

The Relationship between Eating Behavior and Early Childhood Caries in Children

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The Relationship between Eating Behavior and Early Childhood Caries in Children

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Abstract

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BACKGROUND: Eating process in children is not only to fulfill hunger but also to fulfill the nutritional needs of children's growth and development. Eating disorders can cause health problems for children, including dental and oral health. Poor oral and dental health in children can affect self-confidence, chewing ability, and nutritional fulfillment. Nowadays, Early Childhood Caries (ECC) is the most common hard tissue disease in primary teeth that affect children.

AIM: This study aims to determine the relationship between eating behavior and ECC in children.

METHODS: This research is an observational study with a cross-sectional design. Sampling was done by purposive sampling with a total sample of 165 children aged 3–5 years old and their mothers. The Children Eating Behavior Questionnaire (CEBQ) was used to measure the eight eating types of children. ECC is measured by def-t index. Data analysis was done using Chi-square test.

RESULTS: The prevalence of ECC was 47.9%. There was a significant relationship between food responsiveness ($p = 0.001$; OR = 3.235; 95% CI 1.648–6.341), food fussiness ($p = 0.010$; OR = 2.380; 95% CI 1.273–4.450), and enjoyment of food ($p = 0.005$; OR = 0.377; 95% CI 0.198–0.72) with the incidence of ECC. However, Emotional over Eating, Desire to Drink, Satiety Responsiveness, Emotional under Eating, and Slowness in Eating were not associated with the incidence of ECC.

CONCLUSION: Children's eating behavior contributes to the incidence of ECC.

Background

Dental and oral health in children is important because poor oral and dental health in children can affect self-confidence, chewing ability, nutritional fulfillment, and general health of children. One of the most common dental and oral diseases suffered by children is dental caries [1].

Early childhood caries (ECC) is a dental disease characterized by the presence of one or more primary teeth enamel that is damaged, lost, or restored. The caries process that continues can cause pain, tooth loss, and infection. Children at the age of 3–5 years old are the peak occurrence of ECC. Based on the WHO data, 60–90% of elementary school students in the world have dental caries [2]. The prevalence of dental caries in children in Indonesia reached 90% [3]. The prevalence of dental caries in children in Palembang is 92.43%. Measurement of the severity of dental caries in children can be measured using the DEF-T index [4].

Eating behavior is a term that describes a person's actions in choosing food and the reasons for eating, eating habits, food intake, and problems related to eating such as obesity, eating disorders, and feeding

disorders [5]. Eating behavior can explain how to eat, how much to eat, and what to eat [6].

The most comprehensive assessment instrument for eating behavior in children is the Children Eating Behavior Questionnaire (CEBQ). This questionnaire consists of 35 question items addressed to parents regarding their child's eating behavior. CEBQ consists of eight subscales, which are four scales pointing to positive behavior toward eating and four subscales leading to negative behavior toward eating. Four subscales that evaluate the positive behavior towards eating, including food responsiveness (FR), emotional over eating (EOE), enjoyment of food (EF), and desire to drink (DD), while another four subscales that evaluate negative behavior toward eating, including satiety responsiveness (SR), slowness in eating (SE), emotional under eating (EUE), and food fussiness (FF) [7].

Anandakrishna *et al.* (2014) reported that there was a relationship between eating behavior and the occurrence of dental caries in children [8]. Children's dental caries status was found to be higher in children who tend to do pocketing or holding on to their food in their mouth without swallowing it, children who overeat and children who eat more when they are not active.

Other studies have reported that dental caries in children is influenced by food responsiveness, emotional over eating, satiety responsiveness, slowness in eating, food fussiness, and desire to drink [9]. Research on children's eating behavior and its relationship with the incidence of caries is still limited. Cultural differences and types of food available in the environment can cause differences in caries status based on eating behavior. Therefore, more research to examine the relationship between eating behavior and Early Childhood Caries (ECC) in children has to be done. This study aims to determine the relationship between eating behavior and ECC in children.

Methods

This study used an observational research method with a cross-sectional design. The study was conducted in Palembang City in October 2020. The sample size required for the study was calculated using the following formula for sample size calculation:

$$n = \frac{[z_{1-\alpha/2} \sqrt{2\bar{P}(1-\bar{P})} + z_{1-\beta} \sqrt{P_1(1-P_1) + P_2(1-P_2)}]^2}{(P_1 - P_2)}$$

n: Sample size

$z_{1-\alpha/2}$: Standard derivative alpha 5% = 1.96

$z_{1-\beta}$: Standard beta coefficient 90% = 1.28

P: Proportion of children with poor dental health which have dental caries = 92.3% (Purwaningsih and Sirat, 2016)

P_1 : Proportion of children with good dental health which have dental caries = 60.9% (Purwaningsih & Sirat, 2016).

Sampling in this study was carried out by purposive sampling, with total 165 children aged 3–5 years. The research data were taken in two stages by measuring children's eating behavior and measuring the severity of caries. The instrument used in measuring children's eating behavior is the Children's Eating Behavior Questionnaire (CEBQ) (found in the Appendix 1). The CEBQ is designed to identify eight aspects of a child's eating style that is assessed by the mother or caregiver. The questionnaire contained 35 CEBQ statements divided into eight subscales, including the food responsiveness (FR), emotional over-eating (EO), enjoyment of food (EF), desire to drink (DD), satiety responsiveness (SR), slowness in eating (SE), emotional under-eating (EUE), and food fussiness (FF) [7].

Measurement of caries severity is using the DEF-T index. DEF-T index was categorized as D (Decayed) for the number of primary teeth that were

damaged by caries and could still be filled, E (Extracted) for the number of primary teeth that had been or to be extracted due to caries, and F (Filled) for the number of primary teeth that had been removed, filled, or restored permanently [10].

Data analysis was performed using univariate analysis to describe the frequency distribution of children's eating behavior and the incidence of ECC. Then, bivariate analysis was conducted to determine the relationship between eating behavior and the incidence of ECC in children. The analysis used is the Chi-square statistical test using the statistical data processing program SPSS version 20. The research data are presented in table form. This study was received ethical approval from the Ethics Commission of the Faculty of Public Health, Sriwijaya University No. 366/UN9.1.10/KKE/2020. The null hypothesis for this study was that no relationship between eating behavior and ECC in children.

Results

The number of respondents in this study was 165 people, consisting of 80 male (48.5%) and 85 female (51.5%). There are 148 five years old respondents (89.7%) and 17 three to four years old respondents (10.3%) (Table 1).

Table 1: Distribution of respondents demographic characteristics

Variable	Frequency (N)	Percentage
Gender		
Male	80	48.5
Female	85	51.5
Age		
5 years old	148	89.7
3–4 years old	17	10.3

Based on the CEBQ, the results showed that children who had Food Responsiveness in the high category were 105 children (63.6%) and in the low category were 60 children (36.4%). Emotional over eating in children with high category was 48 children (29.1%), while in low category was 117 children (70.9%). Enjoyment of food in the high category was 107 children (64.8%) and 58 children (35.3%) were in low category. Children with high Desire to drink category were 92 children (55.8%) and in low category were 73 children (44.2%). Satiety responsiveness in children be in the high category was 102 children (61.8%) and 63 children (38.2%) is in low category. Slowness in eating in children with high category was 110 children (66.7%), while in low category was 55 children (33.3%). Emotional under eating with a high category was 102 children (61.8%) and 53 children (38.2%) is in low category. Food fussiness in children with high category was 84 children (50.9%) and in low category was 81 children (49.1%).

Early childhood caries (ECC) variable in children was measured using the def-t index. There was 79 (47.9) children with high category of ECC and 86 children (52.1%) with low category of ECC (Table 2).

Table 2: Distribution of respondents' eating behavior and ECC

Variable	Frequency (N)	Percentage
Food responsiveness (FR)		
High	105	63.6
Low	60	36.4
Emotional over eating (EOE)		
High	48	29.1
Low	117	70.9
Enjoyment of food (EF)		
High	107	64.8
Low	58	35.2
Desire to drink (DD)		
High	92	55.8
Low	73	44.2
Satiety responsiveness (SR)		
High	102	61.8
Low	63	38.2
Slowness in eating (SE)		
High	110	66.7
Low	55	33.3
Emotional under eating (EUE)		
High	102	61.8
Low	53	38.2
Food fussiness (FF)		
High	84	50.9
Low	81	49.1
Early childhood caries (ECC)		
High	79	47.9
Low	86	52.1

Based on statistical tests with 5% alpha, it was known that there were three variables that have a significant relationship with ECC in children, such as food responsiveness ($p = 0.001$), enjoyment of food ($p = 0.005$), and food fussiness ($p = 0.010$). Meanwhile, emotional over eating, desire to drink, satiety responsiveness, slowness in eating, and emotional under eating did not have a significant relationship with the incidence of ECC in children (Table 3).

Discussion

Based on the results of this study, it is known that the incidence of ECC is more common in children with high food responsiveness (58.1%) and there is a significant relationship between food responsiveness and the incidence of ECC in children ($p = 0.001$). Children with high food responsiveness will have a 3.2 times more likely to experiencing ECC compared to children with low food responsiveness. This is in line with the research of Banerjee et al. (2019) [11] which reported that there was a significant relationship between food responsiveness and ECC ($p = 0.042$), with 51% of children with high food responsiveness experienced ECC. Food Responsiveness is related to the frequency of children's eating. If food responsiveness is high, then the frequency of children's eating is more frequent. Increased food responsiveness causes an increase in exposure to food in the mouth, thus triggering an increase in demineralization [8].

Table 3: Relationship between eating behavior and the incidence of ECC

Variable	Early childhood caries		Frequency	p value	OR	95% CI		
	High	Low						
	n	%	n	%	n	%		
Food responsiveness	61	58.1	44	41.9	105	100	0.001*	3.235 (1.648-6.341)
High	18	30	42	70	60	100		
Emotional over eating	50	46.7	57	53.3	107	100	0.812	0.877 (0.463-1.663)
High	29	50	29	50	58	100		
Enjoyment of food	39	38.6	62	61.4	101	100	0.005*	0.377 (0.198-0.72)
High	40	62.5	24	37.5	64	100		
Desire to drink	44	47.8	48	52.2	92	100	1.000	0.995 (0.538-1.841)
High	35	47.9	38	52.1	73	100		
Satiety responsiveness	45	44.1	57	55.9	102	100	0.285	0.673 (0.358-1.266)
High	34	54	29	46	63	100		
Slowness in eating	56	52.7	54	47.3	110	100	0.349	1.443 (0.751-2.773)
High	23	41.8	32	58.3	55	100		
Emotional under eating	61	58.1	44	41.9	105	100	0.285	0.673 (0.358-1.266)
High	18	30	42	70	60	100		
Food fussiness	49	58.3	35	41.7	84	100	0.010*	2.380 (1.273-4.450)
High	30	37.0	51	63.0	81	100		

The results of this study showed that there were 107 children with high emotional over eating where 50 children had high ECC and 57 children had low ECC. Based on statistical tests with 5% alpha, $p = 0.812$, which means that there was no significant relationship between emotional over eating and ECC in children. However, the results of this study contradicted the results of the study of Nembhwani et al. (2020) [12] who reported an increase in the incidence of ECC along with a significant increase of Emotional Over Eating ($p = 0.18$). Emotional over eating is defined as an increase in a child's appetite when facing negative emotions (anxiety, sadness, fear, and worry). Based on the results of interviews, information was obtained that children will eat more often if they feel bored or have no activities to do. This causes an increase in the frequency of eating thus increasing the risk of dental caries in children [8].

Food Fussiness (FF) is defined as children refusal to eat large amounts of food or certain types of food, especially new foods that are unfamiliar to them. There was a significant relationship between food fussiness and the incidence of ECC in children ($p = 0.010$). Children with high food fussiness will 2.4 times more likely to develop ECC compared to children with low food fussiness. This is in line with the results of the study reported by Nembhwani et al. (2020) [12] who conducted a case control study of 440 children to determine the relationship between eating disorder process and ECC. This study reports that ECC and Food Fussiness have a significant relationship ($p = 0.001$). Children refusal to eat certain foods, especially healthy foods, can cause nutritional deficiencies that are good for oral health. Deficiency of Vitamin D and calcium causes hypo-mineralization of the enamel that makes teeth susceptible to caries [13].

The results of this study showed that there were 92 children with high desire to drink, including 47.8% children with high ECC and 52.2% with low ECC. The results of statistical tests with 5% alpha obtained $p = 1000$, meaning that there was no significant relationship between desire to drink and the incidence of ECC in children. However, the results of this study differ from the results of previous studies by Nembhwani *et al.* (2020) [12] that showed the def-t value increases along with the increase in consumption of sugary drinks. Drinks with added sugar such as carbonated drinks and sweetened drinks have a damaging effect on teeth compared to whole fruit juices and milk.

In this study, 102 respondents had high satiety responsiveness, of which 44.1% had high ECC and 55.9% had low ECC. Based on statistical test analysis with 5% alpha, $p = 0.285$, it means that there was no significant relationship between Satiety Responsiveness and ECC. A similar result was reported by Nembhwani *et al.* (2019) [9] who conducted research on 3–6 years old children. Satiety Responsiveness is children response to satiety which is defined as the children ability to regulate the amount of food consumed based on the level of satiety. Satiety responsiveness relates to the amount or portion of food per meal. Children with low satiety responsiveness will consume more energy with each meal. The research of Banerjee *et al.* [11] showed that 79% of child respondents had high satiety responsiveness and found a significant relationship between satiety responsiveness and ECC ($p = 0.036$). This is explained by Anandakrishna *et al.* (2014) as a result of most children not eating the right portion of food (less than it should be), therefore children will eat snacks between meal times [8]. This causes an increase in glucose exposure to the tooth surface [8].

The results of this study showed that there are 110 children with a high level of slowness in with 52% of them had high ECC and 47.3% had low ECC. Based on statistical analysis with an alpha value of 5%, p -value = 0.349, it means that there is no significant relationship between slowness in eating and the incidence of ECC in children. Nembhwani's 2020 research showed similar results that there was no significant relationship between Slowness in Eating and ECC [12]. Research by Nembhwani *et al.* (2019) reported that there was no significant difference in Slowness in Eating in children with or without ECC [9]. Slowness in eating is characterized by a reduction in children's interest in eating as a consequence of the children reduced enjoyment and interest in food. Slowness in eating usually occurs when children eat foods they disliked. Slowness in eating is characterized by children who keeps food in his mouth and does not immediately chew the food (pouching). Pouching causes teeth to be exposed to food for a certain time. This causes an increased risk of caries in children.

Based on the results of this study, there were 102 children with high Emotional Under Eating with 45 children had high ECC and 57 children had low ECC. Based on statistical tests with 5% alpha, $p = 0.285$, which means that there was no significant relationship between emotional under eating and ECC in children. EUE is defined as a decrease in a children appetite as a response to negative emotions, such as sadness, anger, fear or worry. The results of this study contradict the research of Nembhwani *et al.* (2020) who conducted a case-control study on 440 children in India that reported an increase in def-t occurred with an increase in emotional under eating [12].

The limitation of this study was only focus on the eating behavior of toddlers and did not examine other factors that cause ECC, such as tooth brushing behavior, levels of fluoride content in drinking water, sugar levels of daily consumption and cariograms analysis. This is due to limited facilities and the COVID-19 pandemic situation.

Conclusion

Eating behavior contributes to the incidence of ECC in children. Based on the examination of eating behavior with the CEBQ, it can be seen that the factors that influence the incidence of ECC in children include food responsiveness, food fussiness, and enjoyment of food. This study results hopefully could be considered for formulating policies related to the promotion and prevention of dental caries in children.

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Appendix 1: Children eating behaviour questionnaire (CEBQ)

Name:

Age:

Gender:

No		Never	Rarely	Often	Always
1	My child loves food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	My child eats more when worried	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	My child has a big appetite	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	My child finishes his/her meal quickly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	My child is interested in food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	My child is always asking for a drink	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	My child refuses new foods at first	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	My child eats slowly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	My child eats less when angry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	My child enjoys tasting new foods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	My child eats less when s/he is tired	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	My child is always asking for food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	My child eats more when annoyed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	If allowed to, my child would eat too much	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	My child eats more when anxious	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	My child enjoys a wide variety of foods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	My child leaves food on his/her plate at the end of a meal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	My child takes more than 30 minutes to finish a meal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Given the choice, my child would eat most of the time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	My child looks forward to mealtimes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	My child gets full before his/her meal is finished	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	My child enjoys eating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23	My child eats more when she is happy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24	My child is difficult to please with meals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25	My child eats less when upset	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26	My child gets full up easily	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	My child eats more when s/he has nothing else to do	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28	Even if my child is full up s/he finds room to eat his/her favourite food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29	If given the chance, my child would drink continuously throughout the day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30	My child cannot eat a meal if s/he has had a snack just before	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31	If given the chance, my child would always be having a drink	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32	My child is interested in tasting food s/he hasn't tasted before	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33	My child decides that s/he doesn't like a food, even without tasting it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34	If given the chance, my child would always have food in his/her mouth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35	My child eats more and more slowly during the course of a meal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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