

# Oral Health-Related Quality of Life: Association with Oral Health-Behavior of 5-year-old Children and Early Childhood Caries Assessed by Mothers

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**Academic Editor:** Catarina Ribeiro Barros de Alencar

**Received:** October 23, 2023 / **Review:** April 03, 2024 / **Accepted:** April 22, 2024

**How to cite:** Setiawati F, Febrian AF, Khairinisa S, Darwita RR, Badruddin IA. Oral health-related quality of life: Association with oral health-behavior of 5-year-old children and early childhood caries assessed by mothers. *Pesqui Bras Odontopediatria Clín Integr.* 2025; 25:e230201. <https://doi.org/10.1590/pboci.2025.004>

## ABSTRACT

**Objective:** To analyze the differences in oral health-related quality of life (OHRQoL) for children aged five with early childhood caries (ECC) based on oral health behavior risk factors in Indonesia. **Material and Methods:** 181 mother-child pairs participated in this study. Due to the pandemic during data collection, ECC status was examined by mothers through online guidelines provided by the researcher by four clinical stages of ECC. Parents completed questionnaires regarding their child's oral health behavior (tooth brushing, feeding, and dental visit related) and perceived quality of life using the Scale of Oral Health Outcomes for 5-year-old children (SOHO-5) Questionnaire. Children are also involved in rating their quality of life. Spearman correlation, Mann-Whitney U, and Kruskal-Wallis were used to identify differences between multiple characteristics of children's oral health behavior. **Results:** OHRQoL is significantly correlated with ECC status. There are significant differences between oral health education ( $p=0.045$  and  $0.046$ ), falling asleep while feeding ( $p<0.001$  and  $0.021$ ), the frequency of sugar consumption ( $p=0.002$  and  $0.001$ ), and the condition of the teeth ( $p<0.001$ ) compared to children's oral health-related quality of life (OHRQoL) perceived by their mothers and themselves, respectively. No significant differences were found between the frequency of tooth brushing in a day, assisted child while tooth brushing, the starting age of a child's teeth brushed, dentist visits, food intake, and number of siblings ( $p>0.05$ ). **Conclusion:** Oral health behavior related to early childhood caries and consequences in decreasing quality of life, both perceived by mothers or children themselves.

**Keywords:** Quality of Life; Oral Health; Dental Caries; Child, Preschool.

## ■ Introduction

Early Childhood Caries (ECC) is a worldwide pandemic, especially in developing countries and low socioeconomic groups [1]. American Academy of Pediatric Dentistry (AAPD) defines ECC as one or more cavities, missing or restoration due to caries in children under 72 months [2]. The Indonesian Basic Health Survey 2018 shows that caries prevalence in 5-year-old children is 90.2%, with a dmft index of 8.1 [1,3]. However, the prevalence and severity of ECC are often overlooked, even though it has an essential role in child development, mastication, aesthetics, and speech [4-7]. Children with dental caries can feel pain and eventually decrease their quality of life, which at this age is a crucial time in social, physical, and mental growth and development [8].

In early-aged children, parents have an essential role in the filtration of children's interaction with crucial environments in ECC prevention, including oral hygiene practice as a protective factor and consumption of cariogenic meals as a risk factor [1]. Mothers are the primary caregivers of children who establish healthy behavior from an early age [9,10]. However, multiple studies showed that mothers did not have sufficient knowledge regarding oral health care for their children [9,11,12]. Having inadequate knowledge, such as when to start brushing a baby's teeth, how to practice proper breastfeeding, and when to go to the dentist, will contribute to the high prevalence of early childhood caries [13,14]. On the other hand, five-year-old children are building their self-image and can report their own needs [15,16]. Oral health problems can lead to decreased quality of life by causing discomfort in eating and sleeping, lowering self-esteem, reducing social participation, and disrupting their educational performance [2,6,16]. The relationship between ECC, Oral Health-Related Quality of Life (OHRQoL), and multiple risk factors needs to be considered because, at this age, primary dental health problems show and might occur in permanent teeth in the future [17]. Thus, in this research, the authors are interested in assessing differences in OHRQoL for children aged five years old with early childhood caries based on oral health behavior in Banten, Indonesia.

## ■ Material and Methods

### Study Design and Ethical Clearance

This cross-sectional study was conducted in 28 preschools in Banten, Indonesia, between November and December 2020. Ethical approval was granted by the Research Ethics Committee of the Faculty of Dentistry, Universitas Indonesia (Protocol No: 010330820). The reporting of the present study is under the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement [18].

### Sample Size Estimation and Selection of Children

Sample size estimation suggested that a total of 136 pairs of parents and children would be sufficient for detecting statistical significance ( $p < 0.05$ ) with a power of 95%, considering 90.2% of 5-year-old Indonesian children have dental caries [3]. During the sampling process, we were assisted with local primary healthcare, and 28 kindergartens were chosen by convenience sampling due to their accessibility and effectiveness. A total of 398 parent-child pairs (PCP) in Banten, Indonesia, were invited to compensate for potential attrition and improve reliability. The inclusion criteria were children aged five years old with parents who were willing to participate, who had a Whatsapp application, and children with no medical condition that might compromise the study outcomes.

### Data Collection

The WhatsApp application was used to send Google form links and briefing videos to school principals and kindergarten teachers. The kindergarten teacher then sent the parents the Google form link and questionnaire briefing video via the parent's kindergarten WhatsApp group. The first section of the Google form includes informed consent. Mothers who received a link to a Google form from their children's teachers filled out the informed consent form before submitting the questionnaire. Each respondent took about 10-15 minutes to complete the questionnaire. They were also instructed to perform examinations on their children.

#### Oral Health Behavior

Mothers were asked to report their children's feeding behavior, such as feeding habits (breastfeeding only, breast- and bottle-feeding, and bottle-feeding only), sleeping with a bottle (yes/no), snacking frequency (never, once a day, two times, or more), age of initiation of brushing habits, brushing frequency (never, once a day, two times, or more), brushing assistance, and visit to the dentist.

#### Visual Detection of Decayed Teeth

Due to the COVID-19 pandemic during this study period, clinical examinations were not possible, and parents were asked to assess their children's dental condition and report it through this online questionnaire. These items were adapted from Evans's [19] based-on International Caries Detection and Assessment System (ICDAS) classification that simplified into 4 ECC clinical stages (ECC: 0, 1, 2, 3) to make it simpler, faster, and more valid, and closely indicate treatment options according to the staging of caries lesions. ECC-0 is when the teeth are sound, ECC-1 is identified as a smooth white spot on the enamel surface, ECC-2 is an enamel breakdown with a hard surface, and ECC-3 is an extending dentin caries lesion [19].

Mothers visually examined the maxilla central primary incisors and mandible first primary molars according to the earlier instruction video and the pictures of each ECC stage in the questionnaire. Before the visual inspection, the procedure involves cleaning (brushing the teeth) and drying the teeth with cotton/tissue. After those sequences of cleaning and drying, visual examination is carried out in a place with adequate sunlight or artificial light [19,20].

#### Children's Oral Health Quality of Life

The scale of Oral Health Outcomes for 5-year-old children (SOHO-5) instrument was developed, which involved both the perceptions of children and parents used in this survey that had been cross-culturally adapted to the Indonesian version in a previous study [21].

SOHO-5 parental version (SOHO-5p): in order to assess parent's perception of child OHRQoL, there are seven items about the impact they thought their child has, such as difficulties in eating, drinking, speaking, playing, sleeping, and also avoiding smiles due to pain and due to appearance. They answered with a 5 Likert scale about how much impact they thought their children had (no = 0, a little = 1, moderate = 2, a lot = 3, and a great deal = 4), and the total score ranged from 0 to 26.

SOHO-5 child version (SOHO-5c): Different from the parents' version, the child version "has the same six similar statements but different answering options, which is 3 Likert scale (no = 0, a little = 1, and a lot = 2) so the answer varies from 0 to 14. Parents were asked to interview their children and report their answers through an online questionnaire.

#### Statistical Analysis

All the data were entered into spreadsheets and analyzed using Statistical Package for Social Sciences (SPSS) 23. Data cleaning was performed before the analysis. A descriptive analysis was performed to establish the subject characteristics. Spearman correlation analysis was conducted to compare each item of OHRQoL with ECC status to determine which domain of quality of life was affected the most by ECC. The non-parametric comparative analytics, Mann-Whitney U and Kruskal-Wallis were used to analyze the difference between SOHO-5p and SOHO-5c based on oral health behavior (daily tooth brushing, assisted brushing, first-time brushing, oral health education received, dentist visit, falling asleep while feeding, and diet intake up to one year old) and also compared among different dental conditions (ECC 0-3). Statistical significance was set at 5% ( $p < 0.05$ ) with a 95% confidence interval (CI).

## ■ Results

Out of 398 mothers and children approached, only 181 pairs completed the whole study (response rate=45.47%). Most of the children have siblings (74%). Based on the mothers' answers, 95 (52.5%) of the children brush their teeth twice a day, in the morning before breakfast and at night before going to bed; 170 (93.9%) parents helped their children brush their teeth, and only 51 (28.2%) parents started brushing their children's teeth before the age of 12 months. Parents who received education about oral health were 75 people (41.4%), while those who had never received were 106 people (58.6%). Among all the participants, only 39 5-years-old children have visited the dentist (21.5%).

Table 1 describes mothers' and children's perceptions regarding their oral health-related quality of life using the SOHO-5 questionnaire. Among the SOHO-5 analyzed items, eating difficulties had the highest impact on ORHQoL. The lowest was smile avoidance due to pain (SOHO-5p) and speaking difficulties (SOHO-5c). The mean score of the children's oral health-related quality of life was  $3.21 \pm 0.267$  (range 0-26) perceived by parents and  $1.85 \pm 0.77$  (range 0-14) perceived by children. We correlate each item of OHRQoL to the ECC status assessed by mothers. Based on the comparison, we found that almost every impact of oral health problems is indeed significant, except drinking difficulties with children's quality of life perceived by parents.

**Table 1. Child's Oral Health-Related Quality of Life perceived by Parents (SOHO-5p) and the child (SOHO-5c) and its correlation to ECC status.**

Oral Health-Related Quality of Life	ECC Status					
	Mean (SD)	SOHO-5p r-value	p-value	Mean (SD)	SOHO-5c r-value	p-value*
Eating difficulties	0.90 (0.075)	0.331	<0.001	0.43 (0.039)	0.319	<0.001
Drinking difficulties	0.35 (0.055)	0.100	0.178	0.7 (0.028)	0.194	0.009
Speaking difficulties	0.48 (0.056)	0.312	<0.001	0.19 (0.030)	0.237	0.001
Playing difficulties	0.41 (0.053)	0.352	<0.001	0.20 (0.031)	0.332	<0.001
Sleeping difficulties	0.41 (0.050)	0.300	<0.001	0.33 (0.037)	0.252	<0.001
Smile avoidance (due to appearance)	0.34 (0.053)	0.307	<0.001	0.25 (0.035)	0.305	<0.001
Smile avoidance (due to the pain)	0.31 (0.047)	0.346	<0.001	0.30 (0.036)	0.349	<0.001
Total Score	3.21 (0.267)	0.453	<0.001	1.85 (0.777)	0.408	<0.001

Spearman Correlation Analysis; \*Statistically Significant.

Table 2 shows children's characteristics associated with their quality of life. Sixty-eight parents never let their children fall asleep while feeding (37.6%), and more than half only consumed breast milk until one year old (51.4%). Most children consumed snacks thrice a day, 77 children ( $n=77$ ; 42.5%). When mother assessed their children, there were 33 children on ECC-0 stage (18.2%), 48 children on ECC-1 stage (26.5%), 29 children with ECC-2 (16%), and those who experienced ECC-3 were 71 children (39.2%).

Kolmogorov Smirnov test showed that this data has a lack of normality ( $p < 0.05$ ), so a non-parametric comparative analysis was used (Table 2). Parents who experience oral health education showed different perceptions of quality of life, according to both parents and children. Dental status and dental caries risk factors such as sleeping while feeding and higher sugar consumption frequency are associated with lower quality of life ( $p < 0.05$ ).

**Table 2. Comparative analysis between oral health status and behavior with children oral health-related quality of life.**

Variables	N (%)	SOHO-5p (0-4)		SOHO-5c (0-2)	
		Mean (SD)	p-value	Mean (SD)	p-value
<b>ECC Status</b>					
ECC 0	33 (18.2)	1.12 (2.67)	<0.001	0.72 (1.81)	<0.001*
ECC 1	48 (26.5)	2.10 (2.84)		1.02 (1.84)	
ECC 2	29 (16.0)	3.58 (2.58)		2.07 (2.17)	
ECC 3	71 (39.2)	4.77 (4.04)		2.85 (2.64)	
<b>Daily Tooth Brushing</b>					
2x (Before breakfast and at the night before sleep)	95 (52.5)	3.28 (3.89)	0.983	1.84 (2.36)	0.619
2x (After breakfast and at night before sleep)	44 (24.3)	3.29 (3.45)		2.13 (2.61)	
1x (Only in the morning)	42 (23.2)	2.95 (3.05)		1.57 (2.22)	
<b>Assisted Brushing<sup>b</sup></b>					
Yes	170 (93.9)	3.24 (3.65)	0.969	1.89 (2.42)	0.333
No	11 (6.1)	2.72 (2.61)		1.18 (1.78)	
<b>First-time Brushing<sup>a</sup></b>					
Before aged 12 months	51 (28.2)	2.61 (3.23)	0.210	1.23 (1.96)	0.055
Aged between 1 – 2 years	92 (50.8)	3.30 (3.91)		2.23 (2.65)	
More than two years	38 (21.0)	3.79 (3.14)		1.76 (2.12)	
<b>Receive Oral Health Education<sup>b</sup></b>					
Yes	75 (41.4)	2.81 (3.69)	0.045	1.54 (2.40)	0.046*
No	106 (58.6)	3.50 (3.50)		2.06 (2.37)	
<b>Visit the Dentist<sup>b</sup></b>					
Yes	39 (21.5)	4.05 (4.59)	0.397	2.23 (2.64)	0.270
No	142 (78.5)	2.98 (3.24)		1.75 (2.32)	
<b>Falling Asleep While Feeding<sup>a</sup></b>					
Never	68 (37.6)	2.28 (3.35)	<0.001	1.47 (2.45)	0.021*
Seldom	66 (36.5)	2.97 (2.81)		1.74 (2.10)	
Often	47 (26.0)	4.89 (4.31)		2.55 (2.58)	
<b>Intake up to 1 Year Old<sup>a</sup></b>					
Breastfed only	93 (51.4)	3.37 (3.37)	0.267	1 (0-8)	0.209
Combination of breastfed and formula milk	72 (39.8)	3.22 (3.93)		0.5 (0-7)	
Formula milk only	16 (8.8)	2.19 (3.15)		0 (0-5)	
<b>Frequency of Sugar Consumption<sup>a</sup></b>					
1x	35 (19.3)	2.40 (2.22)	0.002	1.08 (1.70)	0.001*
2x	69 (38.1)	2.42 (3.62)		1.43 (2.32)	
3x	77 (42.5)	4.28 (3.81)		2.57 (2.55)	
<b>Number of Siblings<sup>b</sup></b>					
0	47 (26.0)	3.13 (3.07)	0.731	1.83 (2.64)	0.445
1 or more	134 (74.0)	3.23 (3.76)		1.85 (2.31)	

<sup>a</sup>Kruskal-Wallis; <sup>b</sup>Mann-Whitney; \*Statistically Significant.

## ■ Discussion

In a developing country, where most of the population has low access to dental care, oral health status is often overlooked [5]. This study evaluated the impact of oral health behavior on caries status on the OHRQoL of young children according to the perception of the children and their parents. This study uses a validated OHRQoL instrument cross-culturally adapted into the Indonesian version [21]. Viewing a child's oral health problems through both parents' and children's lenses may obtain more interesting findings because parents'

proxy reports may not always be identical to their children's [16]. Mothers and children were asked to complete the SOHO-5 questionnaire [21]. Eating difficulties had the most significant impact on ORHQoL compared to the other SOHO-5 items that were analyzed. The lowest scores were speaking difficulties (SOHO-5c) and avoiding smiling because of pain (SOHO-5p). Like previous studies, eating has the most significant impact on dental problems [4,21,22]. This may be the one that was reported the most because it will eventually affect other items, from nutrition status to school presence [23,24]. However, almost all parameters of oral health-related quality of life were significantly correlated to ECC status. This result supports the idea that we should see oral health problems beyond clinical measures and focus on patients' perceived impacts on their everyday lives.

Toothbrushing is the main protective factor in obtaining oral health, and regular dental appointments are essential in identifying oral health problems and enhancing preventive care. The current study found no significant difference in the quality of life of 5-year-old children based on toothbrush frequency. This contradicts a previous study that showed in vitro evidence that brushing before eating minimally reduced mineral compounds in the teeth compared to after eating [25]. Brushing their teeth twice a day and assisted by their parents will optimally reduce the risk of developing dental caries [26]. However, multiple studies have shown that even if there's a high report of positive oral health practice, the prevalence of caries is still high, which indicates non-proper and ineffective oral health practices [27]. It is essential to monitor the children's health behavior when they are this young. In this study, three out of five children did not have an adult watching them while they brushed their teeth, which suggests that the behavior was less effective [28].

Previous studies showed that awareness and understanding regarding taking care of children's oral health varied [29-31]. Prospective and young mothers often do not know when and how to perform oral and dental care [14]. Thus, oral health promotion as early as possible will effectively prevent early childhood caries and increase awareness of care for oral health.

Usually, parents do not bring their children for dental visits. They only seek treatment during acute dental problems, such as toothache or bleeding in the oral cavity [32]. Low utilization of dental health may result in indifferent quality of life, the children reported. Multiple stigmas, such as unimportant primary teeth, and it is common for primary teeth to have carious lesions, resulting in them being unsupportive towards early childhood dental efforts [9].

Regarding sugar intake, breastmilk is one of the first sugars children consume, which protects against infections, boosts the immune system, and promotes natural development. Breastfeeding should begin within the first hours of life and continue exclusively until two years old, along with complementary food [33]. Even though breastfeeding does not increase the risk of dental caries and may provide protection compared to feeding with formula milk if continued until one year old, after 12 months of age, milk consumption offers a higher risk of developing caries [34]. Even though not significant, consistent with various studies that showed breastmilk is better and has a lower caries risk factor, it showed children with different quality of life, with children exclusively breastfed having a higher quality of life.

According to a previous study, breastfeeding for more than 18 months, using a bottle to feed or quiet a crying baby at night, and putting a child to sleep are all factors linked to an increased risk of dental caries [35,36]. The results showed no difference in the quality of life of children aged five years based on intake up to 1 year of age. Contrary to what the World Health Organization (WHO) recommends, babies consume breast milk exclusively until the age of 6 months, then continue with the addition of complement intake until the age of 2 years because there are various benefits, including health in the oral cavity [37]. However, babies who are breastfed have been shown to have low levels of dental caries compared to babies who are fed formula milk.

Breastfeeding is more effective than breastfeeding rather than bottle-formula feeding [35]. High breastfeeding frequency with formula milk at night and adding sugar to formula milk are risk factors for ECC [38].

As infants grow older, parents usually introduce them to sugary snacks and WHO limits sugar intake by less than 10% of daily energy [39]. Higher consumption of sugar may lead to numerous chronic diseases, including dental caries [40]. Even when children are as young as five years old, this study has already shown differences in the quality of life of children based on the frequency of sugar consumption. This study showed that the number of siblings didn't differ in children's quality of life. However, a previous study showed that children who live in the same house with two or more siblings have a higher average dmft than others who have less, resulting in a lower quality of life. Children living with a large number of family members may lack attention from their parents due to divided focus [41].

Poor oral health will result in poor quality of life. Due to the social distancing policy during the data collection period, we instructed mothers to assess their children's oral health with more straightforward criteria based on previously published guidelines [18]. Even though we acknowledge that this method may underestimate the severity of caries in this population, we collected children's oral health conditions and increased mother awareness in those limited circumstances. Compared to children's quality of life, this study showed that children with cavities have worse oral health-related quality of life. The most common symptoms of ECC were pain in the teeth and gums, difficulty chewing, dissatisfaction with the appearance of one's teeth, and disturbed sleep. Not only that, but mental conditions like constant discomfort and psychological disorders can also impact their well-being [42]. Despite being preventable, along with inequalities in oral health, costly dental treatments, and competing health priorities with limited resources, ECC still be the most common chronic disease of childhood [5,43].

This study showed that even in free caries children, they reported an amount of impact. This may have happened because of a sociodemographic background that was not adjusted in this study. Sometimes, the severity of caries does not mean they will report a significant impact of OHRQoL. For them, pain means treatment needs, while not all children with caries will feel the pain [23]. Different pain perceptions may occur depending on their psychological state and cause different impacts felt and reported. Positive and negative emotion will affect their pain perception, which multiple backgrounds and parenting styles contribute [44]. Thus, the gap between pain and OHRQoL may be diverse even in a similar clinical condition. This understanding was needed because, nowadays, oral health is much more than a disease-only focus; it is also a broader biopsychosocial concept of oral health, so dentistry is not only about treatment but also care [23]. Assessment of OHRQoL allows for establishing care that focuses on a person's social and emotional experience and physical functioning so that the appropriate treatment can be established [45].






Few previous studies also compared caretakers and children, although some used different instruments. It shows that children report their OHRQoL higher than their caretakers. Even when comparing the father, mother, and children, it shows that both parents may not have the same perception of the child's OHRQoL as their children, but still, the mother is a better proxy than the father [27]. Even though some studies show that children at this age can report their OHRQoL reliably, it is acknowledged there might be some issues regarding recall and their limited capabilities of abstract thinking, so parents' reports should still be employed [3]. Parents are typically very sensitive to their children's health, while the children may lack perspective and insight. Not only affect children's quality of life, but their oral health problems may also impact parents' daily lives [6]. Based on this and previous studies, to assess a child's OHRQoL, especially in 5-year-old children, both child and parent perceptions may be needed to avoid missing information on the burden of ECC on children's lives [12,27,26].

This study has inherent limitations of the cross-sectional design, yet can establish the direction of the association. The sampling method that was used might be unrepresentative to 5-year-old children who didn't go to school, random errors may have occurred due to the sampling method, and the result may only be generalized to some children in Indonesia. Convenience sampling for participant selection may jeopardize the sample's representativeness even further. Also, due to the COVID-19 pandemic during the study collection period, the adjusted method of data collection, which is different from the previous studies, may lessen the reliability of the results [4,21]. When ECC status is assessed indirectly due to COVID-19 social distancing, the dependence on online ECC assessments may lead to mistakes and the underreporting of ECC cases. Data collected through questionnaires can have biased results, but they have been minimalized by using validated questionnaires [46]. Other factors that may influence ECC and OHRQoL weren't observed in this study [27,47]. These limitations gaps could be filled with further research that ensures a more reliable data collection, thorough analysis, better representation, and a more transparent presentation of findings and their implications. Despite the limitations, this study is able to report how community assessment in the COVID-19 era went and identify few findings in this population.

## ■ Conclusion

These results suggest an intense relationship between oral health behavior and early childhood caries and results in decreasing quality of life, both perceived by mothers and children themselves. Understanding proper hygiene and nutrition intake is essential in oral health management and disease prevention. Awareness of parents as caregivers of young children is critical.

## ■ Authors' Contributions

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

## ■ Financial Support

This research is funded by Faculty of Dentistry, University of Indonesia.

## ■ 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] Chen J, Duangthip D, Gao SS, et al. Oral health policies to tackle the burden of early childhood caries: A review of 14 countries/regions. *Front Oral Health* 2021; 2:670154. <https://doi.org/10.3389/froh.2021.670154>
- [2] American Academy of Pediatric Dentistry. Policy on Early Childhood Caries (ECC): Classifications, consequences, and preventive strategies. *Pediatr Dent* 2016; 38(6):52-54.
- [3] Ministry of Health Republic Indonesia. Basic Health Survey. Jakarta: Ministry of Health Republic Indonesia. 2019. Available from: <http://www.depkes.go.id/resources/download/info-terkini/hasil-risikesdas-2018.pdf> [Accessed on July 20, 2022]. [In Indonesian].



- [4] Ramadhani A, Khairinisa S, Setiawati F, Darwita RR, Maharani DA. The relationships among oral health practices, early childhood caries, and oral health-related quality of life in Indonesian preschool children: A cross-sectional study. *J Int Soc Prev Community Dent* 2021; 11(2):158-165. [https://doi.org/10.4103/jispcd.JISPCD\\_388\\_20](https://doi.org/10.4103/jispcd.JISPCD_388_20)
- [5] Chaffee BW, Rodrigues PH, Kramer PF, Vítole MR, Feldens CA. Oral health-related quality-of-life scores differ by socioeconomic status and caries experience. *Community Dent Oral Epidemiol* 2017; 45(3):216-224. <https://doi.org/10.1111/cdoe.12279>
- [6] Pakkhesal M, Riyahi E, Naghavi Alhosseini A, Amdjadi P, Behnampour N. Impact of dental caries on oral health-related quality of life among preschool children: Perceptions of parents. *BMC Oral Health* 2021; 21(1):68. <https://doi.org/10.1186/s12903-021-01396-4>
- [7] Chi DL, Scott JM. Added sugar and dental caries in children: A scientific update and future steps. *Dent Clin North Am* 2019; 63(1):17-33. <https://doi.org/10.1016/j.cden.2018.08.003>
- [8] AlMarshad LK, Wyne AH, AlJobair AM. Early childhood caries prevalence and associated risk factors among Saudi preschool children in Riyadh. *Saudi Dent J* 2021; 33(8):1084-1090. <https://doi.org/10.1016/j.sdentj.2021.04.003>
- [9] Almoudi MM, Hussein AS, Doss JG, Schroth RJ. Expectant mothers' readiness to initiate preventive oral health care for their children. *Saudi J Dent Res* 2016; 7(2):118-126. <https://doi.org/10.1016/j.sjdr.2016.04.006>
- [10] Susi S, Murniwati M, Kasuma N, Minarni M. The relationship between maternal characteristics and early childhood caries. *Padjadjaran Journal of Dentistry* 2020; 32(1):22. <https://doi.org/10.24198/pjd.vol32no1.23640>
- [11] Chala S, Houzmali S, Abouqal R, Abdallaoui F. Knowledge, attitudes and self-reported practices toward children oral health among mother's attending maternal and child's units, Salé, Morocco. *BMC Public Health* 2018; 18(1):618. <https://doi.org/10.1186/s12889-018-5542-2>
- [12] Kafi MS, Abed BJ. EB49\_Knowledge, Attitude of mothers towards infant oral healthcare in Baghdad City/ Al-Karkh. *Med-Leg Update* 2022; 22(4):35-41. <https://doi.org/10.37506/mlu.v22i4.3331>
- [13] Hallas D, Fernandez JB, Lim LJ, Catapano P, Dickson SK, Blouin KR, et al. OHEP: An oral health education program for mothers of newborns. *J Pediatr Health Care* 2015; 29(2):181-190. <https://doi.org/10.1016/j.pedhc.2014.11.004>
- [14] Hammad OA, Binsaad SM, Gasim RA, Jambi S, Haidary R, Amal Afandi A, et al. Assessing expectant mothers' knowledge and beliefs about oral healthcare during infancy and pregnancy: A cross sectional survey in Saudi Arabia. *Pesqui Bras Odontopediatria Clin Integr* 2018; 18(1):e4027. <https://doi.org/10.4034/PBOCI.2018.181.66>
- [15] Kitchener R. Piaget's theory of knowledge: Genetic epistemology and scientific reason. Yale University Press; 1986. <https://doi.org/10.2307/j.ctt1xp3sbd>
- [16] Khairinisa S, Setiawati F, Maharani DA, Darwita RR. Validity of mother-child self-perceived oral health for the assessment of 5 years old children's oral health in Indonesia. *BMC Oral Health* 2023; 23(1):172. <https://doi.org/10.1186/s12903-023-02876-5>
- [17] Gilli M, Maringer D, Schumann E. Basic Methods. In: Gilli M, Maringer D, Schumann E. Numerical Methods and Optimization in Finance. Academic Press; 2011. <https://doi.org/10.1016/b978-0-12-375662-6.00011-0>
- [18] Malta M, Cardoso LO, Bastos FI, Magnanini MM, Silva CM. STROBE initiative: Guidelines on reporting observational studies. *Rev Saude Publica* 2010; 44(3):559-565. <https://doi.org/10.1590/S0034-89102010000300021>
- [19] Evans RW, Feldens CA, Phantunvanit P. A protocol for early childhood caries diagnosis and risk assessment. *Community Dent Oral Epidemiol* 2018; 46(5):518-525. <https://doi.org/10.1111/cdoe.12405>
- [20] Wang X, Wei Z, Li Q, Mei L. A longitudinal study of early childhood caries incidence in Wenzhou preschool children. *BMC Oral Health* 2017; 17(1):1-5. <https://doi.org/10.1186/s12903-017-0394-1>
- [21] Rachmawati Y, Pratiwi A, Maharani D. Cross-cultural adaptation and psychometric properties of the Indonesia version of the scale of oral health outcomes for 5-year-old children. *J Int Soc Prev Community Dent* 2017; 7(Suppl 2):S75-S81. [https://doi.org/10.4103/jispcd.jispcd\\_272\\_17](https://doi.org/10.4103/jispcd.jispcd_272_17)
- [22] Abanto J, Tsakos G, Paiva SM, Raggio DP, Celiberti P, Bönecker M. Agreement between children aged 5-6 years and their mothers in rating child oral health-related quality of life. *Int J Paediatr Dent* 2014; 24(5):373-379. <https://doi.org/10.1111/ipd.12081>
- [23] Clementino MA, Gomes MC, Pinto-Sarmiento TC, Martins CC, Granville-Garcia AF, Paiva SM. Perceived impact of dental pain on the quality of life of preschool children and their families. *PLoS ONE* 2015; 10(6):e0130602. <https://doi.org/10.1371/journal.pone.0130602>
- [24] Furuta M, Fukai K, Aida J, Shimazaki Y, Ando Y, Miyazaki H, et al. Periodontal status and self-reported systemic health of periodontal patients regularly visiting dental clinics in the 8020 promotion foundation study of Japanese dental patients. *J Oral Sci* 2019; 61(2):238-245. <https://doi.org/10.2334/josnusd.18-0128>
- [25] Toumba J. Tooth brushing before or after breakfast? *Eur Arch Paediatr Dent* 2012; 107(2012). <https://doi.org/10.1007/BF03262854>
- [26] Aliakbari E, Gray-Burrows KA, Vinall-Collier KA, Edwebi S, Marshman Z, McEachan RRC, et al. Home-based toothbrushing interventions for parents of young children to reduce dental caries: A systematic review. *Int J Paediatr Dent* 2021; 31(1):37-79. <https://doi.org/10.1111/ipd.12658>
- [27] Maharani DA, Adiatman M, Rahardjo A, Burnside G, Pine C. An assessment of the impacts of child oral health in Indonesia and associations with self-esteem, school performance and perceived employability. *BMC Oral Health* 2017; 17(1):5-9. <https://doi.org/10.1186/s12903-017-0358-5>

- [28] İnan-eroğlu E, Özşin-özler C, Erçim RE, Büyüktuncer Z. Is diet quality associated with early childhood caries in preschool children? A descriptive study. *Turk J Pediatr* 2017; 59(5):537-547. <https://doi.org/10.24953/turkijped.2017.05.006>
- [29] Brega AG, Jiang L, Johnson RL, Wilson AR, Schmiege SJ, Albino J. Health literacy and parental oral health knowledge, beliefs, behavior, and status among parents of american Indian newborns. *J Racial and Ethnic Health Disparities* 2020; 7(4):598-608. <https://doi.org/10.1007/s40615-019-00688-4>
- [30] van Spreuwel PCJM, Jerković-Čosić K, van Loveren C, van der Heijden GJMG. Parents' willingness to invest in primary oral health prevention for their preschool children. *Int J Environ Res Public Health* 2021; 18(21):11437. <https://doi.org/10.3390/ijerph182111437>
- [31] Fadel HT, Alamray SF, Alsayed SS, Zolaly GY, Alsisi LH, Bahammam SA. Parents' education level and children's BMI explain caries distribution among kindergarten students: A cross-sectional study. *East Mediterr Health J* 2022; 28(3):190-196. <https://doi.org/10.26719/emhj.21.074>
- [32] Pinto GDS, Azevedo MS, Goettens ML, Correa MB, Pinheiro RT, Demarco FF. Are maternal factors predictors for early childhood caries? Results from a Cohort in Southern Brazil. *Braz Dent J* 2017; 28(3):391-397. <https://doi.org/10.1590/0103-Dickensário.0000171718>
- [33] Camacho-Morales A, Caba M, García-Juárez M, Caba-Flores MD, Viveros-Contreras R, Martínez-Valenzuela C. Breastfeeding contributes to physiological immune programming in the newborn. *Front Pediatr* 2021; 9:744104. <https://doi.org/10.3389/fped.2021.744104>
- [34] Branger B, Camelot F, Droz D, Houbiers B, Marchalot A, Bruel H, et al. Breastfeeding and early childhood caries. Review of the literature, recommendations, and prevention. *Arch Pediatr* 2019; 26(8):497-503. <https://doi.org/10.1016/j.arcped.2019.10.004>
- [35] Avila WM, Pordeus IA, Paiva SM, Martins CC. Breast and bottle feeding as risk factors for dental caries: A systematic review and meta-analysis. *PLoS ONE* 2015; 10(11):e0142922. <https://doi.org/10.1371/journal.pone.0142922>
- [36] Alshunaiber R, Alzaid H, Meaigel S, Aldeeri A, Adlan A. Early childhood caries and infant's oral health; pediatricians' and family physicians' practice, knowledge and attitude in Riyadh city, Saudi Arabia. *Saudi Dent J* 2019; 31(Suppl):S96-S105. <https://doi.org/10.1016/j.sdentj.2019.01.006>
- [37] Martin CR, Ling PR, Blackburn GL. Review of infant feeding: Key features of breast milk and infant formula. *Nutrients* 2016; 8(5):279. <https://doi.org/10.3390/nu8050279>
- [38] de Souza PM do ES, Mello Proença MA, Franco MM, Rodrigues VP, Costa JF, Costa EL. Association between early childhood caries and maternal caries status: A cross-section study in São Luís, Maranhão, Brazil. *Eur J Dent* 2015; 9(1):122-126. <https://doi.org/10.4103/1305-7456.149659>
- [39] World Health Organization. Guideline: Sugars intake for adults and children. Geneva: World Health Organization; 2015. Executive summary. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK285538/>. [Accessed on October 23, 2023].
- [40] Feldens CA, Pinheiro LL, Cury JA, Mendonça F, Groisman M, Costa RAH, et al. Added sugar and oral health: A position paper of the Brazilian academy of dentistry. *Front Oral Health* 2022; 3:869112. <https://doi.org/10.3389/froh.2022.869112>
- [41] Liu M, Yun Q, Zhao M, Chen W, Zhang H, Hou W, et al. Association of siblings' presence and oral health-related quality of life among children: A cross-sectional study. *BMC Oral Health* 2021; 21(1):153. <https://doi.org/10.1186/s12903-021-01526-y>
- [42] Bramantoro T, Prabandari YS, Ismail D, Tedjosasongko U. The development of early childhood caries impact on quality of life-Indonesia instrument as assessment instrument of dental caries impact on quality of life of children aged 3-5 years based on Indonesian community characteristics. *Dent J* 2015; 48(4):197. <https://doi.org/10.20473/j.djmk.v48.i4.p197-203>
- [43] Saikia A, Aarthi J, Muthu MS, Patil SS, Anthonappa RP, Walia T, et al. Sustainable development goals and ending ECC as a public health crisis. *Front Public Health* 2022; 10:931243. <https://doi.org/10.3389/fpubh.2022.931243>
- [44] Gomes MC, Neves ÉTB, Perazzo MF, Paiva SM, Ferreira FM, Granville-Garcia AF. Contextual and individual determinants of oral health-related quality of life among five-year-old children: A multilevel analysis. *PeerJ* 2018; 6:e5451. <https://doi.org/10.7717/peerj.5451>
- [45] Singh N, Dubey N, Rathore M, Pandey P. Impact of early childhood caries on quality of life: Child and parent perspectives. *J Oral Biol Craniofac Res* 2020; 10(2):83-86. <https://doi.org/10.1016/j.jobcr.2020.02.006>
- [46] Althubaiti A. Information bias in health research: Definition, pitfalls, and adjustment methods. *J Multidiscip Healthc* 2016; 9:211-217. <https://doi.org/10.2147/JMDH.S104807>
- [47] Foster Page L, Gilchrist F, Broder H, Clark E, Thomson W. A comparison of three child OHRQoL measures. *Dent J* 2019; 7(1):19. <https://doi.org/10.3390/dj7010019>