

The Relationship Between Picky Eating Behavior and The Frequency of Consumption of Cariogenic Foods and Beverages Among Preschool Children

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ABSTRACT

Picky eating behavior refers to a child's tendency to select and reject certain types of food. This condition is commonly observed among preschool children, with a reported prevalence of 60.3% in Indonesia, and may influence a child's food preferences and be associated with the frequency of consumption of cariogenic foods and beverages. This study aimed to analyze the relationship between picky eating and the frequency of consumption of cariogenic foods and beverages among preschool children in Kedungdoro Village, Surabaya. This study used a cross-sectional design involving 189 respondents. Data were collected using the Food Fussiness subscale of the Children's Eating Behavior Questionnaire (CEBQ) and a modified Food Frequency Questionnaire (FFQ). Data analysis was performed using the Spearman rank correlation test. The results showed a significant positive association between picky eating and the frequency of consumption of cariogenic foods and beverages ($p = 0.181$; $p = 0.012$), with a weak strength of association. In conclusion, children with a higher tendency toward picky eating tended to have a higher frequency of cariogenic food and beverage consumption. These findings highlight the importance of paying attention to children's eating behaviors and food choices as part of efforts to establish healthier consumption patterns starting in preschool.

Keywords: picky eating; cariogenic diet; preschoolers; eating behavior

INTRODUCTION

Oral health is a crucial aspect of overall health that plays a role in supporting children's growth, development, and quality of life [1]. One issue that remains a global challenge to this day is dental caries, with children being the most vulnerable group [2]. The World Health Organization, through the Global Oral Health Action Plan 2023–2030, has prioritized the prevention of dental and oral diseases as a global health priority through sustainable promotive and preventive approaches [3], and Indonesia is following up on this through the "Caries-Free Indonesia 2030" program [4]. However, dental caries remains highly prevalent among Indonesian children. The 2018 Basic Health Research (Riskesdas) reported a caries prevalence of 81.1% among children aged 3–4 years, increasing to 92.6% among those aged 5–9 years [5]. In preschool-aged children, caries not only causes pain and infection but also impairs chewing function, nutritional status, and the child's growth and development [6].

Dental caries is a multifactorial disease influenced by the interaction of biological, microbial, environmental, and individual behavioral factors [7]. Among these factors, children's eating behavior plays a key role because it directly determines their daily exposure to cariogenic substrates [8]. A cariogenic diet is characterized by a high intake of fermentable carbohydrates, particularly free sugars and refined starches, which can be metabolized by plaque bacteria into acids that reduce oral pH, promote enamel demineralization, and contribute to the development of dental caries [9]. The cariogenic potential of the diet is influenced not only by the amount of carbohydrate or sugar consumed but also by the frequency of consumption [10].

One eating behavior commonly observed among preschool-aged children is picky eating. Picky eating is characterized by a child's tendency to consume a limited variety of foods, reject certain types of food, and develop strong preferences for particular foods or food characteristics. This behavior may result in a

less diverse diet and influence the overall quality of children's food consumption [11]. Picky eating is relatively common among preschool children, with reported prevalence reaching 72% in Taiwan and 60.3% in Indonesia [12]. During the preschool period, children increasingly develop their own food preferences and become more active in determining what they are willing to eat. Therefore, persistent picky eating may influence children's daily dietary patterns and the types of foods and beverages they consume [13].

Picky eating behavior not only reflects selective food preferences but also has the potential to affect a child's daily eating patterns. A study in the journal *Nutrients* shows that children who are picky eaters tend to have less healthy eating patterns, characterized by low consumption of fruits and vegetables and higher consumption of snacks and sugary drinks [14]. Similar findings have also been reported in China, where picky eaters tend to consume sugary foods more frequently [15]. This tendency can steer children's consumption toward cariogenic foods and beverages, thereby increasing the risk of dental caries [10]. However, evidence regarding the relationship between picky eating and the consumption of sugary or cariogenic foods remains inconsistent. Some studies have found differences in the consumption of sweet foods and beverages between picky and non-picky eaters, whereas other studies have reported no significant differences [16]. The inconsistent findings and limited evidence regarding the relationship between picky eating and the frequency of consumption of cariogenic foods and beverages among preschool-aged children in Indonesia highlight the need for further investigation. Therefore, this study aimed to analyze the relationship between picky eating behavior and the frequency of consumption of cariogenic foods and beverages among preschool children

RESEARCH METHOD

This study is a quantitative study using an analytical observational approach and a cross-sectional design. The study was conducted at five daycare centers and kindergartens in Kedungdoro Village, Tegalsari Subdistrict, Surabaya, namely Surabayan Kindergarten, Kaliasin Kindergarten, Trikora Kindergarten, Aisiyiah 35 Daycare and Kindergarten, and Mariyam Kindergarten. The sample size was determined using the Lemeshow formula (1990) with a 95% confidence level and a 5% margin of error to obtain a sample representative of the study population. The study subjects consisted of 189 mother-child pairs who met the inclusion criteria: children aged 3–6 years enrolled in daycare centers or kindergartens in the study area, living with their mothers, and having mothers who were aware of

their children's daily eating habits and were willing to participate as respondents. The study protocol received ethical approval from the Universitas Airlangga Faculty of Dental Medicine Health Research Ethical Clearance Commission, under approval number 0704/HRECC.FODM/VII/2026.

The data collected were primary data obtained through questionnaires completed by the mothers. Picky eating behavior was measured using the Food Fussiness subscale of the Children's Eating Behavior Questionnaire (CEBQ), which consists of six statements on a 1–5 Likert scale [17]. The mean score was used to determine the picky eating category, with a score of ≥ 3.00 classified as picky eating and a score of < 3.00 as non-picky eating, following the validation study by Steinsbekk et al. [18]. The frequency of consumption of cariogenic foods and beverages was measured using the Food Frequency Questionnaire (FFQ), which was adapted and modified from an instrument developed to assess children's exposure to cariogenic substrates [19]. The FFQ consists of 15 food and beverage items on a frequency scale of 1–4, where 1 = never, 2 = 1–3 times per week, 3 = 4–6 times per week, and 4 = every day. The total score was analyzed as continuous data, with higher scores indicating a higher frequency of consumption of cariogenic foods and beverages.

Prior to data collection, the validity of all questionnaire items was tested using Pearson's correlation coefficient, and reliability was assessed using Cronbach's alpha. The reliability test results showed a Cronbach's alpha value of 0.799 for the CEBQ and 0.812 for the FFQ. Data were analyzed using SPSS software version 27.0. The Spearman rank correlation test was used to analyze the relationship between picky eating behavior and the frequency of consumption of cariogenic foods and beverages. A 95% confidence level ($\alpha = 0.05$) was used, with a p-value < 0.05 indicating a statistically significant relationship.

RESULTS

A total of 189 mother-child pairs from five kindergartens in the Kedungdoro neighborhood participated in this study. The gender distribution of the children was relatively balanced, with 97 girls (51.3%) and 92 boys (48.7%), and the majority were in the 5-year-old (46.6%) and 6-year-old (39.7%) age groups. The mothers had a mean age of 35.28 ± 7.07 years, ranging from 22 to 55 years. Most respondents had completed high school or a diploma program (77.2%) and came from families with incomes below the Surabaya minimum wage (70.4%); thus, the study sample generally represented urban families with lower-middle socioeconomic status.

TABLE 1: Distribution of Study Subjects' and Respondents' Characteristics.

Variable	n	%	Mean ± SD	Min	Max
Child's Age					
3 years	1	0,5%	-	-	-
4 years	25	13,2%	-	-	-
5 years	88	46,6%	-	-	-
6 years	75	39,7%	-	-	-
Child's Gender					
Male	92	48,7%	-	-	-
Woman	97	51,3%	-	-	-
Mother's Age	-	-	35,28 ± 7,070	22	55
Mother's Highest Level of Education					
Elementary/Junior High School	32	16,9%	-	-	-
Senior High School/Diploma	146	77,2%	-	-	-
Bachelor's Degree/Postgraduate Degree	11	5,8%	-	-	-
Family Income					
Below the Surabaya Minimum Wage (<IDR 4.961.753)	133	70,4%	-	-	-
Equivalent to the Surabaya Minimum Wage (IDR 4.961.753)	42	22,2%	-	-	-
Above the Surabaya Minimum Wage (>IDR 4.961.753)	14	7,4%	-	-	-

Data on children's picky eating behavior were obtained by administering the Children's Eating Behavior Questionnaire (CEBQ) on the food fussiness subscale, while data on the frequency of children's consumption of cariogenic foods and beverages were obtained through the Food Frequency Questionnaire (FFQ). Picky eating

behavior was identified in 82 children (43.4%), while 107 children (56.6%) were classified as non-picky eaters. The frequency of consumption of cariogenic foods and beverages showed a similar pattern, with 86 children (45.5%) falling into the "frequent" category and 103 children (54.5%) into the "infrequent" category.

TABLE 2: Distribution of Picky Eating Behavior and Frequency of Consumption of Cariogenic Foods and Beverages Among Children.

Variable	n	%
Picky Eating Behavior		
Non-Picky Eating	107	56,6%
Picky Eating	82	43,4%
Frequency of Consumption of Cariogenic Foods/Beverages		
Good/Rare	103	54,5%
Poor/Frequent	86	45,5%

TABLE 3: Cross-Tabulation of Picky Eating Behavior and Frequency of Consumption of Cariogenic Foods/Beverages.

Picky Eating Behavior	Frequency of Children's Consumption of Cariogenic Foods/Beverages				Total	Sig. (2-tailed)	Spearman's Rho (ρ)
	Good/Rare		Poor/Frequent				
	n	%	n	%	n (%)		
Non-Picky Eating	68	63,6%	39	36,4%	107 (100%)	0,012	0,181
Picky Eating	35	42,7%	47	57,3%	82 (100%)		

In the non-picky eating group, most children had good/infrequent consumption habits for cariogenic foods and beverages (63.6%), whereas in the picky eating group, the proportion of children with poor/frequent consumption habits (57.3%) was higher than that in the good/infrequent category.

The results of the Spearman rank correlation test showed a significance value of 0.012 ($p < 0.05$) with a correlation coefficient of 0.181, indicating a significant relationship between children's picky eating behavior and the frequency of their consumption of cariogenic foods and beverages. The positive correlation coefficient indicates that the relationship between the two variables is positive, though the strength of the relationship is weak. Thus, the higher a child's tendency toward picky eating, the higher their tendency to consume cariogenic foods and beverages more frequently.

DISCUSSION

The results of this study indicate a significant positive relationship between picky eating behavior and the frequency of consumption of cariogenic foods and beverages among preschool children in Kedungdoro Village, Surabaya ($p = 0.181$; $p = 0.012$), although the strength of the relationship is classified as weak. This pattern is further supported by the results of the cross-tabulation, in which the proportion of children with "poor/frequent" cariogenic consumption habits was higher in the picky-eating group (57.3%) compared to the non-picky-eating group (36.4%), while the majority of non-picky-eating children fell into the "good/rare" consumption category (63.6%). This pattern indicates that the higher a child's tendency toward picky eating, the greater their tendency to consume cariogenic foods and beverages more frequently.

These findings are consistent with the concept that picky eating is not merely characterized by the refusal of one or two types of food, but rather constitutes a pattern of eating behavior that tends to be persistent. Children with this behavior tend to have limited food choices and exhibit specific preferences regarding food flavors and textures [11]. These preference tendencies directly imply a high exposure of children to cariogenic foods, given that most processed foods preferred by picky eaters fall into the category of foods containing fermentable carbohydrates, such as cookies, candy, and sugary drinks [10]. A study by Kutbi et al. [14] on school-aged children in Saudi Arabia reported that picky eating behavior is associated with an unhealthy diet, characterized by low consumption of fruits and vegetables and higher consumption of snacks and sugary drinks. Similar findings were reported among children in China, where picky eaters were found to consume high-sugar foods more frequently than non-picky eaters [15].

These findings can be further understood by considering the biological mechanisms involved in the development of dental caries. Fermentable carbohydrates in cariogenic foods are utilized by plaque bacteria to produce acids that lower the pH

in the oral cavity. This condition can disrupt the mineral balance on the enamel surface and trigger demineralization [9]. Therefore, if picky eating behavior is associated with a higher frequency of cariogenic food consumption, this pattern may indirectly serve as a contributing factor to the risk of caries. These findings are also consistent with a study of children in Finland, which demonstrated an association between higher food fussiness scores and a greater incidence of caries [20].

Although there is an association between picky eating and the consumption of cariogenic foods, the strength of the association in this study is relatively weak; thus, picky eating is not the sole factor associated with children's cariogenic consumption patterns. This finding is consistent with a study by Samuel [16], which reported inconsistent results regarding differences in the consumption of sugary foods and beverages between picky eaters and non-picky eaters. These differences may be influenced by variations in the instruments and operational definitions of picky eating used, population characteristics, and other factors such as parental feeding practices, food availability, and the family's eating environment [21,22].

The sociodemographic characteristics of the respondents also provide context for the study's findings. The majority of mothers had completed high school or a vocational diploma (77.2%) and came from families with incomes below Surabaya's minimum wage (70.4%); these characteristics indicate that the majority of respondents belong to the lower-middle socioeconomic group. Sociodemographic conditions can influence children's eating patterns, particularly through differences in access to diverse and nutritious foods. In situations with limited access, processed foods, which are more affordable and readily available, may become a more frequent choice, potentially increasing the frequency of consumption of cariogenic foods [14].

The results of this study are expected to inform the development of promotive and preventive oral health initiatives for preschool children. Strategies such as gradually introducing a variety of flavors and textures, establishing a regular meal schedule, and providing positive reinforcement when children try new foods can help reduce the tendency toward picky eating in children [23,24]. This study itself has several limitations; the cross-sectional design used does not allow for drawing causal conclusions between picky eating and the frequency of consumption of cariogenic foods and beverages, as both variables were measured at the same point in time [25]. Additionally, data on picky eating behavior and the frequency of consumption of cariogenic foods and beverages were obtained through mothers' subjective reports, which may introduce recall bias or social desirability bias. This study was also conducted in only five daycare centers and kindergartens in a single urban village; therefore, generalizing the findings to preschool-aged children in other areas should be done with caution. Future research is recommended to involve

a more diverse sample to obtain a more comprehensive picture of the relationship between picky eating and the frequency of consumption of cariogenic foods among preschool-aged children.

CONCLUSION

In conclusion, children with a higher tendency toward picky eating tended to have a higher frequency of consumption of cariogenic foods and beverages. These findings highlight the importance of paying attention to children's eating behaviors and food choices in efforts to establish healthier consumption patterns starting in preschool.

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