RELATIONSHIP BETWEEN PICKY EATING BEHAVIOR AND LEVEL OF NUTRIENT ADEQUACY IN PRESCHOOL CHILDREN

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ABSTRACT

Picky eating behavior or selective eating behavior in children poses a significant difficulty to parents during the preschool years of growth and development. This may have an impact on the range of foods that kids eat. Food variety restrictions will affect how much energy, protein, fat, and carbohydrates are consumed. This study was aimed to analyze the relationship between picky eating behavior and the level of nutrient adequacy in preschool children in Buduran District, Sidoarjo Regency. The method of this study was a cross-sectional study design involving 64 preschool children as respondents who were selected proportionally by random sampling method. Data were collected by completing the Child Eating Behavior Questionnaire (CEBQ) and Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ). Data analysis was performed using the Spearman Rank Correlation test. The study found a significant correlation between picky eating behavior and carbohydrate adequacy (p=0.014). Specifically, 51.6% of the subjects exhibited picky eating behavior, and among them, a significant proportion had a carbohydrate intake classified as deficient. The findings underscore the importance of targeted nutritional interventions for children with picky eating behaviors to ensure balanced nutrient intake.

Keywords*: nutrient adequacy, picky eater, preschool*

INTRODUCTION

Preschool children aged 3-6 years are a crucial period in the formation of healthy and adequate eating habits. During this period, children experience rapid physical, psychological and motor development, including the development of diet and nutrient intake (Kasenda *et al*., 2017; Lida, 2016). Given its long-term effects on children's growth, physical, cognitive, emotional development, an adequate and balanced diet is crucial. Children's growth and development at this time can serve as a baseline for assessing their nutritional and health status, indicating that parents must play an active part in giving their children the care they require (Mansur, 2019). However, parents frequently have to deal with children who exhibit "picky eater" behavior when it comes to food.

Picky eaters are kids who make specific dietary choices, as seen by their limited food options, reluctance to try new foods, avoidance of some meals, and preferences for certain foods, including the way food is presented (Yulianar, 2022). An eating problem called picky eating is also characterized by an individual's inability to consume particular food categories and their aversion to meals they have never tried before (Islami, 2022). Nowadays, preschool-aged youngsters are often prone to show picky eating behavior (Cahyani, 2019).

Globally, picky eating behavior among preschool children varies widely but remains a significant concern. For instance, in Taiwan, 72% of children aged 3-5 years exhibit such behaviors (Chao & Chang, 2017), while in the United States, eating difficulties in preschoolers are often linked to picky eating, with issues such as a lack of variety in food types (58.1%), rejection of vegetables, fruits, meat, and fish (55.8%), and a preference for specific cooking methods (51.2%) (Cerdasari *et al*., 2017). In Indonesia, the prevalence is similarly high, with around 60.3% of children under five displaying picky eating tendencies (Kusuma *et al*., 2016). Regional studies further highlight the concern, such as in Aceh, where 53.1% of preschoolers are picky eaters (Nadhirah *et al*., 2021), and in Balikpapan, where the figure reaches 82.2% (Puspita *et al*., 2023). In Sidoarjo, 52.2% of children were reported to exhibit picky

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eating behavior (Widati, *et al.,* 2024). Although the prevalence of picky eaters in Sidoarjo is lower than that reported in other parts of Indonesia and globally, it nonetheless highlights the importance of implementing targeted nutritional interventions for this specific population.

In certain countries, the prevalence of picky eating behavior is still known as a common occurrence. For example, in children aged 3-5 years in Taiwan, the incidence rate of picky eating behavior reached 72% (Chao & Chang, 2017). Research in the United States also shows that eating difficulties in preschool children are associated with picky eating behavior and involve a variety of factors, including lack of variety in food types (58.1%), rejection of vegetables, fruits, meat, and fish (55.8%), and a tendency to prefer certain cooking methods (51.2%) (Cerdasari *et al*., 2017). Conversely, among children under five in Indonesia, the percentage of finicky eaters is likewise rather high, at about 60.3% (Kusuma *et al*., 2016). A study conducted in Aceh revealed that more than half, 53.1% of preschool children experienced picky eating tendencies (Nadhirah *et al*., 2021), as well as a study conducted in Balikpapan in 2023 also mentioned that there are 82.2% of preschool children who show picky eating behavior (Puspita *et al*., 2023).

Picky eating in children can be influenced by a number of factors, including genetics, the effects of pregnancy, the introduction of food in the early postnatal period, the diet of the parents, and the family environment (Kamumu & Rakay, 2023). There are two types of influences that affect picky eaters: internal factors (kid behavior) and external factors (parental behavior). The mother's employment level, parenting styles, exclusive breastfeeding and supplemental feeding practices, eating habits of the parents, the number of children in the household, and food introduction delays are only a few examples of external factors. Conversely, internal influences include the child's sensory sensitivity, screen-time habits, and the existence of attention deficit hyperactivity disorder (ADHD) (Astuti *et al*., 2023).

Children who are picky eaters will tend to struggle with accepting meals due to the problems of this eating disorder. This may have an impact on the variety of food consumed. Limitations in food variety will have an impact on the consumption of protein, energy, meat and vegetables (Horst *et al*., 2016). If picky eating behavior is not addressed immediately, it can cause a decrease in nutritional intake and disrupt metabolic processes. This can form harmful habits, which in turn can lead to imbalances in nutrient intake and potentially compromise the adequate levels of energy, protein, fat and carbohydrate and lead to impaired nutritional status of the individual.

METHODS

This research is an observational analytical research using cross-sectional study design. The research was conducted in four Dharma Wanita Persatuan kindergartens located in Siwalanpanji Village, Sidomulyo Village, Banjarsari Village, and Damarsi Village in June 2023. The study population consisted of 198 children, who were all students in kindergarten A and kindergarten B classes in the four kindergartens. The sample size of 64 students was determined by Lemeshow's 1990 formula using the proportional stratified random sampling method. The total population of preschool children was divided into strata based on age and gender, ensuring that each subgroup was appropriately represented. The sample size was calculated with a 95% confidence level and a 5% margin of error to ensure that the selected sample accurately represented the entire population. Inclusion criteria included children aged 36-72 months whose mothers were willing to participate as respondents.

To measure picky eating behavior in children, the Child Eating Behaviour Questionnaire (CEBQ) instrument was filled out and interviewed, while to measure the level of nutrient adequacy using the Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ). Data were analyzed using SPSS software version 27.0 by demonstrating the Spearman Rank Correlation test to evaluate the relationship between picky eating behavior and the level of nutrient intake in children. The significance level used was 95% ($\alpha = 0.05$). Where if the sig. <0.05, it can be concluded that there is a significant relationship between the variables being tested.

RESULTS

In this study, preschool children's characteristics such as age and gender were identified, along with mothers' characteristics such as age, education level, job status, and family income. The data from this identification is presented in table 1.

Table 1 shows that the majority of the study subjects were aged between 61-72 months (90.6%). The subjects had an average age of 67.03 ± 3.716 months, with the lowest age of 56 months and the highest age of 71 months. On the other hand, 32 subjects (50%) were female. The characteristics of the respondents obtained showed that 33 respondents (51.6%) had an age range between 31 to 40 years, with an average maternal age of about 34.19 ± 6.284 years. The youngest mother's age was 24 years, while the oldest reached the age of 54 years. The majority of respondents had a high school education, as many as 36 mothers (56.3%). Most of the respondent mothers, 41 mothers (64.1%), were not working, while 23 mothers (35.9%) were working. In addition, the characteristics of the respondents showed that a total of 22 respondents (34.4%) had family incomes located in the quintile 1 range, which ranged from Rp1,000,000 to Rp3,000,000, with an average family income of around Rp4,328,281.25 ± Rp1,970,497.121. The lowest recorded family income was Rp1,000,000, while the highest reached Rp11,000,000.

The data regarding picky eating behavior in the research subjects were collected through filling out the Child Eating Behavior Questionnaire (CEBQ) given to the respondents.

Table 1. Distribution of Subject and Respondent Characteristics in 4 Kindergartens of Dharma Wanita Persatuan, Buduran District

Variable	n	%	Mean±SD	Min	Max
Child's Age	-	-	67.03 ± 3.716	56	71
49-60 months	6	9.4	-	-	-
61-72 months	58	90.6	-	-	-
Child's Gender	-	-	-	-	-
Male	32	50.0	-	-	-
Female	32	50.0	-	-	-
Mother's Age	-	-	34.19 ± 6.284	24	54
21-30 years	21	32.8	-	-	-
31-40 years	33	51.6	-	-	-
41-50 years	9	14.0	-	-	-
51-60 years	1	1.6	-	-	-
Mother's Last Education	-	-	-	-	-
Completed elementary school	4	6.3	-	-	-
Completed junior high school	12	18.7	-	-	-
High school graduate	36	56.3	-	-	-
College graduate	12	18.7	-	-	-
Job Status	-	-	-	-	-
Work	23	35.9	-	-	-
Does not Work	41	64.1	-	-	-
Family income	-	-	4,328,281.25 ± 1,970,497.121	1,000,000	11,000,000
Quintile 1 (Rp1,000,000 – Rp3,000,000)	22	34.4	-	-	-
Quintile 2 (Rp3,001,000 – Rp3,400,000)	4	6.3	-	-	-
Quintile 3 (Rp3,401,000 – Rp4,200,000)	14	21.9	-	-	-
Quintile 4 (Rp4,201,000 – Rp5,500,000)	12	18.7	-	-	-
Quintile 5 (> Rp5,500,000)	12	18.7	-	-	-
Total	64	100.0	-	-	-

Table 2. Distribution of Picky Eating Behavior of Subjects in 4 Kindergartens of Dharma Wanita Persatuan, Buduran District

Variable	n	%
Picky Eating Behavior		
Not a picky eater	31	48.4
Picky eater	33	51.6
Total	64	100.0

Table 2 presents the findings of the investigation regarding the distribution of individuals' picky-eating behavior. As a result, 33 subjects (about 51.6%) showed picky eating behavior, while 31 subjects (about 48.4%) did not show picky eating behavior.

The Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ), which was distributed to the respondents, was used to collect information on the estimated nutritional intake of the subject.

Table 3 presents the findings of the investigation regarding the mean, minimum, and maximum values of the respondents' estimated nutrition intake amount. As a result, the mean value of the subject's estimated energy intake is about 1595.641 ± 630.5543 kcal. The average estimated protein intake of the subjects was about 74.595 ± 40.8644 grams. Meanwhile, the average estimated fat intake of the subjects was about 60.080 ± 29.0363 grams, and the average estimated carbohydrate intake of the subjects was about 190.580 ± 67.1806 grams.

Data regarding the level of nutrient adequacy of the subject was obtained by concerning the estimated nutrient intake of the subject with the Nutrient Adequacy Guidelines in accordance with the provisions listed in the Regulation of the Indonesian Minister of Health No. 28 of 2019 concerning Guidelines for Recommended Nutrient Adequacy for the Indonesian People. The subject's nutrient adequacy level is distributed shown in table 4.

Table 4 shows significant dietary imbalances among the subjects, with the majority showing excessive intake of energy (42.2%), protein (93.7%), and fat (50%). These findings suggest a dietary pattern high in these macronutrients, which may predispose children to overweight or other metabolic issues. Conversely, a substantial portion of the subjects (51.6%) had carbohydrate intakes that were classified as deficient, which could indicate an imbalance in the macronutrient distribution in their diets. This imbalance is critical to address, as it might reflect dietary habits that deviate from recommended guidelines, potentially impacting the overall nutritional status and health outcomes in this population.

Table 5 presents data collected from a cross-tabulation between picky eating behavior and the amount of energy, protein, fat, and carbohydrates that 4 Dharma Wanita Persatuan Kindergartens preschoolers aged 3-6 years consumed.

From the analysis of the relationship between picky eating behavior and the level of energy

Table 3. Distribution of Estimated Nutrient Intake Subjects in 4 Kindergartens of Dharma Wanita Persatuan, Buduran District

Nutrients	Average	Minimum	Maximum
Energy (kcal)	1595.641 ± 630.5543	356.7	2864.7
Protein (g)	74.595 ± 40.8644	10.6	191.1
Fat (g)	60.080 ± 29.0363	13.7	128.0
Carbohydrate (g)	190.580 ± 67.1806	47.0	348.1

Table 4. Distribution of Nutrient Adequacy Levels of Subjects in 4 Kindergartens of Dharma Wanita Persatuan, Buduran District

Nutrients Adequacy Level	Deficit		Adequate		Excess		Total	
	n	%	n	%	n	%	N	%
Energy (kcal)	13	20.3	24	37.5	27	42.2	64	100.0
Protein (g)	1	1.6	3	4.7	60	93.7	64	100.0
Fat (g)	17	26.6	15	23.4	32	50	64	100.0
Carbohydrate (g)	33	51.6	17	26.6	14	21.8	64	100.0

adequacy using the Spearman Rank correlation test, a p-value of 0.073 (p>0.05) was obtained. This result indicates that there is no significant relationship between picky eating behavior and the level of energy adequacy in preschool children.

As well as the result of the analysis conducted regarding the relationship between picky eating behavior and protein adequacy level using the Spearman Rank correlation test, a p-value of 0.333 (p>0.05) was obtained. This result indicates that there is no significant relationship between picky eating behavior and the level of protein adequacy in preschool children.

In addition, based on the results of the analysis of the relationship between picky eating behavior and the level of fat adequacy using the Spearman Rank correlation test, the p-value is 0.501 (p>0.05).

This indicates that there is no significant relationship between picky eating behavior and the level of fat adequacy in preschool children.

The results of the analysis of the relationship between picky eating behavior and the level of carbohydrate adequacy using the Spearman Rank correlation test obtained a p-value of 0.014 (p <0.05). This indicates a significant relationship between picky eating behavior and the level of carbohydrate adequacy in preschool children. The results of the r-calculated value of the analysis of the relationship between picky eater behavior and the level of carbohydrate adequacy showed a negative correlation value with a relatively low level of relationship strength of -0.306. This value indicates that the lower the child's picky eating behavior, the higher the level of carbohydrate adequacy obtained.

Table 5. Cross Tabulation of Picky Eating Behavior with Energy Adequacy Level

Picky Eating Behavior	Energy Adequacy Level						Total		p-value
	Deficit		Adequate		Excess				
	n	%	n	%	n	%	N	%	
Not a picky eater	5	16.1	9	29.0	17	54.9	31	100.0	0.073
Picky eater	8	24.2	15	45.5	10	30.3	33	100.0	

Table 6. Cross Tabulation of Picky Eating Behavior with Protein Adequacy Level

Picky Eating Behavior	Protein Adequacy Level						Total		p-value
	Deficit		Adequate		Excess				
	N	%	n	%	n	%	N	%	
Not a picky eater	0	0.0	1	3.2	30	96.8	31	100.0	0.333
Picky eater	1	3.0	2	6.1	30	90.9	33	100.0	

Table 7. Cross Tabulation of Picky Eating Behavior with Fat Adequacy Level

Picky Eating Behavior	Fat Adequacy Level						Total		p-value
	Deficit		Adequate		Excess				
	N	%	n	%	n	%	N	%	
Not a picky eater	9	29.0	4	12.9	18	58.1	31	100.0	0.501
Picky eater	8	24.2	11	33.3	14	42.5	33	100.0	

Table 8. Cross Tabulation of Picky Eating Behavior with Carbohydrate Adequacy Level

Picky Eating Behavior	Fat Adequacy Level						Total		p-value
	Deficit		Adequate		Excess				
	N	%	n	%	n	%	N	%	
Not a picky eater	12	38.7	8	25.8	11	35.5	31	100.0	0.014
Picky eater	21	63.6	9	27.3	13	9.1	33	100.0	

DISCUSSION

In this study, the number of subjects who were female and male was equal, 32 children each. The subjects were categorized as preschoolers and varied in age from 56 to 71 months. Children in the age range of 3 to 6 years old are referred to as preschoolers, and they typically enroll in kindergarten or preschool programs (Adiputra *et al*., 2021). This period is crucial, as during this time all aspects of motor development are growing rapidly (Kasenda *et al*., 2017).

The mothers of preschool-aged children who participated in this study were between the ages of 24 and 54, and the majority of them had completed senior high school. An individual's capacity to process information is significantly influenced by their level of education. As a result, those with greater education levels typically respond better to knowledge that helps them take better care of their kids on a daily basis (Lailatul & Ni'mah, 2015). Furthermore, the percentage of respondents who do not have a job is higher than that of respondents who do. Compared to moms who work outside the home, stay-at-home mothers have more opportunities to interact with their children and more time to acquire health-related education (Marfuah *et al*., 2022).

Based on the findings of this study, more than half or 51.6% of the subjects had picky eating behavior. The results of this study are in line with the results of a study in Surabaya which states that there are 57.8% of preschool children who have picky eating behavior (Putri & Muniroh, 2019). Children who tend to be picky eaters are generally not interested in trying new foods, tend to reject food without trying it, eat food slowly, and often do not enjoy food (Nisa *et al*., 2021).

In this study, it was found that the majority of subjects who did not exhibit picky eating behavior generally had good preferences and high interest in food, felt happy while eating, and often asked for food. On the other hand, the majority of subjects who exhibited picky eating behavior tended to have fast eating habits and refused to try new foods. Therefore, it can be concluded that children who do not exhibit picky eating behavior tend to be more open in accepting food and more active in requesting food compared to children who are picky eaters.

The selection of nutritious foods is crucial to guarantee that children get well nourished and prevent disruptions in their growth and development (Mayar & Astuti, 2021). Most of the subjects in the study had an excess intake of energy, protein and fat, but had a deficiency in carbohydrate intake. This may be due to the habitual consumption of fried foods and snacks. Snack foods make a significant contribution to nutrient intake at various age ranges, especially in children (Sari & Rachmawati, 2020). Snack foods can have a negative impact on health if they do not meet healthy food safety standards in the production process or when served (Rusmiati, 2020).

The findings of this study showed that there was no significant relationship between picky eating behavior and the adequacy of nutrients such as energy, protein, and fat. However, there was a significant relationship between picky eating behavior and carbohydrate intake. The high consumption of protein and fat sources in most preschool children indicates that picky eating behavior does not necessarily result in insufficient protein and fat intake in comparison to daily recommendations. This aligns with research conducted by Purnamasari & Adriani (2020), which indicated that there was no association between picky eating behavior and protein and fat intake levels in preschool-aged children. Another study also indicated that there was no significant association between energy, protein, and fat intake and picky eating behavior in preschool-aged children (Hardianti *et al*., 2018). In addition, the findings in this study also revealed that the majority of children who have picky eating behavior experience a deficit in carbohydrate intake as they often limit their consumption of carbohydrate-rich foods. On the other hand, children who do not have picky eating behavior tend to have a more diverse diet and often consume foods containing carbohydrates, so they meet their carbohydrate needs. Another study conducted by Purnamasari & Adriani (2020) stated that picky eating behavior has a strong relationship with carbohydrate and fiber intake in preschool children. Children with picky eating behavior tend to limit their intake of foods such as rice, vegetables, fruits, and fish. However, they more often consume wafers,

biscuits, milk, meatballs, chicken, nuggets and fried foods *(*Hardianti *et al*., 2018).

This study has several limitations. First, the reliance on self-reported data from questionnaires may introduce reporting biases, as parents may not accurately recall or report their child's eating behaviors. Second, although the sample size was determined proportionately, it may not fully capture the diversity of the population, potentially limiting the generalizability of the findings. Future research should consider larger and more diverse samples, as well as alternative methods of data collection to mitigate these biases.

CONCLUSION

In this study, there was no relationship between picky eating behavior and adequate levels of energy, protein and fat. However, there was an association between picky eating behavior and carbohydrate adequacy. Based on the findings of this study, it is recommended that early childhood educators and parents implement targeted nutritional interventions to address picky eating behaviors in preschool children. These interventions could include structured mealtime routines, exposure to a variety of healthy foods, and positive reinforcement strategies. Additionally, public health initiatives should focus on educating parents about the importance of balanced nutrition in early childhood development.

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