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ORIGINAL SCIENTIFIC ARTICLE

Oral health-related quality of life in portuguese pre-school children: a cross-sectional study

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Abstract

Purpose To study Oral Health related Quality of Life (OHRQoL) of pre-school children and its associated factors.

Methods Cross-sectional study with sample data collected through an on-line questionnaire to a non-probabilistic sample. The questionnaire included the Portuguese version of the Early Childhood Oral Health Impact Scale (ECOHIS) and questions about sociodemographic characteristics, oral health behaviours, and reported oral health of the child. Data analyses included descriptive statistics, Mann–Whitney and Kruskal–Wallis tests and Linear regression ($\alpha = 0.05$).

Results The sample consisted of 1475 parents of pre-school children (3–5 years-old), residing in Portugal. The mean ECOHIS total score was 1.5 (sd = 3.4). In the bivariate analysis the child's age, starting toothbrushing after one year of age, frequent intake of sugary food and drinks, previous appointment with an oral health professional, all reported of oral health problems, and a negative perception of oral health were negatively associated with OHRQoL ($p < 0{,}05$). In the regression model the factors that most contributed to a worse quality of life were dental caries and abscess, contributing to an ECOHIS average increase of 2.56 and 3.34, respectively.

Conclusions The studied population presented a good OHRQoL, with the item related to pain being the most relevant for the ECOHIS score. Worst OHRQoL was found in older children, whose parents negatively rated the children's oral health and with reported dental caries, trauma, and abscess.

Keywords Oral Health · Quality of Life · Preschool children · Behaviour · Questionnaire

Introduction

Oral health is one of the determinants of health and an important factor for the individual's quality of life, as it is a part of general health and influences several essential functions for the well-being, such as talking, eating, and smiling (Alazmah 2017). Oral diseases can affect people throughout their lives, causing pain, discomfort, aesthetic problems, and low self-confidence. Additionally, it leads to costs associated with treatment and rehabilitation (Peres et al. 2019).

Oral diseases continue to have a high prevalence in childhood and dental caries remain one of the most prevalent chronic diseases in the world and a serious public health problem. The World Health Organization (WHO) reports that more than 530 million children in the world suffer from caries in the primary teeth (World Health Organization 2020). Dental caries lesions in childhood, especially at an early age, can have serious complications for the child and his family, impairing the child's harmonious and healthy development (Alazmah 2017). Decreased quality of life and learning capacity are also consequences of the presence of caries lesions in children, with increased anxiety, pain, and worst school performance. For the family, the increase in costs associated with dental treatment, as well as the increase in hospitalizations and emergency oral health

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appointments, can cause parents absence to work and reduce the family income (Peres et al. 2019).

Oral Health-Related Quality of Life (OHRQoL) has become a widely used indicator for the study of oral health, not only in adults but also in children and adolescents. In children, OHRQoL reflect the impact that oral diseases can have in their daily lives, as well as their families (Pakkhesal et al. 2021).

In addition to behaviours and factors directly related to the oral cavity, there are several sociodemographic variables that influence the prevalence of caries in children. In fact, this disease is not only a health problem, but a social problem that affects the most disadvantaged populations (Chaffee et al. 2017; Mendes and Bernardo, 2015). Individuals with lower socioeconomic levels tend to have worse OHRQoL (Knorst et al. 2021; Moghaddam et al. 2020). This relationship is explained by the fact that disadvantaged families and individuals have less capacity to respond to oral health problems and to perceive their own problems.

The modern concept of oral health has a holistic and patient-centred perspective and in this context, OHRQoL becomes a relevant indicator, qualifying the disparities and access to oral health care, as well as identifying the benefits of treatments and the concerns of patients, and to help establishing priorities in oral health at a global level (Chaffee et al. 2017).

In children, especially in the preschool age, the impact of oral health problems on OHRQoL and on their families is mediated by parents' attitudes and beliefs, as they are the decision-makers in relation to the child's health (Pahel et al. 2007). Knowledge of the impact of oral health on the quality of life of children and their families can help to support decision-making in relation to disease prevention and health promotion.

This work aims to study the OHRQoL in the Portuguese preschool population (using the Early Childhood Oral Health Impact Scale – ECOHIS and analyse the relation of OHRQoL with sociodemographic variables, child's oral health behaviours and reported oral disease.

Methods

This cross-sectional study was approved by the Ethics Committee of the Faculdade de Medicina Dentária da Universidade de Lisboa (reference: 202,107). The target population consisted of parents of children with ages between 3 and 5 years old, living in Portugal. The non-probabilistic sample included all parents who voluntarily answered the study questionnaire, giving their informed consent.

Data were collected through a questionnaire in Portuguese, available on-line. The questionnaire was developed specifically for the study, based on a review of the literature (Bica et al. 2016; Chaffee et al. 2017; Ghanghas et al. 2019; Pahel et al. 2007). Before data collection, the questionnaire was reviewed by three experts in oral health studies and pretested with four parents. The questionnaire was available between February and May 2021 through a link accessible on the internet. The link was distributed to educational institutions by email and by social networks in groups of school institutions, parents' associations, and other groups of parents.

The final version of the questionnaire had a first section with a brief introduction, clarifying the study objectives and procedures and ending with the participant's informed consent. It was only possible to proceed to the following sections if the participant declared that agree to participate in an informed way. The second section confirmed the inclusion criteria: resident in Portugal and being father/mother of a child between 3 and 5 years old. The remaining sections included the sociodemographic questions (age, gender, and mother´s education level); the questions related to oral health behaviours (brushing frequency, use of fluoride toothpaste, starting age of toothbrushing, toothbrushing supervision, frequent intake of cariogenic foods and previous oral health appointments); the questions about oral health diseases of the child; and the Portuguese version of ECOHIS (Costa 2013).

ECOHIS was an instrument originally developed by Pahel et al. (2007) to assess OHRQoL in children from 0 to 6 years old. The instrument is applied to parents and composed of 13 items, with 9 items related to the impact of oral problems on children (child´s domain) and the remaining 4 items related to the impact of the oral problems on the family (family´s domain). The items use a Likert-scale, with five response options: 0 = Never, 1 = Almost never, 2 = Occasionally 3 = Often, 4 = Very often. There is also a sixth answer hypothesis (5 = I don't know), that should be considered a missing value. The individual is excluded when the child's domain has more than two missing values and more than one in the family domain. The ECOHIS total score is calculated adding the values of all items and varies between 0 and 52. The scores of each domain can also be calculated separately, "ECOHIS child" with values between 0 and 32; and "ECOHIS family" with values between 0 and 16. Lower scores corresponds to a better OHRQoL (Pahel et al. 2007).

Data analysis was performed with *Statistical Package for Social Sciences (SPSS) version 26*. Descriptive analysis was performed, and bivariate analysis included Mann–Whitney and Kruskal–Wallis tests. Linear regression models were computed to assess the factors (sociodemographics, oral health behaviours and oral health diseases) associated with OHRQoL. The level of statistical significance was set at $p < 0.05$ in the bivariate and multivariate analisys. All associated factors at a significance level, $p < 0.2$, on unadjusted (univariable) linear regression analysis were further

examined in multivariable linear regression. The final model was achieved by eliminating one by one the factors with $p < 0.10$.

Results

The final sample included 1475 participants. The children's mean age was 4.1 (sd = 0.8).

The mean score of the "ECOHIS total" was 1.53, with a minimum of "0" and a maximum of "33". The "ECOHIS child" domain had a higher mean value (0.91) than the "ECOHIS family" domain (0.63). When analysing each of the ECOHIS items, the most frequent answer in all items was "Never". The item that presented the most negative impact for OHRQoL was the item associated with pain, with 23.3% of parents stating that the child had already experienced pain in the teeth, mouth, or jaws (Table 1).

Table 1 Mean ECOHIS scores and frequencies and means of each item

ECOHIS Score		Minimum	Maximum	Mean (sd)		Median
ECOHIS total score (all items)		0	33	1.53 (3.3)		0
ECOHIS child domain score (items 1 to 9)		0	20	0.91 (2.1)		0
ECOHIS family domain score (items 10 to 13)		0	15	0.63 (1.6)		0
ECOHIS Item	Never % (n)	Hardly ever % (*n*)	Occasionally % (*n*)	Often % (*n*)	Very often % (*n*)	Mean (sd)
1. How often has your child had pain in the teeth, mouth or jaws?	76.7 (1128)	18.8 (276)	3.9 (58)	0.5 (7)	0.1 (2)	0.28 (0.6)
2. How often has your child had difficulty drinking hot or cold beverages because of dental problems or dental treatments?	91.8 (1352)	7.1 (105)	1 (14)	0.1 (2)	0 (0)	0.09 (0.3)
3. How often has your child had difficulty eating some foods because of dental problems or dental treatments?	92.4 (1363)	5.9 (87)	1.5 (22)	0.1 (2)	0.1 (1)	0.09 (0.4)
4. How often has your child had difficulty pronouncing any words because of dental problems or dental treatments?	93.3 (1368)	5 (73)	1.2 (18)	0.3 (4)	0.3 (4)	0.09 (0.4)
5. How often has your child missed preschool, day care or school because of dental problems or dental treatments?	95.3% (1404)	3.8 (56)	0.9 (13)	0.1 (1)	0 (0)	0.06 (0.3)
6. How often has your child had trouble sleeping because of dental problems or dental treatments?	90.3 (1331)	7.8 (115)	1.8 (26)	0.1 (2)	0 (0)	0.11 (0.4)
7. How often has your child been irritable or frustrated because of dental problems or dental treatments?	92.2 (1358)	6.7 (98)	0.9 (13)	0.3 (4)	0 (0)	0.09 (0.3)
8. How often has your child avoided smiling or laughing when around other children because of dental problems or dental treatments?	96.5 (1423)	3.1 (46)	0.3 (4)	0.1 (2)	0 (0)	0.04 (0.2)
9. How often has your child avoided talking with other children because of dental problems or dental treatments?	96.7 (1427)	2.8 (42)	0.3 (4)	0.1 (1)	0 (0)	0.04 (0.2)
10. How often have you or another family member been upset because of your child's dental problems or dental treatments?	87.1 (1285)	8.3 (123)	3.5 (52)	0.7 (11)	0.3 (4)	0.19 (0.6)
11. How often have you or another family member felt guilty because of your child's dental problems or dental treatments?	88.1 (1298)	7.7 (114)	2.7 (40)	1.2 (17)	0.3 (4)	0.18 (0.5)
12. How often have you or another family member taken time off from work because of your child's dental problems or dental treatments	92.5 (1363)	5.6 (82)	1.3 (19)	0.5 (8)	0.1 (1)	0.10 (0.4)
13. How often has your child had dental problems or dental treatments that had a financial impact on your family?	87.8 (1293)	8.8 (129)	2.2 (33)	0.5 (7)	0.7 (10)	0.17 (0.5)

Most children brushed their teeth two or more times a day (67.6%) with fluoride toothpaste (80.8%) and with daily parental supervision (68.1%). Only 50.5% of children started toothbrushing under one year of age. About half of children frequently consumed cariogenic foods or drinks (45%) and never visited the oral health professional (47.1%).

Bivariate analyses demonstrated a higher score of ECOHIS, revealing a worse OHRQoL, in older children ($p=0.03$), who started brushing their teeth later ($p=0.02$), who had a frequent intake of cariogenic foods or drinks ($p<0.001$) and who had already an appointment with the oral health professional ($p<0.001$) (Table 2). All reported

Table 2 Impact of sociodemographic and behavioural factors on Oral Health-Related Quality of Life

	n	%	OHRQoL (ECOHIS total)			
			Minimum	Maximum	Mean (sd)	*p*
Child age						
3 years old	411	27.9	0	17	1.1 (2.5)[a]	
4 years old	503	34.1	0	18	1.3 (2.5)[ab]	**0.03****
5 years old	561	38	0	33	2.1 (4.4)[b]	
Sex						
Female	718	48.7	0	33	1.7 (3.7)	0.35*
Male	757	51.3	0	27	1.4 (2.9)	
Mother´s education						
Basic education complete or less	141	9.6	0	18	1.6 (3.4)	0.23**
Secondary education complete	386	26.2	0	20	1.6 (3.2)	
High education complete	948	64.3	0	33	1.5 (3.4)	
Toothbrushing frequency						
Doesn´t brush	3	0.2	0	2	1.0 (1.0)	0.94**
Less than once per day	23	1.6	0	4	1.1 (1.6)	
Once a day	452	30.6	0	20	1.5 (3.1)	
Twice or more per day	997	67.6	0	33	1.6 (3.5)	
Use of fluoridated toothpaste						
No	185	12.6	0	19	1.8 (3.6)	0.44*
Yes	1190	80.8	0	33	1.5 (3.3)	
Don´t no	97	6.6	–	–	–	
Starting age of toothbrushing						
Before one year of age	743	50.5	0	27	1.5 (3.3)[a]	**0.02****
Between 1 and 2 years of age	601	40.8	0	19	1.4 (3.1)[ab]	
Between 2 and 3 years of age	113	7.7	0	33	2.0 (4.4)[bc]	
After 3 years of age	15	1.0	0	13	3.6 (4.6)[c]	
Parental help/supervision in toothbrushing						
No	4	0.3	0	26	13.0 (15.0)	0.05**
Yes, rarely	18	1.2	0	13	1.4 (3.1)	
Yes, sometimes	81	5.5	0	14	1.8 (2.9)	
Yes, most of the times	367	24.9	0	20	1.4 (2.8)	
Yes, every day	1002	68.1	0	33	1.5 (3.4)	
Frequent intake of cariogenic foods/drinks (daily or most of the days)						
No	666	45.2	0	33	1.2 (3.01)	**< 0.001***
Yes	809	54.8	0	27	1.8 (3.5)	
Previous oral health appointment						
No	695	47.1	0	26	1.1 (2.5)	**< 0.001***
Yes	780	52.9	0	33	1.9 (3.9)	

Values that share the same letter do not differ significantly

*Mann–Whitney test

**Kruskal–Wallis test

Table 3 Impact of oral health diseases reported by parents on Oral Health-Related Quality of Life

	n	%	OHRQoL (ECOHIS total score)			
			Minimum	Maximum	Mean (sd)	*p*
Dental caries						
No	1304	88.4	0	27	1.1 (2.72)	**< 0.001***
Yes	171	11.6	0	33	4.9 (5.30)	
Dental trauma						
No	1316	89.2	0	33	1.3 (3.04)	**< 0.001***
Yes	159	10.8	0	26	3.3 (4.88)	
Malocclusion						
No	1403	95.1	0	27	1.5 (3.22)	**0.01***
Yes	72	4.9	0	33	2.8 (2.79)	
Aphthous ulcers						
No	1378	93.4	0	33	1.5 (3.32)	**< 0.001***
Yes	97	6.6	0	22	2.1 (6.63)	
Abscess						
No	1438	98.1	0	27	1.4 (3.11)	**< 0.001***
Yes	28	1.9	0	33	7.9 (7.39)	
Previous dental treatment						
No	1340	90.8	0	26	1.2 (2.67)	**< 0.001***
Yes	135	9.2	0	33	5.3 (5.99)	
Untreated caries lesions						
No	1402	95.1	0	33	1.3 (3.10)	**< 0.001***
Yes	73	4.9	0	19	5.5 (5.08)	
Child's Oral Health Perception						
Very poor	2	0.1	8	19	13.5 (7.78)^{abd}	**< 0.001****
Poor	21	1.4	0	18	5.4 (5.45)^{ac}	
Reasonable	173	11.7	0	33	2.6 (4.79)^{bce}	
Good	683	46.3	0	26	1.7 (3.31)^{de}	
Very good	596	40.4	0	24	0.8 (2.33)^{f}	

Values that share the same letter do not differ significantly

*Mann–Whitney test

**Kruskal–Wallis test

oral diseases demonstrated to have a very significant and negative impact on OHRQoL ($p < 0.001$) (Table 3).

In the multivariable linear regression model only child age, sex, mother's education, dental caries, dental trauma,

Table 4 Linear regression model for Oral Health-Related Quality of Life

	β	Standard error	*p*-value	95% Confidence Interval	
				Lower bound	Upper bound
Intercept	− 0.97	0.50	0.055	− 1.95	0.021
Child age	0.24	0.10	0.023	0.03	0.44
Male	− 0.27	0.16	0.084	− 0.58	0.04
Secondary education complete	0.53	0.30	0.079	− 0.06	1.12
High education complete	0.51	0.28	0.067	− 0.04	1.06
Dental caries	2.56	0.28	< 0.001	2.01	3.12
Dental trauma	1.24	0.26	< 0.001	0.73	1.75
Malocclusion	0.68	0.37	0.067	− 0.05	1.41
Abscess	3.34	0.62	< 0.001	2.11	4.56
Previous oral appointment	0.33	0.18	0.061	− 0.02	0.68
Child's Oral Health Perception	0.69	0.12	< 0.001	0.45	0.92

malocclusion, abscess, previous oral health appointment and child oral's perception had a p-value < 0.1, so were included in the final regression model. Of these factors only child age, dental caries, dental trauma, abscess, and child's oral health perception have statistically significant association with a worse OHRQoL ($p < 0.05$). The model explained (R2) 19.6% of the total variance (Table 4).

Discussion

This study presents a non-probabilistic sample and investigated the perceived oral health of pre-school children reported by their parents, with data collected by an online questionnaire. Online surveys have some disadvantages related to the sample, including non-response, unknown participation rates, and under-coverage of the target population (Nayak and Narayan 2019). To minimize these disadvantages the link was available to the different regions of the country and to groups that included parents from public and private schools, regarding to achieve a more diverse sample. In 2021 the total of children between 3 to 5 years old were 238,320 (PORDATA 2021) representing 0,6% of the target population.

Oral health has a strong impact on the OHRQoL of pre-school-age children and their families. The impact is not just physical, but also social, psychological, and in the financial domain. The ECOHIS scores found in this study were lower than those in other Portuguese studies performed in the preschool population in which ECOHIS values were 3.0 (Reis 2020) and 15.5 (Bica et al. 2016). The ECOHIS scores reported in other countries are also variable, ranging from 1, in a study carried out in Chile (Zaror et al. 2018) and 11.8 in a study made in Iran (Pakkhesal et al. 2021). Such disparity may reflect the sociodemographic differences of the populations studied, such as socioeconomic status, educational qualifications, and access to health care. A systematic review and meta-analysis concluded that dental caries in pre-school children have a negative impact on the OHRQoL, revealing that children with caries have reported twice more impact than children with no caries. Additionally, this impact was five times higher in children with severe caries (dmft > 5). However, when evaluated at population level this impact is less evident (Zaror et al. 2022).

Like in the present study, other studies that used ECOHIS to evaluate the in preschool children revealed that pain was the item that had the most impact in the child domain (Carminatti et al. 2017; Farsi et al. 2021; Gomes et al. 2015; Zaror et al. 2022). In the family domain, the percentages of the items "10" (annoyed), "11" (guilty) and "13" (financial impact) revealed a higher impact on this ECOHIS domain. Items "10" and "11" were also the items in the family domain that have more impact in OHRQoL in similar studies (Gomes et al. 2015; Moghaddam et al. 2020).

The oral health behaviours are quite satisfactory, however only about half of the children started toothbrushing during the first year of age, refer a frequent intake of cariogenic foods/drinks and had a previous oral health appointment. These behaviours are described in the literature as associated with early childhood caries (Bica et al. 2012; Kirthiga et al. 2019; Pereira et al. 2020) and need to be considered and reinforced in oral health promotion actions in this population. In Portugal there are oral health guidelines to children between 3 to 5 years old that recommend supervised toothbrushing twice a day, with a pea-size fluoride toothpaste (at least 1000 ppm of fluoride) (Direção-Geral da Saúde 2021). These recommendations are aligned with European recommendations (Toumba et al. 2019). The improvement of these behaviours' indicators may also contribute to the OHRQoL at these ages. In Portugal there is still a very significant demand for oral health services due to the need of treatment but not for preventive reasons. This aspect is even more notorious regarding young children and deciduous dentition (Gomes et al. 2015). In the regression model the previous oral health appointment revealed a marginal significant impact in OHRQoL ($p = 0.06$), supporting that most young children go to the dentist when they are in pain or to do treatments.

Older children had a higher ECOHIS score, like found in the studies of Bica et al. (2016) and Pakkhesal et al. (2021). The older children can be exposed for a longer time to risk factors and are more able to express their feelings. Contrary to other studies (Chaffee et al. 2017; Moghaddam et al. 2020; Pakkhesal et al. 2021) there were no significant differences in the children's OHRQoL relative to the mother's educational level.

Dental caries, trauma and abscess reported by the parents had a significant impact on OHRQoL. Other studies also have this a positive association, with children having dental caries (Carminatti et al. 2017; Chaffee et al. 2017; Farsi et al. 2021) or severe trauma (Milani et al. 2019) reflecting a worst OHRQoL. However, the impact of dental trauma on OHRQoL is controversial, with other studies demonstrating no association with this dental problem (Chaffee et al. 2017; Zaror et al. 2018). The differences found in these studies may be related with the use of different methodologies, like the type of trauma considered and the characteristics of the population studied. Bittencourt et al. (2021) found that children with fistula or abscess had a greater negative impact on OHRQoL than children with carious lesions without pulp involvement. The factors that most contributed to a worse quality of life were dental caries and abscess, contributing in the regression model to an ECOHIS average increase of 2.56 and 3.34, respectively.

The impact of caries lesions is greater when the disease is more severe, as these lesions cause more pain, compromise aesthetics and function, require more expensive treatments and cause greater absence to work and school (Gomes et al. 2015). Chaffee et al. (2017) found that the ECOHIS total score was almost three times greater in children with five or more caries lesions, than in children without any lesion, reflecting that the parents tend to give more importance to oral diseases when they cause pain and discomfort.

In the present study there was a significant impact of malocclusion in OHRQoL found in the bivariate analysis like in other studies (Carminatti et al. 2017; Zaror et al. 2018), but this result was not confirmed in the regression model.

The regression model explained only about 20% of the OHRQoL, demonstrating that the OHRQL is a complex, multidimensional variable with many predictors, some of which were not analysed in the present study. The oral diseases weren´t observed but reported by parents, due to the data collection having been carried out in a pandemic context of confinement. Despite these limitations, the sample has a considerable size, having good characteristics regarding distribution by sex, age, and with all Portuguese regions represented. Although the sample is not representative, this study can be considered an important contribution to the knowledge of the OHRQoL in preschool children, demonstrating the importance of early prevention and care of primary teeth. The results recognize the need to implement oral health strategies to promote oral health early in life and to consider specific factors to improve oral health of preschool children. The actions to promote oral health at these ages should take these factors into account to improve behaviours, prevent oral diseases more effectively and, consequently, to improve the OHRQoL.

Conclusions

Considering the limitations of this study with a non-probabilistic sample of Portuguese children, it has been shown that:

- The studied population presented a good OHRQoL, with the item related to pain being the most relevant for the ECOHIS score;
- Worst OHRQoL scores were found in older children, whose parents negatively rated the children's oral health and in those with reported dental caries, trauma, and abscess.

Authors' contributions MF, SM and SG contributed to the study conception and design. Data collection was performed by MF and SM. Statistical analyses was made by MF, SM and SD. All authors contributed to data interpretation and discussed the results and written, read and approved the final manuscript.

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Data availability Authors declare data transparency and if necessary, availability of data and material.

Declarations

Conflicts of interest Authors declare no conflicts of interest.

Ethical approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of University of Lisbon, FMDUL.

Informed consent Informed consent was obtained from all individual participants included in the study.

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