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Influence of maternal dental anxiety on oral health–related quality of life of preschool children

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Abstract
Purpose The aim of this study was to determine the influence of maternal dental anxiety on perceptions about oral health–related quality of life (OHRQoL) of preschool children.
Methods A cross-sectional study was conducted with 608 mother–child dyads during the Children's National Immunization Campaign in Pelotas, Brazil. Mothers answered a questionnaire on dental anxiety (DAS), socioeconomic status, use of dental services, and perception of their child's OHRQoL (ECOHIS). The ECOHIS includes a child impact section (symptoms, function, psychological, self-image/social interaction domains) and a family impact section (parent distress and family function domains). Clinical examination of the children was performed to assess dental caries, dental trauma, and occlusal traits occurrence. The association assessment used Poisson regression models (RR; 95%CI, $P \leq 0.05$).
Results Anxious mothers presented higher scores in the parent distress domain. Higher impacts on OHRQoL were observed in children presenting untreated dental caries; children whose mothers had not completed primary education; and those who had non-regular use of dental services.
Conclusions Mean ECOHIS total score was not influenced by maternal dental anxiety. However, anxiety had a negative effect on the perception of the impact of the child's oral health problems in the family, affecting the parent distress domain.

Keywords Quality of life · Dental anxiety · Epidemiology · Pediatric dentistry · Oral Health

Abbreviations

DAS	Dental anxiety scale
ECOHIS	Early childhood oral health impact scale
OHRQoL	Oral health–related quality of life
RR	Relative risk
WHO	World Health Organization

Background

Children are subject to various clinical conditions that may affect their oral health status. However, clinical parameters alone do not measure the extent to which disorders disrupt normal role functioning. In many ways, traditional measures represent a limited one-dimensional aspect of oral health and need to be supplemented by information obtained from the patient or by proxy reports to document the consequences of oral disorder on oral health–related quality of life (OHRQoL) [1].

OHRQoL instruments are being increasingly used in oral health surveys [2], especially for adults or elderly populations. Only recently has this interest spread to children and

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adolescents, and specific measures appropriate to the age group under study have been developed. These instruments also take into account cognitive, social, and emotional development stages [3–5]. Information can be obtained either from the children themselves or from proxy respondents, usually parents [6].

When a proxy rating is used, it has been suggested that the respondents' characteristics may affect the perception about children's quality of life. In adults, it is recognized that self-rated oral health is influenced by socioeconomics, demographics, the cultural context, oral health conditions, and dental service use [7]. A knowledge of the adult and child factors that may influence parental perception of child's OHRQoL is fundamental, once parents hold child care responsibility.

In addition to quality of life, dental anxiety is an issue of central importance in dental care: quality of life helps to understand the impact of dental problems and the effectiveness of interventions on the patients' well-being, while dental anxiety has proven to be a major barrier to the access and the provision of appropriate dental care [8]. Studies have also shown that dental anxiety has a significant correlation with oral health impact on quality of life [8–13].

Maternal dental anxiety has been suggested as an indicator of the child's oral health and dental service use [14, 15]. However, its influence on the maternal perception of the child's OHRQoL has not been as yet studied. Thus, the purpose of this study was to determine the prevalence of maternal dental anxiety and its influence on the mother's perceptions of her child's OHRQoL. The primary hypothesis to be tested was that maternal dental anxiety could be associated with a worsened perception of the child's OHRQoL.

Methods

Study settings and population

This study was approved by the Human Research Ethics Committee of the Federal University of Pelotas under protocol number 052/2008. A cross-sectional study was carried out with 2- to 5-year-old children and their mothers in the city of Pelotas, located in southernmost Brazil. It has about 350,000 inhabitants, including 22,150 children up to 5 years of age [16].

To assess maternal dental anxiety prevalence, the estimated minimum sample size was calculated assuming the following parameters: dental anxiety prevalence estimated at 50%, margin of error of 5% points, and confidence level of 95%. Since the cluster sample selection was adopted, a design effect of 1.2 was estimated. To cover non-response, the sample was increased by 10% to 507 mother–child dyads.

A two-stage stratified sample design was adopted to select the sample during the Children's National Immunization Campaign in June 2009. According to the Ministry of Health, acceptance of the program in Pelotas was 90% among children up to 59 months. Of these children, only a small percentage (4%) was vaccinated in places other than public health centers, like schools or supermarkets. Nine health care centers were randomly selected out of 25 existing in town that have dental office facilities by using a probability selection method—with probability proportional to health center size. Health centers were used as sampling points because the city is divided into 7 administrative areas, each of them with at least one public health center responsible for the vaccination of those living in that area, ensuring representativeness of the city.

After the child had been vaccinated, mothers were invited to participate in the survey in order of arrival at the health center. All mothers signed an informed consent form and answered a questionnaire in Portuguese. Dental examination of the children was performed. Children with neurological or systemic diseases were not included.

Dependent variable

To assess maternal perception of the child's OHRQoL, the Brazilian version [17] of the Early Childhood Oral Health Impact Scale (ECOHIS) [3], developed and validated by Pahel et. al, was used. The ECOHIS was specifically developed for use in epidemiological surveys to assess preschool age child OHRQoL. It consists of 13 items, including a child impact section (symptoms, function, psychological, self-image/social interaction domains) and a family impact section (parent distress and family function domains). Answers were recorded using a Likert scale with response options coded 0–5 (0 = never; 1 = hardly ever; 2 = occasionally; 3 = often; 4 = very often; 5 = don't know). Mean ECOHIS scores were calculated for each domain and for the whole scale as a simple sum of the response codes, after recoding all "Don't know" responses as missing. For those with up to two missing responses in the child section or one in the family section, a score for the missing items was imputed as an average of the remaining items for that section [3]. No questionnaires were missing more than this maximum and no responses were excluded. Total score had a 0–52 range—the higher the score, the greater the impact of oral health problems and related treatment experiences on OHRQoL of preschool children and their families.

Independent variables

Maternal dental anxiety was the main independent variable studied. The Brazilian version of Corah's Dental Anxiety

Scale (DAS) was used [18]. It contains four multiple-choice items dealing with subjective reactions on going to the dentist and other dentally related situations: 1. If you had to go to the dentist tomorrow, how would you feel about it? 2. When you are waiting at the dentist's office for your turn in the chair, how do you feel? 3. When you are in the dentist's chair waiting while he gets his drill ready to begin working on your teeth, how do you feel? 4. You are in the dentist's chair to have your teeth cleaned. While you are waiting and the dentist is getting out the instruments which he will use to scrape your teeth around the gums, how do you feel? Each item can be scored on a 1 (*calm*) to 5 (*terrified*) scale. Tallied scores for all items gave totals varying from 4 to 20. Scores up to 11 represent a low anxiety state, whereas scores >11 indicate moderate to high anxiety levels [19].

World Health Organization (WHO) [20] criteria were used for dental caries assessment. Anterior tooth trauma presence was assessed using O'Brien's criteria [21]. Anterior open bite was assessed based on the lack of vertical overlap of the incisors in occlusal position. Overjet was considered increased when greater than 2 mm [22].

Demographic characteristics and socioeconomic status were collected with a questionnaire. Family monthly income was measured in terms of the Brazilian minimum wage, which corresponded to approximately 250 US dollars at the time of data collection. Educational level was assessed by comparing mothers that had completed more than 8 years of formal education, which in Brazil corresponds to primary school, with those who had not. Mothers were also asked about their use of dental services (regular or non-regular) [23] and whether their children had had a dental appointment.

Data collection

Twelve previously trained dental students performed the interviews with mothers before the oral clinical examination so as to avoid influence on the mothers' responses. Clinical oral examinations were performed by 12 dentists who were not aware of mothers' responses at the interview. The examiners had previous experience in oral health surveys and had been trained and calibrated at the Dentistry School. Training practice was first performed for a 4-h period. Then, dentists examined 15 children each. Inter-examiner agreement was tested against a gold standard examiner. Intra-examiner reliability was investigated by replicate examinations after a week [24]. Kappa statistics was used to test inter- and intra-examiner reliability for the three conditions assessed.

Dental examinations were performed at dental offices in health care centers under artificial light with a dental mirror and a WHO periodontal probe. Biosafety principles established by WHO were followed [20]. Mothers were informed of the oral health status of their children and those children who needed dental treatment were referred to the Dentistry School from the Federal University of Pelotas.

To test the proposed methodology, a pilot study involving 15 children was carried out before data collection.

Statistical analyses

The analyses were performed by using the STATA 10.0 (Stata Corporation, College Station, TX, USA). Unadjusted analyses provided summary statistics assessing the association between independent variables and total ECOHIS and mean domain scores. Multivariate Poisson regression models were fitted to assess overall and domain-specific ECOHIS score covariates. This strategy allowed estimating relative risks (RR) between comparison groups and their respective 95% confidence interval (CI). A forward stepwise procedure was used to include or exclude explanatory variables in model fitting. Variables with P values ≤ 0.20 in correlation assessment (unadjusted analyses) were included in model fitting. For final models, the variables were considered significant if they had a P value ≤ 0.05 after adjustment. Maternal dental anxiety was entered and retained in the final models, whether it was significant or not. The analyses took the clustered sample into account.

Results

Inter-examiner unweighed Kappa values ranged from 0.70 to 1 for occlusion (mean = 0.83), from 0.70 to 0.93 for dental trauma (mean = 0.78), and from 0.85 to 0.96 for dental caries (mean = 0.92). Intra-examiner Kappa value was 1 for occlusion and ranged from 0.70 to 1 for dental trauma (mean = 0.85) and caries (mean = 0.95).

A total of 685 mothers were invited to participate in the survey; 92% of them agreed to participate. Of the 630 mothers that answered the questionnaire, 3.5% ($n = 22$) were excluded from data analysis because of child refusal during clinical examination, totaling 608 mother–child dyads. The resulting sample had a 79% power to detect a minimum mean difference of 1.4 points in total ECOHIS scores.

Table 1 summarizes clinical characteristics of children and the demographic and socioeconomic characteristics of the sample. Dental anxiety prevalence was 40.5% (95%CI = 36.6–44.4). The mean ages of mothers and children were, respectively, 29.3 years (SD = 7.2) and 43.4 months (SD = 12.0). Thirty-nine percent of the children had early childhood caries (ECC), defined as the presence of one or more decayed tooth surfaces in any

Table 1 Demographic and socioeconomic variables, mother's dental anxiety, and clinical characteristics of children in Pelotas, Brazil ($n = 608$ mother–child dyads)

Variables	Categories	n[a]	Percent (%)
Sex	Male	301	49.5
	Female	307	50.5
Age (months)	24–35	175	28.8
	36–47	186	30.6
	≥48	247	40.6
Family income per month[b]	≥1.5 BMW	316	52.8
	<1.5 BMW	282	47.2
Maternal schooling (years)	>8	261	43.7
	≤8	345	56.9
Maternal dental anxiety	Low	362	59.5
	Moderate/high	246	40.5
Mother visit dentist	Regularly	242	39.8
	Non-regularly	366	60.2
Child visited dentist	Yes	126	20.7
	No	482	79.3
Anterior open bite	Absent	328	55.4
	Present	264	44.6
Overjet (mm)	<3	280	76.3
	≥3	87	23.7
Dental trauma	Absent	423	70.6
	Present	176	29.4
ECC	Absent	371	61.0
	Present	237	39.0

[a] The total was smaller than the effective sample ($n = 608$) due to missing information

[b] *BMW* Brazilian minimum wage, *ECC* early childhood caries

primary tooth of children younger than 72 months [25]. Only 1.7% of the children with dmft ≥1 had had restored or extracted teeth. Almost 80% of children had never had a dental appointment.

Total ECOHIS and domains scores are shown in Table 2. Total scores ranged from 0 to 42 with a 3.3 mean (SD = 5.4). Except for the family function domain, responses ranged from "never" (minimum) to "very often" (maximum). The highest mean was that for parent distress domain (0.9) and the lowest for the child self-image/social interaction domain (0.2). Four hundred and three mothers (58.9%) reported that their children had an impact on at least one ECOHIS item.

Table 3 shows ECOHIS mean scores according to presence of dental anxiety, the unadjusted and adjusted assessment of the association between maternal dental anxiety and total ECOHIS and domain-specific scores. In univariate analysis, maternal dental anxiety was significantly associated with higher total score means (RR = 1.45, 95%CI = 1.12–1.87, $P < 0.01$) and with the child's function (RR = 1.46,

Table 2 Descriptive distribution of total ECOHIS and domains scores. Pelotas/Brazil ($n = 608$ mother–child dyads)

ECHIS domains	Mean (SD)	Possible range	Range
Child section			
1. How often has your child had pain in the teeth, mouth, or jaws? (*Symptoms*)	0.5 (0.9)	0–4	0–4
How often has your child…because of dental problems or dental treatments? (*Function*)	0.8 (1.9)	0–16	0–16
2. Had difficulty drinking hot or cold beverages			
3. Had difficulty eating some foods			
4. Had difficulty pronouncing any words			
5. Missed preschool, daycare, or school			
How often has your child….because of dental problems or dental treatments? (*Psychological*)	0.7 (1.4)	0–8	0–8
6. Had trouble sleeping			
7. Been irritable or frustrated			
How often has your child … because of dental problems or dental treatments? (*Self-image/social interaction*)	0.2 (0.9)	0–8	0–8
8. Avoided smiling or laughing when around other children			
9. Avoided talking with other children			
Family section			
How often have you or another family member … because of your child's dental problems or dental treatments? (*Parent distress*)	0.9 (1.7)	0–8	0–8
10. Been upset			
11. Felt guilty			
How often … (*Family function*)	0.2 (0.8)	0–8	0–7
12. Have you or another family member taken time off from work because of your child's dental problems or dental treatments?			
13. Has your child had dental problems or dental treatments that had a financial impact on your family?			
Total ECOHIS	3.3 (5.4)	0–52	0–42

ECOHIS early childhood oral health impact scale, *SD* standard deviation

95%CI = 1.01–2.14, $P = 0.05$) and parent distress (RR = 1.81, 95%CI = 1.34–2.44, $P < 0.01$) domains. Anxiety influence on the function domain and total score was not confirmed after multivariate analysis. However, dental anxiety affected the parent distress domain (RR = 1.60, 95%CI = 1.20–2.13, $P = 0.02$), which assesses whether the respondent ever feels upset or guilty because of the child's dental problems or treatment.

The unadjusted assessment of associations found dental caries and trauma presence, the child's age, non-regular use

Table 3 Association between maternal dental anxiety and overall and domain-specific ECOHIS scores. Poisson regression analysis. Pelotas/Brazil ($n = 608$ mother–child dyads)

	High/moderate maternal dental anxiety Mean (± SD)	Low maternal dental anxiety Mean (± SD)	RR Unadjusted (95%CI)	*P*	RR[a] Adjusted (95%CI)	*P*
ECOHIS (*overall scale*)	4.06 (5.90)	2.80 (4.98)	1.45 (1.12–1.87)	<0.01	1.15 (0.88-1.53)	0.29
Domains						
Symptoms	0.61 (0.98)	0.48 (0.91)	1.28 (0.97–1.69)	0.08	1.18 (0.90–1.55)	0.25
Function	0.99 (2.06)	0.67 (1.79)	1.46 (1.01–2.14)	0.05	1.15 (0.76–1.74)	0.50
Psychological	0.77 (1.34)	0.64 (1.37)	1.19 (0.88–1.62)	0.26	1.14 (0.84–1.56)	0.39
Self-image	0.24 (0.95)	0.14 (0.78)	1.67 (0.79–3.53)	0.18	1.37 (0.40–4.69)	0.61
Parent distress	1.22 (2.03)	0.67 (1.40)	1.81 (1.34–2.44)	<0.01	1.60 (1.20–2.13)	0.02
Function domain	0.22 (0.89)	0.18 (0.68)	1.21 (0.64–2.26)	0.56	1.36 (0.71–2.60)	0.35

RR relative risk, *SD* standard deviation

[a] Adjusted by sex, age, maternal schooling, family income, and clinical condition

of dental services by the mother, low level of maternal education, and the fact that the child had already been to the dentist to be the main covariates of the overall ECOHIS score. Analogous observations were performed for domain-specific ECOHIS scores (Unadjusted results are available from the authors). Table 4 shows multivariate analysis results. After the adjustment, the total score remained significantly associated with child's age (RR = 0.70, 95%CI = 0.54–0.93, $P = 0.01$), presence of untreated dental caries (R = 2.26, 95%CI = 1,75–2,93, $P < 0.01$), low maternal education level (RR = 1.32, 95%CI = 1.02–1.71, $P = 0.03$), non-regular use of dental services by the mother (RR = 1.37, 95%CI = 1.06–1.77, $P = 0.01$), and the fact that the child had already been to the dentist (RR = 0.46, 95%CI = 0.35–0.61, $P < 0.01$). The presence of anterior open bite affected maternal perception on the child function domain (RR = 1.44, 95%CI = 1.00–2.10, $P = 0.05$) only.

Discussion

Studies in adults and adolescents have found a negative association between dental anxiety and OHRQoL [8, 10, 12]. To our knowledge, this is the first study to assess whether maternal dental anxiety affects the mother's perception on OHRQoL in preschoolers. Unadjusted analysis results showed that anxious mothers had significantly higher scores in the functional and parental distress domains and also in ECOHIS total scores. However, after multivariate analysis, only the parent distress domain was influenced by maternal anxiety showing that anxious mothers tend to report on feeling guilty or upset because of children's dental problems or treatment experience. The measure of assessment used, which corresponds to the quotient between average scores of each comparison group, allowed estimating that anxious mothers showed scores 60% higher in the parent distress domain than non-anxious mothers (RR 1.60; 95%CI 1.20–2.13).

The higher distress levels of anxious mothers toward their children's oral health could be related to the concern mothers have over their own oral condition. Anxious subjects have a negative dental treatment impression; therefore, it is understandable that the parent distress domain should be influenced by such feelings, as parents do not want their children to face the same situations that caused them discomfort.

Children whose mothers did not use dental services on a regular basis had a worse OHRQoL. A similar result was found by Grembowski et al. [26]. According to these authors, the mother's regular use of dental service may be linked to her child's oral health through several mechanisms, particularly the influence that a mother's own access has on the child's access to dental care, oral hygiene habits, and direct exposure to cariogenic bacteria. In agreement with these authors, our study emphasizes the importance of including parental education as a preventive strategy for children. Moreover, it is well known that the non-regular use of dental service is related to dental anxiety [11, 27] and socioeconomic characteristics [28]. These factors could explain the relation between the mother's use of dental services and the impaired perception on the child's OHRQoL found in this study.

Low income [29–31] and low educational level [11, 32] are considered risk factors to a poor quality of life. It was found that mothers with low schooling had a relative risk of 1.37 for poor perception of child's OHRQoL. The mother's education is a socioeconomic indicator often used as a child's health predictor. According to Tsakos et al. [32], a low educational level has an independent negative impact on OHRQoL, which is not explained by differences in income among educational groups.

Table 4 Association between predictor variables and mean ECOHIS scores and domains—multivariate analyses (Pelotas/Brazil; $n = 608$ mother–child dyads)

Variables	Symptoms RR (95%CI)	Function RR (95%CI)	Psychological (95%CI)	Self-image RR (95%CI)	Parent Distress RR (95%CI)	Family function RR (95%CI)	Total ECOHIS RR (95%CI)
Sex		*	*		*	*	*
Male							
Female							
Age (months)				*	*		
24–35			1.00				1.00
36–47			0.79 (0.54–1.15)				1.08 (0.78–1.50)
≥48			0.45 (0.32–0.64)				0.70 (0.54–0.93)
Family monthly income			*		*		*
≥1.5 BMW							
<1.5 BMW							
Maternal schooling	*		*	*	*		
>8 years							1.00
≤8 years							1.32 (1.02–1.71)
Maternal dental anxiety							
Low	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Moderate/high	1.18 (0.90–1.55)	1.15 (0.76–1.74)	1.14 (0.84–1.56)	1.37 (0.40–4.69)	1.60 (1.20–2.13)	1.36 (0.71–2.60)	1.15 (0.88–1.53)
Mother visit dentist	*			*	*		
Regularly		1.00					1.00
Non-regularly		1.69 (1.13–2.52)					1.37 (1.06–1.77)
Child visited dentist				*			
Yes	1.00	1.00	1.00		1.00	1.00	1.00
No	0.64 (0.49–0.83)	0.48 (0.31–0.73)	0.48 (0.34–0.66)		0.70 (0.52–0.95)	0.24 (0.71–2.60)	0.46 (0.35–0.61)
ECC						*	
Absent	1.00	1.00	1.00	1.00	1.00		1.00
Present	2.43 (1.83–3.22)	2.34 (1.50–3.32)	1.84 (1.36–2.51)	4.95 (1.40–17.52)	3.25 (2.37–4.45)		2.26 (1.75–2.93)
Overjet (mm)				*			
<3							
≥3							
Dental trauma	*		*	*	*	*	*
Absent							
Present							
Open bite				*			
Absent		1.00					
Present		1.44 (1.00–2.10)					

Log pseudolikelihood = −2,126.33, *RR* Relative risk, *ECOHIS* Early childhood oral health impact scale, *ECC* Early childhood caries, *BMW* Brazilian minimum wage

* Variables not included in the final model after the adjustment

Children who had had at least one dental appointment were more likely to have higher ECOHIS scores. It is possible that the parental demand for the dental treatment of their children should be related to parental perceptions of their children's oral health. Mothers who consider that dental disease affects the OHRQoL of children negatively would, as a consequence, bring the child to the dentist. These findings are in accordance with those of Filstrup et al. [33], who suggest that, until decay interferes with the child's life, the parent/guardian may be unaware that a dental problem even exists.

Children with untreated caries had the highest ECOHIS scores. Other studies have also found that the presence of ECC affects the quality of life of children [29, 33–35]. According to Low [35], children affected by dental caries do not necessarily complain of pain and can manifest their effects through changes in eating and sleeping habits. Dental caries did not have a significant impact in the family function domain in our study. This is understandable because dental services use was low in the sample ($n = 126$, 20.7%) and the items in this domain assess the financial impact and time off work due to the child's dental treatment.

Dental trauma presence showed no effect on the OHRQoL of preschool children in the multivariate-adjusted model, in contrast with results found for the permanent dentition of children and adolescents [36, 37]. This could be expected because, unlike dental caries, traumatic dental injuries in primary dentition do not tend to cause pain and limitations for long periods. It is also likely that the loss of part or the whole deciduous tooth is not as impacting as it could be for a permanent tooth, given the temporary nature of the esthetic or functional damage. However, the severity of the injuries was not taken into account and, in epidemiological studies, most injuries diagnosed present low severity.

The relationship between malocclusion and the child's quality of life has been studied for the permanent dentition only, and it has been found that dentofacial esthetics plays an important role in social interaction and psychological well-being [38]. In this study, only the anterior open bite presence was associated with the outcome, affecting the child's function domain, which probably happened in older age groups in the sample.

It is recognized that parents may have a limited knowledge of their children's activities and feelings. However, in the age groups studied, a proxy rating is indispensable. As parents hold the responsibility for child care, knowledge of the parents' perception is of outmost importance, as it could influence oral health decisions and health care use patterns [6]. It was found that a 58.9% of the mothers reported at least one impact on the child OHRQoL, similar to results by Pahel et al. [3], who found that 58.0% of the parents reported impact in the child section and 45.6% in the family section. The ECOHIS has recently been developed; thus, there is no published research at a population level to allow a comparison of results. A study in Uganda which used a modified version of ECOHIS concluded that there is a substantial burden of oral diseases in infants [29]. Another study in Brazil using items partly drawn from the *Parental-Caregiver Perceptions Questionnaire* showed that presence of severe caries affected preschool children OHRQoL in a significant way [34].

The use of a validated and specific questionnaire is one of the major strengths of the study. The ECOHIS has a reduced number of items, minimizing the burden on study participants and the costs of data collection. Its discriminative ability has also been demonstrated, showing that parents can provide valid reports for their preschool children's OHRQoL [3]. Besides that, DAS is the most widely used instrument to evaluate dental anxiety as it has satisfactory reliability and validity [39]. The internal validity of the study should also be highlighted because it obtained good intra-examiner concordance and the number of children examined was substantially higher than the minimum calculated.

On the other hand, the sampling method employed might question external validity. To ensure variability, it would be appropriate to include a higher number of sampling points [40]. However, as the vaccination program has a wide coverage and the centers selected encompass nearly 60% of the children attending the vaccination program, the sample can be considered representative of the population of preschool children in Pelotas. The cross-sectional study design limits casual inference; thus, cohort designs are proposed to provide more robust knowledge of the factors influencing parents' concerns over their children's oral health [29].

Conclusions

In conclusion, the results showed that dental anxiety prevalence was high, and mean ECOHIS total score was not influenced by maternal dental anxiety. Maternal anxiety had a negative effect on the perception of the impact of the child's oral health problems in the family, affecting the parent distress domain. The study also demonstrated that poor oral conditions and poor socioeconomic status had a negative impact on children's OHRQoL.

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References

1. Locker, D. (1988). Measuring oral health: A conceptual framework. *Community Dental Health, 5*(1), 3–18.
2. Goursand, D., Paiva, S. M., Zarzar, P. M., Ramos-Jorge, M. L., Cornacchia, G. M., Pordeus, I. A., et al. (2008). Cross-cultural adaptation of the child perceptions questionnaire 11–14 (CPQ11–14) for the Brazilian Portuguese language. *Health and Quality of Life Outcomes, 6*, 2.
3. Pahel, B. T., Rozier, R. G., & Slade, G. D. (2007). Parental perceptions of children's oral health: The early childhood oral health impact scale (ECOHIS). *Health and Quality of Life Outcomes, 5*, 6.
4. Tesch, F. C., Oliveira, B. H., & Leao, A. (2007). Measuring the impact of oral health problems on children's quality of life: Conceptual and methodological issues. *Cadernos de Saúde Pública, 23*(11), 2555–2564.
5. Jokovic, A., Locker, D., Stephens, M., Kenny, D., Tompson, B., & Guyatt, G. (2002). Validity and reliability of a questionnaire for measuring child oral-health-related quality of life. *Journal of Dental Research, 81*(7), 459–463.
6. Jokovic, A., Locker, D., & Guyatt, G. (2004). How well do parents know their children? Implications for proxy reporting of child health-related quality of life. *Quality of Life Research, 13*(7), 1297–1307.
7. Cascaes, A. M., Peres, K. G., & Peres, M. A. (2009). Periodontal disease is associated with poor self-rated oral health among Brazilian adults. *Journal of Clinical Periodontology, 36*(1), 25–33.
8. Vermaire, J. H., de Jongh, A., & Aartman, I. H. (2008). Dental anxiety and quality of life: The effect of dental treatment. *Community Dentistry and Oral Epidemiology, 36*(5), 409–416.
9. Mehrstedt, M., John, M. T., Tonnies, S., & Micheelis, W. (2007). Oral health-related quality of life in patients with dental anxiety. *Community Dentistry and Oral Epidemiology, 35*(5), 357–363.
10. Ng, S., & Leung, W. (2008). A community study on the relationship of dental anxiety with oral health status and oral health-related quality of life. *Community Dentistry and Oral Epidemiology, 36*(4), 347–356.
11. Kumar, S., Bhargav, P., Patel, A., Bhati, M., Balasubramanyam, G., Duraiswamy, P., et al. (2009). Does dental anxiety influence oral health-related quality of life? Observations from a cross-sectional study among adults in Udaipur district, India. *Journal of Oral Science, 51*(2), 245–254.
12. Luoto, A., Lahti, S., Nevanpera, T., Tolvanen, M., & Locker, D. (2009). Oral-health-related quality of life among children with and without dental fear. *International Journal of Paediatric Dentistry, 19*(2), 115–120.
13. Schierz, O., John, M. T., Reissmann, D. R., Mehrstedt, M., & Szentpetery, A. (2008). Comparison of perceived oral health in patients with temporomandibular disorders and dental anxiety using oral health-related quality of life profiles. *Quality of Life Research, 17*(6), 857–866.
14. Tuuti, H., & Lahti, S. (1987). Oral health status of children in relation to the dental anxiety of their parents. *The Journal of Pedodontics, 11*, 146–150.
15. Kinirons, M., & McCabe, M. (1995). Familial and maternal factors affecting the dental health and dental attendance of preschool children. *Community Dental Health, 12*(4), 226–229.
16. IBGE. (2009). Estimativas de População. http://www.ibge.gov.br/home/estatistica/populacao/estimativa2009/POP2009_DOU.pdf. Accessed August 14, 2009.
17. Tesch, F. C., de Oliveira, B. H., & Leao, A. (2008). Semantic equivalence of the Brazilian version of the early childhood oral health impact scale. *Cadernos de Saúde Pública, 24*(8), 1897–1909.
18. Hu, L. W., Gorenstein, C., & Fuentes, D. (2007). Portuguese version of Corah's dental anxiety scale: Transcultural adaptation and reliability analysis. *Depress Anxiety, 24*(7), 467–471.
19. Corah, N. L., Gale, E. N., & Illig, S. J. (1978). Assessment of a dental anxiety scale. *Journal of the American Dental Association, 97*(5), 816–819.
20. WHO. (1997). *Oral health survey—Basics methods*. Geneva: World Health Organization.
21. O'Brien, M. (1994). *Children's dental health in the United Kingdom 1993*. Londres: Her Majesty's Stationery Office.
22. Moyers, R. (1991). *Ortodontia*. Rio de Janeiro: Guanabara Koogan.
23. Camargo, M. B., Dumith, S. C., & Barros, A. J. (2009). Regular use of dental care services by adults: Patterns of utilization and types of services. *Cadernos de Saúde Pública, 25*(9), 1894–1906.
24. Peres, M. A., Traebert, J., & Marcenes, W. (2001). Calibração de examinadores para estudos epidemiológicos de cárie dentária. *Cadernos de Saúde Pública, 17*(1), 153–159.
25. Drury, T. F., Horowitz, A. M., Ismail, A. I., Maertens, M. P., Rozier, R. G., & Selwitz, R. H. (1999). Diagnosing and reporting early childhood caries for research purposes. A report of a workshop sponsored by the National Institute of Dental and Craniofacial Research, the Health Resources and Services Administration, and the Health Care Financing Administration. *Journal of Public Health Dentistry, 59*(3), 192–197.
26. Grembowski, D., Spiekerman, C., & Milgrom, P. (2009). Linking mother access to dental care and child oral health. *Community Dentistry and Oral Epidemiology, 37*(5), 381–390.
27. Hagglin, C., Hakeberg, M., Ahlqwist, M., Sullivan, M., & Berggren, U. (2000). Factors associated with dental anxiety and attendance in middle-aged and elderly women. *Community Dentistry and Oral Epidemiology, 28*(6), 451–460.
28. Barros, A. J. D., & Bertoldi, A. D. (2002). Desigualdades na utilização e no acesso a serviços odontológicos: uma avaliação em nível nacional. *Ciência e saúde coletiva, 7*(4), 709–717.
29. Wandera, M., Kayondo, J., Engebretsen, I. M., Okullo, I., & Astrom, A. N. (2009). Factors associated with caregivers' perception of children's health and oral health status: A study of 6- to 36-month-olds in Uganda. *International Journal of Paediatric Dentistry, 19*(4), 251–262.
30. Locker, D. (2007). Disparities in oral health-related quality of life in a population of Canadian children. *Community Dentistry and Oral Epidemiology, 35*(5), 348–356.
31. Panepinto, J. A., Pajewski, N. M., Foerster, L. M., Sabnis, S., & Hoffmann, R. G. (2009). Impact of family income and sickle cell disease on the health-related quality of life of children. *Quality of Life Research, 18*(1), 5–13.
32. Tsakos, G., Sheiham, A., Iliffe, S., Kharicha, K., Harari, D., Swift, C. G., et al. (2009). The impact of educational level on oral health-related quality of life in older people in London. *European Journal of Oral Sciences, 117*(3), 286–292.
33. Filstrup, S. L., Briskie, D., da Fonseca, M., Lawrence, L., Wandera, A., & Inglehart, M. R. (2003). Early childhood caries and quality of life: Child and parent perspectives. *Pediatric Dentistry, 25*(5), 431–440.
34. Feitosa, S., Colares, V., & Pinkham, J. (2005). The psychosocial effects of severe caries in 4-year-old children in Recife, Pernambuco, Brazil. *Cadernos de Saúde Pública, 21*(5), 1550–1556.
35. Low, W., Tan, S., & Schwartz, S. (1999). The effect of severe caries on the quality of life in young children. *Pediatric Dentistry, 21*(6), 325–326.
36. Cortes, M. I., Marcenes, W., & Sheiham, A. (2002). Impact of traumatic injuries to the permanent teeth on the oral health-related quality of life in 12–14-year-old children. *Community Dentistry and Oral Epidemiology, 30*(3), 193–198.

37. Ramos-Jorge, M. L., Bosco, V. L., Peres, M. A., & Nunes, A. C. (2007). The impact of treatment of dental trauma on the quality of life of adolescents—A case-control study in southern Brazil. *Dental Traumatology, 23*(2), 114–119.
38. Marques, L. S., Ramos-Jorge, M. L., Paiva, S. M., & Pordeus, I. A. (2006). Malocclusion: Esthetic impact and quality of life among Brazilian schoolchildren. *American Journal of Orthodontics and Dentofacial Orthopedics, 129*(3), 424–427.
39. Newton, J. T., & Buck, D. J. (2000). Anxiety and pain measures in dentistry: A guide to their quality and application. *Journal of the American Dental Association, 131*(10), 1449–1457.
40. Bennett, S., Woods, T., Liyanage, W. M., & Smith, D. L. (1991). A simplified general method for cluster-sample surveys of health in developing countries. *World Health Statistics Quarterly, 44*(3), 98–106.