Pesquisa Brasileira em Odontopediatria e Clínica Integrada 2023; 23:e210099
https://doi.org/10.1590/pboci.2023.019
ISSN 1519-0501 / eISSN 1983-4632

ORIGINAL ARTICLE

Caregivers' Sense of Coherence and Untreated Dental Caries in Children and Adolescents: A Cross-Sectional Study

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Academic Editor: Catarina Ribeiro Barros de Alencar

Received: 10 October 2021 / **Review:** 07 April 2022 / **Accepted:** 24 May 2022

How to cite: Mattos MG, Luiz RR, Maia LC, Neves AA. Caregivers' sense of coherence and untreated dental caries in children and adolescents: a cross-sectional study. Pesqui Bras Odontopediatria Clín Integr. 2023; 23:e210099. https://doi.org/10.1590/pboci.2023.019

ABSTRACT

Objective: To associate caregivers' sense of coherence (SOC) and untreated caries with oral health status in children covered by a dental public health system. **Material and Methods:** A convenience sample of caregivers/children in Angra dos Reis, Brazil, was surveyed. Caregivers' SOC was evaluated using the 13-question version questionnaire. For both caregivers/children, sociodemographic information was acquired and caries experience was evaluated by DMFT/dmft and PUFA/pufa index. Statistical associations between children's untreated carious teeth and interest variables from the caregivers were evaluated by binary logistic regression assessed by generalized linear modeling. **Results:** A total of 233 pairs of caregivers-children were included. Children's untreated permanent and primary carious teeth represented 34.8% and 62.2% of the caries experience, respectively and at least one PUFA/pufa scored tooth was detected in 22.7% of them. Caregivers' DMFT was 13.5±7.0, while 33.6% scored on PUFA. A total of 62.1% of them presented untreated carious lesions. Results from the univariate model, correlating children's untreated caries and caregivers' attributes showed a statistical significance for SOC values ($p<0.015$), untreated decayed teeth ($p<0.035$), self-perception of oral health ($p<0.022$) and oral impact on daily performance ($p<0.010$). The multivariate logistic first model kept the statistical significance only for the caregiver's untreated decayed teeth. **Conclusion:** Caregivers' SOC and untreated carious teeth could be used as indicators of dental treatment needs in their offspring.

Keywords: Oral Health; Public Health; Dental Caries; Sense of Coherence; Mother-Child Relations.

Introduction

Dental professionals, especially those working in underprivileged communities, frequently have to deal with the high demand for untreated carious teeth and its consequences [1]. In fact, dental caries is still one of the most prevalent chronic diseases worldwide, and the challenge nowadays is to target the diversity of local, systemic, and sociocultural factors which may foster its onset and progression [2].

Dental caries lesions are resulted from the imbalance of a biofilm-organized polymicrobial community comprising the individuals' resident bacteria that metabolize sugars leading to the demineralization of enamel and dentin [3]. In the presence of fluoride, calcium and phosphate ions supplied by saliva, remineralization of tooth tissues may also take place, but caries progress will occur if the net demineralization result is higher than the re-mineralization process [4]. A diversity of factors has been studied to affect this imbalance, including the directly involved individual factors or the indirect factors which may be present at the family and community levels [5]. Evidence indicates that individual factors, including oral health behaviors [6], salivary composition, flow rate and pH buffering capacity of saliva [7], morphological features and position of the teeth in the oral cavity [3], fluoride exposure [8], genetic susceptibility [9] and sociodemographic characteristics may directly influence caries development [6]. In addition to that, parental factors, such as oral health behaviors, mothers' age, socioeconomic, education and occupation status, sugar consumption, self-oral care attitudes, and their caries experience, have been suggested as dependent factors influencing their offspring's oral health [10-12].

Moreover, psychological and emotional aspects have also been recognized as influencers of oral health, such as locus of control, self-efficacy, social support, self-esteem and sense of coherence (SOC) [13]. The sense of coherence represents an internal resource that enables people to manage stressful situations, identifying and mobilizing their external and internal resources, promoting effective coping, finding solutions, and resolving tension in a health promoting manner. It is used to measure the degree of individual ability to cope with stressful daily situations [14]. As children and adolescents are directly influenced by caregivers' behavior, their social relations and coping mechanisms might be important factors related to their own oral health and of other family members. In this perspective, although caregivers' SOC has already been explored as an essential model for their children/adolescents' oral health [14-17], there is still a place for confirmatory data to support this assumption.

The hypothesis of this study was that caregivers' SOC is associated with better oral health conditions not only on their own but also in their children/adolescents. Thus, the aim of the present study was to investigate the association between caregivers' SOC and oral health conditions, reflected by levels of untreated disease in their offspring.

Material and Methods

Data Source and Ethical Clearance

A cross-sectional study was carried out between 2016 and 2018 in the municipality of Angra dos Reis-RJ, Brazil. The majority of the residents in this location work in tourist and fishing sectors. The city is located in the southern coast region of Brazil and in the year 2018, the estimated population was about 127.3 individuals/km2, divided into a continental and an island location (Baía da Ilha Grande). According to the last Brazilian census data, the population is characterized as belonging to a socioeconomically disadvantaged community, with more than 60% of the population living on a maximum of 5 minimum wages and depending almost exclusively on public health services [18]. The region is supplied with non-fluoridated water.

The present study was conducted in accordance to the Ethics Committee of Federal University of Rio de Janeiro (protocol 1.499.665/2016). Participants were informed of the aims of the research, and informed consents were obtained before the start of the study.

Sample size was obtained by convenience and recruitment occurred from January to December 2017. The population included pairs of caregiver-children/adolescents, and the sample composition was based on a direct invitation to users of the Brazilian Public Family Oral Health Program, which lived either in the island (Araçatiba, Praia de Fora, Japariz e Freguesia de Santana) or in the continental part of the city (local fishermen community). Inclusion criteria for participants were: to be a user of the Brazilian public health system; being a caregiver of one or more children/adolescents enrolled in a public school and thus, forming one or more pairs of participants with their children or adolescents. The exclusion criteria were individuals presenting systemic diseases affecting the oral cavity; those using orthodontics appliances and individuals with the diagnosis of enamel or dentine developmental defects. If the caregiver was excluded, so would be the offspring and vice-versa.

Data Collection

Data collection was performed in a private room at different spaces (home, school, public health unit), where the caregivers were interviewed regarding their oral health and were asked to fill out the SOC questionnaire. The clinical examinations were performed under similar aspects of illumination and position of the participants among the different settings. They were recruited from both the island and the continental district of the city.

Caregivers' data collection was obtained through; (i) a self-administered SOC questionnaire, (ii) sociodemographic findings, (iii) an oral health interview, and (iv) an oral examination. For both caregivers and children/adolescents, the oral examination included scoring of DMFT/dmft index (number of decayed, missing or filled primary/permanent teeth due to dental caries), which was obtained according to the World Health Organization (WHO) criteria [18] For the examination of clinical consequences of untreated dental caries, the pufa/PUFA index was applied, as described previously [19].

The calibration process was divided into a theoretical session, clinical case discussions and patient examinations between two of the authors (M.G.M. and A.A.N.). Theoretical and clinical case discussion training was focused on DMFT/dmft and PUFA/pufa indexes. After this training, an initial clinical examination was performed on 20 volunteers, varying from children to caregivers in the pediatric dental clinic of the Federal University of Rio de Janeiro. After 1-week, the same examiners conducted another clinical examination on the same volunteers to obtain intra- and inter-reproducibility indexes, calculated by Cohen-Kappa statistic. The dmft/DMFT scoring demonstrated an inter- and intra-examiner agreement of 0.9 and 0.85, respectively and for pufa/PUFA indexes, inter- and intra-examiner agreement were 0.87 and 0.83, respectively.

The Antonovsky's 13-question version of the SOC instrument, composed of a five-point Likert scale and previously validated for the Brazilian population [20], was used in the present study. The higher the sum of the scores, the stronger was the SOC of the participant. Low SOCs demonstrate weakness in dealing with challenging daily situations. Sociodemographic data collected from caregivers were: age, gender, employment status, education and socioeconomic level. The oral health interview comprised a history of toothache and questions about their self-perception of oral health and its impact on performance of daily activities during the previous 6 months, as suggested by the National Oral Health Policy Survey Guidelines (Brasil Sorridente, 2010) [21]. The interview also investigated the participants' opinion on the importance of the primary dentition, history of smoking and the use of removable dental prosthesis. During data collection, 10% of the participants'

questionnaires (SOC and oral health interviews) were repeated to access the level of concordance and understanding of the questions.

Children and adolescents' data collection were performed through: (i) sociodemographic and (ii) oral health interviews, and (iii) oral examination. Type of school (full-time or part-time), school attendance, gender, age, and number of siblings were explored in the sociodemographic interview. Respondents were asked about the frequency of toothbrushing, the frequency of sugar consumption, history of toothache and self-perception of oral health. Finally, to check if children had oral health education activities in the school environment, participants were asked about toothbrushing habits during the school period. The respondents were children/adolescents with good cognitive ability, otherwise, the correspondent caregivers were invited to answer the questionnaire.

The SOC scale was divided into high and low, according to the median score obtained (41). The criteria "self-perception of oral health" was grouped into "satisfactory" (for the respondents that answered "very satisfied", "satisfied" and "nor satisfied nor unsatisfied") and into "unsatisfactory" (for those that responded "unsatisfied" and "very unsatisfied"). The oral health impact on daily performance was dichotomized into "none/slight affected" and "very affected". Each of the nine questions was equivalent to one point; therefore, the total variable varied from one to nine. The first category corresponded to participants achieving 0 to 4 points, whereas the remaining (5 to 9 points) were categorized as "very affected". The importance attributed to the primary dentition was divided into the categories "value" (including caregivers that answered very important and important) and "no value" (those responding that they did not know).

The co-variant "frequency of toothbrushing" was divided into "once" and "more than once". Frequency of sugar consumption was categorized as "often" (for those consuming sugar every day and some days in the week), or as "not often" (for those ingesting sugar only on the weekend and never). Students were considered to brush their teeth "always" and "sometimes" and, regarding oral health activities at school, they were grouped into "present" and "not present".

Considering the clinical oral examination, primary or permanent teeth under the status of decayed or filled with caries were categorized as "untreated caries". The DMFT/dmft, pufa/PUFA index and untreated caries were first categorized into their presence or absence for each participant. The DMFT index obtained for the caregivers was classified into 0-4; 5-10; and more than 10. The caregivers´ component M (missing) was obtained from the DMFT index to compose the co-variable "severity of edentulism". The severity of edentulism was grouped into low; moderate (1-4 teeth); and severe (more than 5 teeth). The dmft index was scored into caries-free, 1 to 4 and more than 5 carious teeth.

Data was tabulated and analyzed using SPSS version 21.0 (IBM, Armonk, NY, USA). Descriptive statistics were conducted to obtain absolute and percentage distribution, mean, median and standard deviation of the variables. The main outcome to be correlated with SOC scores was defined as children/adolescents' untreated primary/permanent decayed teeth, and the co-variants used were divided into those originating from caregivers and those from children/adolescents. Associations between the variables were determined using the chi-square and Mann-Whitney tests. A binary logistic regression was used to elaborate multivariate logistic models associating the outcome "untreated primary/permanent carious teeth" among children/adolescents and caregivers to their own demographics. Oral health characteristics obtained by the interview were assessed by generalized linear modeling (GLM). The level of significance was set at 0.05. Odds ratios (OD) were reported with 95% confidence intervals (CI). Although sample size calculation was not performed "a priori", power analysis resulted in 0.8521, considering the final sample size used.

Results

Initially, 255 pairs of caregivers-children were selected for the study, but only 233 caregiver-child/adolescent pairs were included in the analysis. The reasons for exclusion were: rejection to participate (7), absenteeism from school (3), and incompletely filled questionnaires (12).

Children/adolescents group were similarly distributed between girls (46.8%) and boys (53.2%) with a mean age of 8.3±4.2 years-old. Caries-free individuals represented 36% and 57.6% in primary and permanent teeth, respectively, while 22.7% scored on the pufa/PUFA index and the mean dmf-t/DMF-T was 2.9±3.3/1.4±2.4. The prevalence of untreated primary and permanent decayed teeth was 59.9% and 34.8%, respectively. There was no statistical difference between gender and the occurrence of untreated carious teeth. Table 1 displays the children/adolescents' demographic characteristics. There was no difference between those findings concerning the island or continent populations, except for the age (p <0.001), which was lower on the island and the oral education activities at school (p <0.001), which were also more frequent in the island, as shown in Table 1.

Table 1. Children/adolescents´ characteristics according to the living district.

Variables	N (%)	Type of District		p-value¥
		Island N (%)	Continent N (%)	
Activity				0.273
Scholar	200 (85.8)	113 (83.7)	87 (88.8)	
Not scholar	33 (14.2)	22 (16.3)	11 (11.2)	
Gender				0.120
Female	109 (46.8)	69 (51.1)	40 (40.8)	
Male	124 (53.2)	66 (48.9)	58 (59.2)	
Age				<0.001
11 months-5y	82 (35.2)	60 (44.4)	22 (22.4)	
6-12y	112 (48.1)	60 (44.4)	52 (53.1)	
13-19y	39 (16.7)	15 (11.1)	24 (24.5)	
Nº siblings (N=231)				0.356
None	51 (22.1)	30 (22.4)	21 (21.6)	
1	93 (40.3)	49 (36.6)	44 (45.4)	
>1	87 (37.7)	55 (41)	32 (33)	
DMFT (N=158)				0.063
0 (carie-free)	91 (57.6)	53 (64.6)	38 (50)	
>0	67 (42.4)	29 (35.4)	38 (50)	
Untreated permanent decayed teeth (N=158)				0.129
0	103 (65.2)	58 (70.7)	45 (59.2)	
>0	55 (34.8)	24 (29.3)	31 (40.8)	
dmf (N=172)				0.381
0	62 (36)	43 (39.8)	19 (29.7)	
1-4	61 (35.5)	37 (34.3)	24 (37.5)	
>5	49 (28.5)	28 (25.9)	21 (32.8)	
Untreated primary decayed teeth (N=172)				0.389
0	69 (40.1)	46 (42.6)	23 (35.9)	
>0	103 (59.9)	62 (57.4)	41 (64.1)	
PUFA/pufa				0.391
0	180 (77.3)	107 (79.3)	73 (74.5)	
>1	53 (22.7)	28 (20.7)	25 (25.5)	
Untreated permanent/primary decayed teeth				0.170
0	88 (37.8)	56 (41.5)	32 (32.7)	
>0	145 (62.2)	79 (58.5)	66 (67.3)	
Frequency of toothbrushing (N=208)				0.315
>1x	177 (85.1)	97 (82.9)	80 (87.9)	
1x	31 (14.9)	20 (17.1)	11 (12.1)	
Frequency of sugar consumption (N=166)				0.524
Not often	111 (66.9)	67 (65)	44 (69.8)	
Often	55 (33.1)	36 (35)	19 (30.2)	
Toothache history (N=211)				0.102
No	124 (60.2)	75 (65.2)	52 (54.2)	

Yes	84 (39.8)	40 (34.8)	44 (45.8)	
Self-perception of oral health (N=177)				0.198
Satisfactory	94 (53.1)	61 (57)	33 (47.1)	
Unsatisfactory	83 (46.9)	46 (43)	37 (52.9)	
Oral health education activities at school (N=200)				<0.001
Present	102 (51)	71 (68.8)	31 (35.6)	
Not present	98 (49)	42 (37.2)	56 (64.4)	

¥p-value was calculated by the qui-square test; DMFT: Decayed, Missing, and Filled Teeth; PUFA: Pulpar Involvement, Ulceration, Fistula and Abscess.

For the caregivers, SOC scores ranged from 22 to 61 (mean 41.7±7.1). Mean DMFT was 13.5±7.0 and the percentage of them showing untreated carious teeth and PUFA scores were 62.1% and 33.6%, respectively. Table 2 synthetizes caregivers' findings.

Overall, the demographics of the participants in the study were similar in the investigated categories independently of their living district (island *versus* continent; Tables 1 and 2). Thus, the total sample was considered uniform for the statistical analysis.

Table 2. Caregivers´ characteristics according to the living district (N=178).

Variables	N (%)	Type of District		p-value¥
		Island N (%)	Continent N (%)	
Sense of Coherence (N=166)				0.931
High	99 (59.6)	54 (59.3)	45 (60)	
Low	67 (40.4)	37 (40.7)	30 (40)	
DMFT§				0.601
0 - 4	23 (16.4)	11 (13.9)	12 (19.7)	
5 – 10	36 (25.7)	22 (27.8)	14 (23)	
> 10	81 (57.9)	46 (58.2)	35 (57.4)	
Untreated decayed teeth§				0.750
0	53 (37.9)	29 (36.7)	24 (39.3)	
>1	87 (62.1)	50 (63.3)	37 (60.7)	
Missing teeth severity§				0.954
None	44 (31.4)	24 (30.4)	20 (32.8)	
Moderate (1-4 teeth)	49 (35)	28 (35.4)	21 (34.4)	
Severity (> 5 teeth)	47 (33.6)	27 (34.2)	20 (32.8)	
PUFA§				0.296
0	93 (66.4)	50 (63.3)	43 (70.5)	
>1	47 (33.6)	29 (36.7)	18 (29.5)	
Toothache history of (N=115)				0.739
No	54 (47)	32 (45.7)	22 (48.9)	
Yes	61 (53)	38 (54.3)	23 (51.1)	
Presence of related oral problems (N=144)				0.952
None	44 (30.6)	24 (30.8)	20 (30.3)	
Yes	100 (69.4)	54 (69.2)	46 (69.7)	
Self-perception of oral health (N=122)				0.179
Satisfactory	65 (53.3)	42 (58.3)	23 (46)	
Unsatisfactory	57 (46.7)	30 (41.7)	27 (54)	
Oral impact on daily performance (N=120)				0.721
None/slight affected	93 (77.5)	55 (76.4)	38 (79.2)	
Very affected	27 (22.5)	17 (23.6)	10 (20.8)	
Knowledge about primary dentition (N=145)				0.141
Value	97 (66.9)	57 (72.2)	40 (60.6)	
No value	48 (33.1)	22 (27.8)	26(39.4)	

¥p-value was calculated by the chi-square test; §Total of participants submitted to clinical dental exam was 140; DMFT: Decayed, Missing, and Filled Teeth; PUFA: Pulpal Involvement, Ulceration, Fistula and Abscess.

Results from the univariate model analyses assessed by generalized linear modeling (GLM) for the children/adolescents' characteristics showed that five co-variables were associated with the presence of the outcome (untreated caries in primary/permanent tooth), including number of siblings (p=0.003), frequency of sugar consumption (p<0.003), history of toothache (p<0.001), self-perception of oral health (p<0.001) and

absence of oral health education activities at school (p<0.013), with a poor self-perception of health and with a high oral impact on daily performance. Moreover, caregivers' attributes tested in that model showed a statistical significance for SOC values (p<0.015), untreated decayed teeth (p<0.035), self-perception of oral health (p<0.022) and oral impact on daily performance (p<0.010). The first multivariate logistic model assessed by GLM, including all variables together, kept statistical significance except for the co-variables number of siblings and oral health education activities in the children/adolescents' group. Concerning the caregivers' variables, however, only untreated decayed teeth remained statistically significant in such model (Table 3). The binary logistic regression models assessed by GLM were finally tested with the outcome and the predictors' frequency of sugar consumption, toothache history and self-perception of oral health were obtained from the children/adolescents' findings (Table 3). Thus, regression analyzes demonstrated that children/adolescents with untreated primary and permanent carious teeth have a 2.2 odds to have caregivers with low SOC-scale, and a 3.8 odds of having caregivers with untreated carious teeth (Table 3).

Table 3. Binary logistic regression models for the association between children/adolescents with untreated primary/permanent decayed teeth and demographics/oral characteristics from children/adolescents and their caregivers.

Variables	Univariate Logistic Model		Multivariate Logistic Model 1		Multivariate Logistic Model 2§		
	OR&	p-value	OR&	p-value	OR&	95% CI	p-value
Children/Adolescents' (N = 233)							
Type of district							
Island	1		1				
Continent	1.462	0.186	1.392	0.480			
Activity							
Scholar	1		1				
Not scholar	0.448	0.449	0.716	0.733			
Gender							
Male	1		1				
Female	0,812	0.431	1.380	0.909			
Age							
11 months-5y	1		1				
6-12y	1.538	0.139	1.254	0.721			
13-19y	1.849	0.121	0.636	0.551			
Nº siblings (N=231)							
None	1		1				
1	1.702	0.138	1.816	0.137			
>1	3.129	0.003	1.807	0.103			
Frequency of toothbrushing (N=208)							
>1x	1		1				
1x	0.995	0.991	2.651	0.126			
Frequency of sugar consumption (N=166)							
Not often	1		1		1		
Often	3.046	0.003	0.319	0.014	3.101	1.29-7.47	0.012
Toothache history (N=211)							
No	1		1		1		
Yes	4.055	<0.001	5.635	0.001	5.929	2.50-14.07	<0.001
Self-perception of oral health (N=177)							
Satisfactory	1		1		1		
Unsatisfactory	4.604	<0.001	3.479	0.005	2.341	4.91-160.13	0.024
Oral health education activities at school (N=200)							
Present	1		1				
Not present	0.485	0.013	0.507	0.245			
Caregivers' (N=178)							
Sense of Coherence							

High	1		1	
Low	2.063	0.015	2.241	0.074
Untreated decayed teeth				
0	1		1	
>1	1.962	0.035	3.796	0.005
Self-perception of oral health (N=122)				
Satisfactory	1		1	
Unsatisfactory	2.175	0.022	1.098	0.836
Oral impact on daily performance (N=120)				
None/slight affected	1		1	
Very affected	1.276	0.010	1	1

&Odds Ratio; ¥Odds Ratio Adjusted.

Discussion

Despite the technical advances in dentistry, leading to improvements in individual-based oral health, a community approach is still essential to control the high prevalence of dental caries, especially in disadvantaged regions [22]. In fact, between 1990 and 2015, population-based oral health did not significantly improve around the world [2]. In view of this, the present survey assessed the relationship between the prevalence of children/adolescents' untreated dental caries lesions and caregivers' findings, including their SOC and oral health status, in an underprivileged community. Children/adolescents with untreated carious teeth had also caregivers with high levels of untreated dental caries and lower SOC. Similar results were also found in previous investigations [11,15].

The sense of coherence (SOC) is considered a psychosocial protective factor and it has been proposed as a useful tool to predict the occurrence of dental caries [15,23]. The theoretical basis underlying this instrument is that it reflects the individual's ability and ways he/she responds to daily stressful situations, which may give hints to the origin of the present health state, instead of focusing on the origin of the disease [24]. Thus, caregivers with high SOC are probably more concerned about oral health habits, such as consuming less sugar and brushing more frequently their teeth, stimulating thus, their offspring to follow those guidelines. This was probably reflected in the results of the present study, showing a statistically significant relationship between the SOC and untreated caries. Considering that oral health behavior affects the establishment of dental caries [25], these factors may have had a positive indirect effect.

However, while some studies corroborate the association between high maternal SOC levels and low prevalence of dental disease in their offspring [13,15], one study failed to demonstrate a significant relation between parents' SOC levels and oral health behavior in their children [17]. Despite being a valid, reliable and cross-culturally applicable instrument for measuring health [26], some discrepancies may occur, probably because a relationship between SOC and oral health may be based on diverse methodologies, both in SOC assessments or on evaluating the oral health variables [13].

DMFT/dmft index represents a morbidity dental caries score, but the component "missing" could erroneously include teeth lost due to trauma, premature exfoliation, orthodontic or prosthetic indication, and thus, these results should be carefully analyzed [27]. Therefore, in the present study, children/adolescents' untreated carious teeth were used as the main outcome in the present population-level survey, as it represents a more reliable measure to assess the decayed component of the dmft/DMFT index [27]. Notably, this sample of caregivers from Angra dos Reis showed an extremely high rate of untreated caries (approximately 62%), confirming the fact that oral health, unfortunately, still demands great improvement worldwide [2]. Another limitation of the DMFT index is the impossibility to identify the consequences of dental caries in individuals

[19]. This is more appropriately measured by the pufa/PUFA index, which aims to identify individuals experiencing consequences of dental caries to target appropriate interventions [19]. In the present study, caregivers had a higher value of this index (33.6%) compared with their offspring (22.7%), demonstrating that they should be given priority on dental care. Improving caregivers´ oral health might reduce the incidence of dental caries in their children/adolescents in the long term.

The Brazilian Federal National Constitution advocates health as "a citizen's right assured through economic and social policies aiming to reduce the risk for diseases and other health problems". Therefore, in 1988 the Brazilian government elaborated the Unified Health System assuming the commitment to provide comprehensive, universal, preventive and curative care to the general population [28]. In that context, in 2003, the National Oral Health Policy (Brasil Sorridente) was implemented, including dental professionals in the Public Family Oral Health Program. The population from the municipality of Angra dos Reis is composed predominantly of a low socioeconomic stratum, and thus they depend almost exclusively on public dental services and are exposed to a sugar and carbohydrate-rich diet, which cost less. Primary dental care represents the principal "gateway" to public health service in this municipality, and, according to the disease severity, users are referred to secondary or tertiary/hospital care. Although the administrative network of the Brazilian Health System is well structured, the main difficulties are the low financial resources, impacting the infrastructure and human resource availability [28]. Hence, oral health surveys are extremely positive to the community as they produce a situational diagnosis, allowing the targeting of those with oral care needs and helping to establish a more cost-effective oral health program [18].

Limitations of the present study include the low specificity of the oral health interview tool used, which included only details on the frequency of sugar consumption and toothbrushing habits. Moreover, "a priori" sample size calculation was not undertaken, but a reasonable power has been calculated from the sample size included. Despite the fact that studies based on cross-section design also present limitations due to prevalence-incidence bias, especially when dealing with chronic oral health conditions, they represent useful instruments for public health planning and are helpful in the understanding of disease etiology [29]. Dental caries is now considered a "dysbiosis", with progression triggered by non-disturbed microbial biofilm accumulation over tooth tissues [3]. Factors acting on the kinetics of progression include a sugar/carbohydrate-rich diet and behavior issues, being usually dictated by family habits. Thus, altogether, the present investigation builds more evidence on the parental' risks and protective factors affecting the occurrence of dental caries in their offspring [30,31] in order to more efficiently target vulnerable groups and more efficiently use financial resources in healthcare.

Conclusion

The present study showed evidence of the interaction between the binomial caregivers X children/adolescents oral findings in both communities of Angra dos Reis (island and continental), suggesting that the caregiver's untreated dental caries and sense of coherence might be considered as parental predictors of dental caries in their offspring. Indeed, the interaction between family members and children/adolescents demands a differentiated view in public policy guidelines to improve oral health promotion programs. Finally, the challenge of reducing the oral health inequalities affecting the majority of nations can only be resolved through individual, family and community efforts.

Authors' Contributions

MGM	https://orcid.org/0000-0001-6596-9195	Investigation, Writing - Original Draft, Writing - Review and Editing and Visualization.
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All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

Financial Support

The work was supported by the Department of Pediatric Dentistry and Orthodontics, School of Dentistry, Federal University of Rio de Janeiro, Brazil.

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.

References

[1] Freire MC, Daher A, Costa LR, Correa-Faria P, de Brito LC, Bonecker MJ, et al. Caries severity declined besides persistent untreated primary teeth over a 22-year period: Trends among children in Goiania, Brazil. Int J Paed Dent 2018; 29(2):1-9. https://doi.org/10.1111/ipd.12451

[2] Kassebaum NJ, Smith AGC, Bernabe E, Fleming TD, Reynolds AE, Vos T, et al. Global, regional, and national prevalence, incidence, and disability-adjusted life years for oral conditions for 195 countries, 1990-2015: a systematic analysis for the global burden of diseases, injuries, and risk factors. J Dent Res 2017; 96(4):380-7. https://doi.org/10.1177/0022034517693566

[3] Simon-Soro A, Mira A. Solving the etiology of dental caries. Trend Microbiol 2015; 23(2):76-82. https://doi.org/10.1016/j.tim.2014.10.010

[4] Kidd EA, Fejerskov O. What constitutes dental caries? Histopathology of carious enamel and dentin related to the action of cariogenic biofilms. J Dent Res 2004; 83:C35-C38. https://doi.org/10.1177/154405910408301s07

[5] Fisher-Owens SA, Gansky SA, Platt LJ, Weintraub JA, Soobader MJ, Bramlett MD, et al. Influences on children's oral health: A conceptual model. Pediatrics 2007; 120(3):e510-520. https://doi.org/10.1542/peds.2006-3084

[6] Arora A, Schwarz E, Blinkhorn AS. Risk factors for early childhood caries in disadvantaged populations. J Investig Clin Dent 2011; 2(4):223-8. https://doi.org/10.1111/j.2041-1626.2011.00070.x

[7] March PD, Do T, Beighton D, Devine DA. Influence of saliva on the oral microbiota. Periodontol 2000 2016; 70(1):80-92. https://doi.org/10.1111/prd.12098

[8] Fejerskov O. Changing paradigms in concepts on dental caries: Consequences for oral health care. Caries Res 2004; 38(3):182-91. https://doi.org/10.1159/000077753

[9] Vieira AR, Modesto A, Marazita ML. Caries: Review of human genetics research. Caries Res 2014; 48(5):491-506. https://doi.org/10.1159/000358333

[10] Tiwari T, Quissell DO, Henderson WG, Thomas JF, Bryant LL, Braun PA, et al. Factors associated with oral health status in american indian children. J Racial Ethn Health Disparities 2014; 1(3):148-56. https://doi.org/10.1007/s40615-014-0017-3

[11] Weintraub JA. Family matters: Influence of biology and behavior on oral health. N Y State Dent J 2007; 73(2):14-9.

[12] Rai NK, Tiwari T. Parental factors influencing the development of early childhood caries in developing nations: A systematic review. Front Publ Health 2018; 6:64. https://doi.org/10.3389/fpubh.2018.00064

[13] Silva AN, Alvares de Lima ST, Vettore MV. Protective psychosocial factors and dental caries in children and adolescents: A systematic review and meta-analysis. Int J Paed Dent 2018; 28(5):1-16. https://doi.org/10.1111/ipd.12375

[14] Mittelmark MB, Bauer GF. The meanings of salutogenesis. In: Mittelmark MB, Sagy S, Eriksson M, Bauer GF, Pelikan JM, Lindstrom B, et al. The Handbook of Salutogenesis. Springer; 2017. pp 7-13.

[15] Kaur M, Jindal R, Dua R, Gautam A, Kaur R. Salutogenesis: A new approach toward oral health promotion. Contemp Clin Dent 2017; 8(3):387-90. https://doi.org/10.4103/ccd.ccd_447_16

[16] Lage CF, Fulgencio LB, Correa-Faria P, Serra-Negra JM, Paiva SM, Pordeus IA. Association between dental caries experience and sense of coherence among adolescents and mothers. Int J Paed Dent 2017; 27(5):412-9. https://doi.org/10.1111/ipd.12275

[17] Qui RM, Wong MCM, Lo EC, Lin HC. Relationship between children's oral health-related behaviors and their caregiver's sense of coherence. BMC Public Health 2013; 13:239-45. https://doi.org/10.1186/1471-2458-13-239

[18] Instituto Brasileiro de Geografia e estatística. Censo demográfico 2010: Trabalho e rendimento. Resultados da amostra. Rio de Janeiro, 2010. Available from: https://biblioteca.ibge.gov.br/visualizacao/periodicos/1075/cd_2010_trabalho_rendimento_amostra.pdf [Accessed on May 10, 2021]. [In Portuguese].

[19] Petersen PE, Baez RJ. Oral Health Surveys: Basic Methods. World Health Organization; 5th ed; 2013. 125p.

[20] Monse B, Heinrich-Weltzien R, Benzian H, Holmgren C, van Palenstein-Helderman W. PUFA: An index of clinical consequences of untreated dental caries. Community Dent Oral Epidemiol 2010; 38(1):77-82. https://doi.org/10.1111/j.1600-0528.2009.00514.x

[21] Bonanato K, Branco DBT, Mota JPT, Ramos-Jorge ML, Paiva SM, Pordeus IA, et al. Trans-cultural adaptation and psychometric properties of the 'Sense of Coherence Scale' in mothers of preschool children. Interamerican Journal of Psychology 2009; 43(1):144-53.

[22] SBBrasil 2010. Manual da Equipe de Campo. Ministério da Saúde, Brasília, 51p. 2009. [In Portuguese].

[23] Skeie MS, Klock KS. Dental caries prevention strategies among children and adolescents with immigrant or low socioeconomic backgrounds: Do they work? A systematic review. BMC Oral Health 2018; 18:1-12. https://doi.org/10.1186/s12903-018-0478-6

[24] Silva AN, Mendonça MH, Vettore MV. The association between low-socioeconomic status mother's Sense of Coherence and their child's utilization of dental care. Community Dent Oral Epidemiol 2011; 39(2):115-26. https://doi.org/10.1111/j.1600-0528.2010.00576.x

[25] Eriksson M. The Sense of Coherence in the salutogenic model of health. In: Mittelmark MB, Sagy S, Eriksson M, Bauer GF, Pelikan JM, Lindstrom B, et al. The Handbook of Salutogenesis. Springer; 2017. pp 91-96.

[26] Harris H, Nicoll AD, Adair PM, Pine CM. Risk factors for dental caries in young children: a systematic review of the literature. Community Dental Health 2004; 21(1 Suppl):71-85.

[27] Eriksson M, Lindström B. Antonovsky's sense of coherence scale and the relation with health: a systematic review. J Epidemiol Community Health 2006; 60(5):373-81. https://doi.org/10.1136/jech.2005.041616

[28] Schuller AA, Horst D. Oral status indicators DMFT and FS-T: Reflections on index selection. Eur J Oral Sci 2001; 109(3):155-9. https://doi.org/10.1034/j.1600-0722.2001.00016.x

[29] Paim J, Travassos C, Almeida C, Bahia L, Macinko J. The Brazilian health system: History, advances, and challenges. Lancet 2011; 377(9779):1778-97. https://doi.org/10.1016/S0140-6736(11)60054-8

[30] Levin KA. Study design III: Cross-sectional studies. Evid Based Dent 2006; 7(1):24-5. https://doi.org/10.1038/sj.ebd.6400375

[31] Mattos MG, Fernandez CA, Masterson D, Maia LC, Neves AA. Is the caregivers' oral health related to dental caries in children or adolescents? A systematic review. Clin Oral Invest 2019; 23(10):3843-54. https://doi.org/10.1007/s00784-019-02814-2