		0 (0.00)	1 (1.40)	0 (0.00)	
Increase on income	0 (0.00)	0 (0.00)	2 (6.90)	0 (0.00)		0 (0.00)	1 (1.40)	1 (5.00)	

†Fisher's exact test; ‡Linear by linear.

Table 3. Association between socioeconomic conditions of the family and changes in oral health condition of early childhood children perceived by parents/caregivers during social isolation caused by COVID-19.

Socioeconomic Variables	Dental Caries			Toothache			Dental Trauma		
	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value
Family income									
≤2 wage	7 (53.80)	29 (27.40)	0.05*	3 (33.30)	33 (30.00)	0.55†	3 (33.30)	33 (30.00)	0.54†
>2 wage	6 (46.20)	77 (72.60)		6 (66.70)	77 (70.00)		6 (66.70)	77 (70.00)	
Caregiver's schooling									
≤8 years	2 (15.40)	4 (3.80)	0.12†	2 (22.20)	4 (3.60)	0.12†	1 (11.10)	5 (4.50)	0.38†
>8 years	11 (84.60)	102 (96.20)		7 (77.80)	106 (96.40)		8 (88.90)	105 (95.50)	
Impact of the pandemic on income									
No impact	3 (23.10)	36 (34.00)	0.11‡	3 (33.30)	36 (32.70)	0.69‡	5 (55.60)	34 (30.90)	0.63‡
Slight reduction	4 (30.80)	53 (50.00)		3 (33.30)	54 (49.10)		1 (11.10)	55 (50.90)	
Drastic reduction	6 (46.20)	14 (13.20)		3 (33.30)	17 (15.50)		3 (33.30)	17 (15.50)	
Total loss	0 (0.00)	1 (0.90)		0 (0.00)	0 (0.00)		0 (0.00)	1 (0.90)	
Increase on income	0 (0.00)	2 (1.90)		0 (0.00)	2 (1.80)		0 (0.00)	2 (1.80)	

*Pearson's Chi-square; †Fisher's exact test; ‡Linear by linear.

Discussion

This study provides information on the impact of social isolation caused by the COVID-19 pandemic on oral health behavior and the oral health status of children in early childhood, according to the perceptions of their parents/caregivers. Previous studies have evaluated the behavior of populations during the pandemic, but most included samples of adult individuals [6,9,22]. Therefore, assessing the potential impacts of the COVID-19 pandemic on the behavior and oral health of individuals early in life is essential to prevent or delay the incidence of unwanted future conditions.

The results of this study showed that almost one-third of families had a slight income reduction, data similar to those obtained in a previous Brazilian study, in which 52.90% of participants reported a slight reduction in family income [8]. The new routine affected by income reduction can impact the well-being of families and other factors, such as unemployment and its consequences [8]. A systematic review showed that, during the quarantine, unexpected unemployment caused parents to be left without a source of income and the prospect of a new job. Those who still had jobs experienced an imminent fear of becoming unemployed, increasing stress levels and requiring families to adapt to a new reality [22]. However, these data do not match what was found in the study since no reports of job loss were found. This finding confirms previous results, as no significant changes occurred in budget or other variables.

The results showed that most parents/caregivers did not report significant changes in their children's dietary habits, unlike findings previously obtained by other authors, who observed an increase in the consumption of sugars and carbohydrates, both during and between meals, during the period of social isolation [8,10,11,17]. It has been suggested that people adopt fewer rigid behaviors when the daily routine is not followed. Thus, to escape the monotony, children and adolescents would increase their food consumption [17]. However, it is noteworthy that some studies that showed changes in eating habits included samples of individuals aged 0-18 years [8,10,17], which could explain the results obtained. Additionally, although a recently published study showed that the frequency of consumption of snacks and sugary liquids between meals increased in all age groups, the magnitude of this increase was smaller for younger children, as also observed that consuming healthy meals more frequently was associated with the presence of parents at home [17]. These factors may have contributed to the maintenance of behavior related to dietary habits in the sample investigated in the present study. Anyway, future studies should investigate if the pandemic included a new routine in the lives of children and adolescents or one-time changes that would increase consumption.

On the other hand, when the impact of the pandemic on family income was evaluated, an association with changes in eating habits was observed. Most families that started consuming lower-cost food during the pandemic had drastic income reductions, in accordance with a recent study that showed an excessive consumption of candy and chocolate among Spanish children whose parents suffered income losses during confinement [23]. In contrast, in the same study, an excessive consumption of these products was noticed in Portuguese families that did not suffer income losses [23]. Previous studies on the Brazilian population have linked low income with a higher intake of sugary foods [24] since lower-cost foods, such as ultra-processed foods, have high added sugars [8,9]. The frequency and amount of sugars consumed are important risk factors for developing and progressing dental caries [25].

In addition to diet, toothbrushing frequency also influences oral health maintenance. The results obtained in the present study showed that for most children, regular oral hygiene was maintained during the isolation period. These findings do not agree with similar studies, in which poor oral hygiene was observed

during the study period [4], as well as less effective tooth brushing among younger children [16,17]. On the other hand, children's regular oral hygiene was also maintained according to reports of parents investigated in previous studies [10,16,23]. As previously mentioned, the presence of parents/caregivers at home may also justify the maintenance of behaviors related to oral hygiene habits in this sample, consisting of children in early childhood who depend on their parents/caregivers for brushing their teeth. Thus, this result can be attributed to the greater presence of parents/caregivers at home, corroborating the findings of a study conducted in Wuhan, China [10,11]. However, maintaining oral hygiene at home may not necessarily mean maintaining oral health, as observed in a study in which 23.30% of parents reported worsening their children's oral health condition despite maintaining regular oral hygiene [16].

In this sense, when the oral health condition of children during the social isolation caused by COVID-19 was evaluated, it was found that most parents/caregivers did not notice dental caries, toothache, or dental trauma in their children. These results are similar to those obtained in another study carried out in Brazil, whose data showed that 90.10% of participating parents/caregivers did not notice dental caries, 93.90% did not observe toothache, and 93.80% did not identify dental trauma in their children [8]. On the other hand, parents/caregivers investigated in a study conducted in China observed dental caries and toothache in children in a more significant proportion (60.80% and 35.50%, respectively). Concerning dental trauma, the percentage of affected children, according to the perception of parents/caregivers, was even lower (1.40%) [10,11]. It is also noteworthy that all participants who observed toothache sought dental care, and almost all cases of identified dental trauma were followed; however, nearly half of parents/caregivers who noticed dental caries in children did not seek dental treatment during the pandemic.

The difficulty in inspecting the child's oral cavity, the limited communication of the age group evaluated, as well as the presence of caries lesions at early stages, and the occurrence of mild dental trauma may have contributed to the obtained results. The perception of parents/caregivers about changes in their children's oral cavity is more evident when it is capable of causing pain, functional limitation, and aesthetic impairment [26]. Parents/caregivers may not have noticed caries lesions in their early stages since many parents can only perceive dental caries when accompanied by toothache [26]. The data show that new carious lesions were diagnosed more frequently in younger children, given that, in a previous study with children aged 1-18 years, among those who sought dental follow-up during the pandemic, new caries lesions were diagnosed more frequently in those under six years of age (16.25% of the total sample) [17]. As previously mentioned, dental caries is the dental clinical condition most associated with pain, as demonstrated in a Brazilian study in which clinically visible pulp exposures from untreated lesions were associated with the highest prevalence of toothache [27]. In the present study, most parents/caregivers did not notice toothache in their children, which can be explained by the fact that no serious and consequently more visible injuries were present, with a greater probability of painful symptoms.

In turn, dental trauma in children is considered a public health problem due to its high prevalence, impact on quality of life, and long-term consequences for children's oral health [28]. Accidental falls are the most common cause of traumatic dental injuries in children [12,13], especially in infants and preschool children [29], for whom the home is the place where trauma occurs most frequently [19]. It was expected, therefore, to have noticed a higher occurrence of trauma to the deciduous teeth among children, which, however, was not reported by the parents/caregivers participating in the study. The same results were reported recently in a study with Portuguese and Spanish children [23]. A more significant number of traumatic injuries in primary teeth may have gone unnoticed or neglected by parents/caregivers [30].

Regarding the association between family income and dental caries perceived by parents/caregivers in children, most who did not perceive dental caries had family income greater than two minimum wages. Parents' responsibilities and daily activities increased during social isolation, including work demands, child care, and household chores [4]. Therefore, parents/caregivers may have been unable to care for their children's oral health. In addition, even though children were not clinically examined due to social distancing from the pandemic, a possible explanation is that dental caries in children is associated with the family's socioeconomic level, as reported in the literature [31]. General trends worldwide suggest that low socioeconomic status, due to social inequalities and poverty, predispose children to high risk for dental caries [32,33], as individuals with lower socioeconomic status present less access to health services, worse oral hygiene standards, and higher intake of sugary foods [24,33]. Therefore, parents with a family income greater than two minimum wages may not have noticed the presence of dental caries in their children during the pandemic because these children do not have the disease.

Nonetheless, as previously mentioned, families with lower-cost food had drastic income reductions. Therefore, consuming lower-cost foods rich in sugar may have implications for children's dental caries in the post-COVID-19 period. Future studies should be performed to confirm this implication.

The results obtained in this study may have some interesting implications for clinical practice. However, contributions must be evaluated after their limitations have been identified. First, a convenience sample was used, which limits the possibilities of generalizing results. Thus, further similar investigations with larger samples in other locations should be conducted to extend the results of this study to other populations. Another possible limitation comes from self-report measures, which can be affected by memory biases and responses based on social desire [17], which is inherent to studies that involve questions directed to participants [14,15]. However, given the scenario of the COVID-19 pandemic in which the research was carried out, the period of social isolation prevented the application of face-to-face questionnaires and the performance of clinical examinations. Finally, the study has a cross-sectional design, which prevents the analysis of causality among variables.

Despite the limitations pointed out, results have comparative value, were analyzed in an unprecedented period in contemporary history [14,15], and refer to an age group in which environmental factors of lifestyle can have repercussions on the increase or reduction of the risk of adverse health events in the future [11,18]. Data obtained in this study could help plan health strategies for the care of children in early childhood against possible oral and behavioral damage caused by confinement due to the pandemic. Future investigations should include analyzing mixed methods to understand the qualitative aspects of behaviors adopted during this pandemic, as previously suggested [14,15].

In addition, pediatric dentists should be aware of behavioral changes in children aged 0-5 years that occur during social isolation so that possible unwanted habits installed in this period do not persist throughout childhood, which could lead to negative consequences for general and oral health [17]. Therefore, pediatric dentists should encourage parents/caregivers to take their children for a periodic dental examination so that instructions, guidelines, and measures for preventing oral diseases and maintaining oral health are adopted, maintained, or reinforced.

Conclusion

Parents/caregivers of Brazilian children aged 0-5 years perceived behavioral changes in the dietary habits of families whose income was impacted by the pandemic, and their perception of dental caries was significantly associated with family income.

Authors' Contributions

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All authors declare that they contributed to a critical review of intellectual content and approval of the final version to be published.

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Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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