

## Association Between Early Childhood Caries and Oral Health-Related Quality of Life Using Ecohis Instrument

Rezky Fauziah Permatasari<sup>1</sup>, Febriana Setiawati<sup>2\*</sup>, Iwany Amalliah Badruddin<sup>2</sup>

1. Undergraduate student, Faculty of Dentistry, Universitas Indonesia, Jalan Salemba Raya No.4, Jakarta Pusat, 10430, Indonesia.

2. Department of Public Health, Faculty of Dentistry, Universitas Indonesia, Jalan Salemba Raya No.4, Jakarta Pusat, 10430, Indonesia.

### Abstract

Dental caries is an oral health problem that can develop early in preschool children, affecting their quality of life. The objective of this study was to assess the relationship between caries status and oral health-related quality of life (OHRQoL) in preschool children at Grogol Utara, Kebayoran Lama, Jakarta Selatan.

We conducted a cross-sectional study on 200 children aged 3–5 years. Dental caries status was assessed via clinical examination. OHRQoL was assessed using the Early Childhood Oral Health Impact Scale (ECOHIS) by interviewing a total of 165 mothers. The results of the ECOHIS were used to represent the OHRQoL.

A significant difference was seen between caries status and OHRQoL regarding the impact on both children and their families ( $P < 0.05$ ). In addition, there was a significant difference between caries free and severe early childhood caries in all domains except the self-image/social interaction domain and the overall ECOHIS score ( $P < 0.05$ ).

We found no significant difference between caries free and early childhood caries in all domains and overall ECOHIS score ( $P \geq 0.05$ ). Caries severity in preschool children had a negative impact on the OHRQoL of the children and their families.

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### Introduction

Oral health plays an important role in general health, yet it continues to be a global problem, particularly with dental caries. According to Riskesdas (Riset Kesehatan Dasar) in 2007 and 2013, the prevalence of oral health diseases in Indonesia increased from 23.2% to 25.9%.<sup>1</sup> Children of any age, even babies and toddlers, can have tooth decay. In Indonesia, based on Riskesdas 2013, the prevalence of oral health diseases in the 1–4 year age group was 10.4%.<sup>2</sup> Another study by Ita Yulita that was conducted at a preschool in Pondok Labu, South Jakarta, reported that the prevalence of early

childhood caries (ECC) in the 1–6 year age group was 76.7%,<sup>3</sup> suggesting that dental caries in younger children is a significant health concern in many countries including Indonesia.

Children and early teenagers are at a crucial age for healthy tooth development. Although ECC is not a life-threatening disease, its impact in the individual or community is extensive, where it results in pain and functional disability, negatively influences growth, reduces body weight, and slows development. Hence, early caries in children will affect their nutrition, concentration, and participation in school, which can decrease their quality of life.<sup>4,5</sup>

The oral health-related quality of life (OHRQoL) concept is based on individuals' perceptions of their position in life in the context of culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns.<sup>6</sup> Numerous measures have been developed over the years to fulfill the need for a specific assessment such as by age. One such instrument is the Early Childhood Oral

#### \*Corresponding author:

**Febriana Setiawati**

Department of Public Health,  
Faculty of Dentistry, Universitas Indonesia,  
Jakarta, Indonesia.

E-mail: febianasetiawati@gmail.com

Health Impact Scale (ECOHIS), which is used to assess the impact of oral health problems and related treatment experiences on the quality of life of children of preschool age (aged 3–5 years) and younger. This instrument considers children's limitations in assessing their OHRQoL such as cognitive limitations. Moreover, ECOHIS also considers the effect of children's oral health problems on the family dynamic.<sup>7</sup>

OHRQoL studies using the ECOHIS instrument are rarely performed. The present study aims to assess the correlation between caries status and OHRQoL using the Indonesian version of ECOHIS in children aged 3–5 years at Grogol Utara, Kebayoran Lama, South Jakarta. Furthermore, this study aims to assess the validity and reliability of the Indonesian version of ECOHIS.

### Materials and methods

This study was an observational analytical study with a cross-sectional design conducted in eight preschools and kindergartens at Grogol Utara, Kebayoran Lama, South Jakarta. Convenience sampling was performed as the survey sampling method. Preschool children aged 36–71 months were included in the study. A clinical examination was performed to collect dental caries information from the children, and the parents/guardians were interviewed using the ECOHIS questionnaire.

We used the dmft index from the WHO in the oral examination to determine dental caries status. The classification of caries severity was based on the American Academy of Pediatric Dentistry criteria, which are caries free (deft=0), ECC (deft≥1), and severe ECC (S-ECC) (≥4 at age 3 years or ≥5 at age 4 years or ≥6 at age 5 years).<sup>8</sup> The Indonesian version of ECOHIS was used to interview the mothers for the children's quality of life assessment. ECOHIS is scored using a Likert scale with responses ranging from 0 (don't know), 1 (never), 2 (rarely), 3 (sometimes), 4 (often), and 5 (very often). Sociodemographic information included the age of the child and the mother, the mother's educational level, and the parent's jobs.

Two dentists performed the oral examination. Calibration was conducted for intra- and inter-observer reliability. The intra- and inter-observer reliability for each examiner was 0.9 (excellent agreement). The validity of the

Indonesian version of ECOHIS was declared invalid because the value of rxy was lower than that of the r table product-moment (DF=13; alpha=0.05; r table=0.514). Next, we used Cronbach's alpha value to assess the internal reliability of the Indonesian version of ECOHIS, which was 0.519 (0.6>α≥0.5) indicating that internal reliability was poor. But if the test was performed continuously by reducing the items to obtain the highest possible α, the value of α passed to 0.687, still suggesting questionable internal reliability. We performed the test-retest analysis to assess the external validity of the Indonesian version of ECOHIS. The questionnaire was distributed at two different times (time span of 2–3 weeks) to 15 mothers who were not included in the research. For external reliability, the weighted intra-class correlation coefficient (ICC) was 0.968 (α≥0.9), suggesting excellent external reliability.

The study protocol, letter of informed consent, and other supporting documents were approved by the Universitas Indonesia Faculty of Dentistry Ethical Review Board prior to their use. Written informed consent was obtained from all mothers prior to their enrollment in the study for the clinical examination and ECOHIS questionnaire interview.

### Results

In total, 165 of 200 mother–child pairs were included for analysis. The subject characteristics are described in Table 1. The children's average age was 59 months (range, 37–71 months). The mothers' average age was 34 years, their educational level was mostly junior or senior high school graduate (57.9%), and more than half were not employed (62.4%). The prevalence of dental caries was 83%, with an average deft value of 6.2 (range, 0–20). Decay was the highest caries component with an average of 6.09 (range, 0–20) (Table 2).

Variables	n (%)	Median (min-max)
Dental caries prevalence		
Free	28 (17.0)	
ECC	48 (29.1)	
S-ECC (Severe ECC)	89 (53.9)	
Dental caries components		
deft		5 (0–20)
decayed		5 (0–20)
extracted		0 (0–7)
filled		0 (0–6)

**Table 1.** Dental Caries Status.

Table 2 displays the distribution of responses to the ECOHIS according to each question. Items related to pain and difficulty eating and drinking were the most frequently reported in the child impact section. Items related to the family feeling guilty and being upset were frequently reported in the family impact section.

Item	Never or hardly ever (1 and 2)	Occasionally, often, or very often (3, 4, 5)	Don't know (0)
	N (%)	N (%)	N (%)
<b>Child impact section</b>			
Symptom domain			
Oral/dental pain	124 (75.2)	41 (24.8)	0 (0)
Child function domain			
Difficulty drinking	149 (90.3)	15 (9.1)	1 (0.6)
Difficulty eating	139 (84.2)	25 (15.2)	1 (0.6)
Difficulty pronouncing words	157 (95.2)	7 (4.2)	1 (0.6)
Missed preschool or school	163 (98.8)	2 (1.2)	0 (0)
Child psychology			
Trouble sleeping	155 (93.9)	10 (6.1)	0 (0)
Irritable or frustrated	152 (92.1)	12 (7.3)	1 (0.6)
Child self-image/social interaction			
Avoided smiling or laughing	158 (95.8)	5 (3.0)	2 (1.2)
Avoided talking	161 (97.6)	2 (1.2)	2 (1.2)
<b>Family impact section</b>			
Parent distress domain			
Felt upset	143 (86.7)	21 (12.7)	1 (0.6)
Felt guilty	123 (74.5)	41 (24.8)	1 (0.6)
Family function domain			
Time off from work	155 (93.9)	9 (5.5)	1 (0.6)
Financial impact	157 (95.2)	7 (4.2)	1 (0.6)

**Table 2.** ECOHIS Responses in the Parents' Survey.

Tables 3 to 5 demonstrate the correlation between dental caries status and ECOHIS responses. Spearman rank correlation was performed to assess the relationship between dental caries and ECOHIS responses. With the exception of the "avoided talking" item from the child impact section, all ECOHIS items were significantly related to dental caries status. The correlation score of all ECOHIS items increased as caries status increased, and all were on a positive direction, which means that the more severe the caries, the higher impact it will have on the child's quality of life. For instance, the correlation between the oral/dental pain item and caries status was  $r=0.3$ , indicating a weak correlation of positive direction.

Item	deft score
<b>Child impact section</b>	
Symptom domain	
Oral/dental pain	$r=0.4^{**}$
Child function domain	
Difficulty drinking	$r=0.1^*$
Difficulty eating	$r=0.2^{**}$
Difficulty pronouncing words	$r=0.3^{**}$
Missed preschool or school	$r=0.2^{**}$
Child psychology	
Trouble sleeping	$r=0.3^{**}$
Irritable or frustrated	$r=0.3^{**}$
Child self-image/social interaction	
Avoided smiling or laughing	$r=0.3^*$
Avoided talking	$r=0.1^*$
Parent distress domain	
Felt upset	$r=0.2^{**}$
Felt guilty	$r=0.4^{**}$
Family function domain	
Time off from work	$r=0.3^{**}$
Financial impact	$r=0.2^{**}$

\* $\leq 0.05$ , \*\* $\leq 0.01$ , ns=not significant, using Spearman correlation test

**Table 3.** Correlation Between ECOHIS Responses with Caries Status and deft Index.

The Kruskal–Wallis test was performed to assess for significant differences between dental caries status and overall ECOHIS score, and post hoc analysis to assess for significant differences in each domain was conducted using the Mann–Whitney *U* test.

There was a significant difference between the overall ECOHIS score ( $P=0.001$ ) and each domain, except for the self-image/social interaction domain, in the caries free and severe dental caries groups (Table 4). However, there was no statistically significant association between the caries free and ECC groups for each domain and overall ECOHIS score (Table 5).

Item	Caries status		p-value
	Caries free	S-ECC	
Domain			
Child symptom domain	1 (1–3)	2 (1–5)	0.001*
Child function domain	4 (4–7)	5 (3–13)	0.006*
Child psychology domain	2 (2–2)	5 (3–13)	0.004*
Child self-image/social interaction domain	2 (2–3)	2 (0–7)	0.051
Parental distress domain	2 (2–5)	2 (0–8)	0.002*
Family function domain	2 (2–3)	2 (0–7)	0.015*
Sum of overall ECOHIS score	13 (13–18)	18 (9–37)	0.001*

Values are expressed as median with a range in parentheses. *P*-values were determined using the Mann–Whitney *U* test.

\*significant difference ( $P<0.05$ )

**Table 4.** Association Between the Caries Free and S-ECC Groups for Each Domain and Overall ECOHIS Score.

Item	Caries Status		p-value
	Caries free	ECC	
Domain			
Child symptom domain	1 (1–3)	1 (1–4)	0.298
Child function domain	4 (4–7)	4 (4–8)	0.817
Child psychology domain	2 (2–2)	2 (2–7)	0.079
Child self-image/social interaction domain	2 (2–3)	2 (0–5)	0.890
Parental distress domain	2 (2–5)	2 (2–4)	0.708
Family function domain	2 (2–3)	2 (2–4)	0.415
Sum of overall ECOHIS score	13 (13–18)	13 (13–28)	0.456

Values are expressed as median with a range in parentheses. *P*-values were determined using the Mann–Whitney *U* test.

**Table 5.** Association Between the Caries Free and ECC Groups for Each Domain and Overall ECOHIS.

## Discussion

The results of the present study show a caries prevalence of 83.5%. The prevalence of ECC in this study was higher than in the previous study by Rahel (2014) at Gunung Anyar, Surabaya,<sup>9</sup> suggesting that a coordinated effort is needed between social service agencies, health care providers, and policy makers.<sup>10</sup>

ECOHIS has been translated and adopted for use in Malaysia<sup>7</sup> and Brazil.<sup>11</sup> The validity of the Indonesian version was assessed using Pearson product-moment correlation coefficient (DF=163; alpha=0.05; *r* table=0.1528), whereas reliability was assessed using Cronbach's alpha (the highest possible score is 0.687 (0.7> $\alpha$ ≥0.6)) and test–retest (ICC: 0.968 [ $\alpha$ ≥0.9]). Overall, we found that the Indonesian version of ECOHIS was a valid and reliable instrument for assessing caries status and OHRQoL.

In this study, the three most common impacts reported by parents in the child impact section were “oral/dental pain,” “difficulty eating,” and “difficulty drinking.” This result is similar to previous studies by Ana Carolina (2011)<sup>11</sup> and Azlina (2015).<sup>7</sup> These three symptoms are frequently related to ECC,<sup>4,12,13</sup> suggesting that the impact of ECC on quality of life is consistent.<sup>14</sup> The least common impact was “missed preschool or school” and is similar to a previous study by Azlina (2015)<sup>7</sup> but contrary to a study by Pahel (2007).<sup>15</sup> This difference may be because some of the children had just applied to preschool when the research took place, school days were limited to 3 days/week, and parents brought their children to the dentist in the evening.

The most frequently reported items in the

family impact section were “felt upset” and “felt guilty,” which is similar to a previous study by Azlina (2015)<sup>7</sup> and Ana Carolina (2011),<sup>11</sup> possibly because parents had knowledge of their children's oral health care but did not enforce it.<sup>13</sup> Parents also might have felt responsible for their preschool children's oral health.<sup>16</sup>

The strongest correlation was found in the item “oral/dental pain” in the child impact section and the item “felt guilty” in the family impact section. The most common immediate consequence of untreated dental caries was dental pain.<sup>4</sup> The prevalence of oral/dental pain was also associated with dental health utilization. A previous study found a higher prevalence of dental pain among those who had been to a dentist.<sup>17</sup> According to the low ratio between the filled and decayed components in the sample's overall deft index (mean dt score=6.09 and ft score=0.08), it can be concluded that the trend for treatment needs in children is high but the utilization rate is still low.<sup>18</sup>

Parental guilt increased with the severity of dental caries. In addition to the reason stated previously, parents were also worried about the future impact of their children's caries.<sup>14,19</sup> From a different perspective, some parents believed that dental caries was a common or normal occurrence in children and was somehow inevitable. This misconception could explain the large number of parents answering “never” on the “feeling guilty” item in the family impact section.<sup>13</sup>

With the exception of the self-image/social interaction domain, the significant difference between the caries free and S-ECC groups (*P*<.05) for each domain and overall ECOHIS score was related to the child's developmental psychology. Children begin to compare their physical features and personality traits with those of other children or against a norm at the age of 6 years. Hence, one of the reasons for the lack of significance in this domain could be because our research assessed children aged <6 years.<sup>13</sup>

For the nonsignificant association between the caries free and ECC groups for each domain and overall ECOHIS score, previous studies have stated that the higher the severity of ECC, the lower the ECOHIS score would be.<sup>13,20</sup> In the present study, 66.7% of 48 children who were diagnosed with ECC only had 1–3 decayed teeth, so it is reasonable that the

answers in this group would be similar to those in the caries-free group in the data analysis. We also considered the result of Table 4 where there was a significant difference between the caries free and S-ECC groups. Finally, we can conclude that the amount of decayed teeth determines both children's and family members' quality of life.

## Conclusions

The Indonesian version of ECOHIS is a reliable and valid instrument for assessing caries status and OHRQoL. Caries severity in preschool children aged 3–5 years in Grogol Utara, South Jakarta, had a negative impact on the OHRQoL of the children and their families. A significant difference was found between caries free and S-ECC in all domains except the self-image/social interaction domain and overall ECOHIS score.

There are limitations to this study. Although this study provides original and substantial evidence, it is a cross-sectional study. Longitudinal studies are needed to assess the long-term effects of ECC so the findings can serve as a source of information for planning and organizing an oral health program. Furthermore, there was also the possibility of recall bias when answering the questionnaire because parents were asked to recall the impact of children's caries to both the children and family.

## Declaration of Interest

The authors certify that they have no commercial associations that might represent a conflict of interest in connection with the submitted manuscript. This study was supported by a 2018 PITTA Grant from the Research and Community Development Center of Universitas Indonesia. The authors would like to thank the teachers and mothers at the preschools and Community Health Center at Grogol Utara, South Jakarta. The publication of this manuscript is supported by Universitas Indonesia.

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