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Original Article

Picky Eating Behavior and Incidence of Malnutrition Among Children Aged 2-5 years in Blora, Indonesia: A Case-Control Study

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ABSTRACT

Background: Malnutrition is a deficiency of nutrients due to inadequate energy intake. Picky eating behavior in children could be a cause of malnutrition, but previous studies' results were still inconsistent. This study aimed to determine the relationship between picky eating behavior and malnutrition among children aged 2-5 years.

Methods: This case-control study involved 70 children aged 2-5 years in Kutukan Village, Randublatung District, Blora Regency. Malnutrition was defined as a weight-for-age Z score <-2.0 SD based on the WHO classification. Child eating behavior was evaluated using the Child's Eating Behavior Questionnaire (CEBQ), identifying picky eaters if the food avoidance score surpassed the food approach score. Data analysis employed the Chi-Square test.

Results: Boys experienced more malnutrition, with 20 (57.1%) affected, and the most affected age group was 24-35 months, with 19 (54.3%). Questionnaire processing revealed that the number of picky-eater children in the malnutrition group was 33 (94.3%), while in the non-malnutrition group, there were 31 (88.6%). Bivariate analysis showed no relationship between picky eating behavior and malnutrition in children aged 2-5 years (p=0.673; CI 95%=0.364-12.459).

Conclusion: This study found no significant relationship between picky eating and malnutrition in children aged 2-5 years.

Key words: Eating Habit, Malnutrition, Weight-for-age Z score (WAZ), Under-5-year children, Indonesia

INTRODUCTION

Malnutrition is a deficiency of nutrients due to inadequate energy intake. Children with primary malnutrition often occur in developing countries due to inadequate food supplies caused by social, economic, and environmental factors. The causes of secondary malnutrition are underlying diseases that cause abnormal nutrient loss, increased energy expenditure, and decreased food intake. [1] Both directly and indirectly, malnutrition causes 60% of infant deaths, and more than 2/3 of these deaths occur at less than 1 year of age. [2] The prevalence of undernourished children in Indonesia is still quite large. In 2013, there were 19.6% malnutrition children, consisting of 5.7% severely malnutrition children and 13.9% undernourished.

The prevalence of nutritional status in Central Java is underweight at 17% and wasting at 9.3%. The data from the Ministry of Health of the Republic of Indonesia explains that 21.9% of children experience malnutrition, 7.3% experience wasting, and 37% experience stunting in Blora Regency. [3] Children's habit of choosing food or being picky eaters also contributes to malnutrition (Liansyah, 2015). The number of picky eaters continues to increase. In 2010, in San Francisco, the highest incidence of picky eaters in children >2 years was 13-22%. [5] A study in Semarang found that 60.3% of children experienced picky eating. [6] It was found that 1.2% of children experienced picky eating and 1.4% of children experienced severe malnutrition. Food intake and nutritional status in children who are picky eaters are not different from children who are not picky eaters. Although children are considered picky eaters of the food they usually consume, due to the intake of other sources such as milk to meet energy and protein needs, there is no nutritional decline in children. [7] However, another study found that intake of protein, carbohydrates, fat, and fiber was in the deficient category, the majority occurring in children with picky eating compared to non-picky eating. The percentage of children with short body proportions was more in children with picky eaters, which was 9.1%. '[6]

The inconsistency results of the correlation between picky eating behavior and malnutrition, as well as relatively high incidence of malnutrition in Kutukan Village, Randublatung Sub-district, Blora Regency, we considered conducting this study. Therefore the aim of this study was to evaluate the correlation between picky eating behavior and malnutrition among children aged 2-5 years.

MATERIALS AND METHODS

Study design

This study was observational research with a case-control design, conducted in Kutukan Village, Randublatung District, Blora Regency, Central Java, Indonesia. The study started in December 2023 until February 2024.

Study participants

The subjects of this study were mothers and their children aged 2-5 years. The eligible subjects must meet the inclusion criteria for the case group, which were children with malnutrition based on Weight-For-Age-Z score (WAZ) <-2.0 SD, parents willing to participate in the study, exclusively breastfed, and no history of low birth weight. The inclusion criteria for the control group were children with normal WAZ -2.0 SD – 2.0 SD, parents willing to participate in the study, exclusively breastfed, and no history of low birth weight. Subjects who refused to participate in the study during data collection, children who were ill or under treatment, children with a history of food allergies, children with a history of congenital abnormalities, and children with WAZ >2.0 SD were not included in the study. All mothers had signed a written consent.

Sample size

A total of 35 malnutrition children and 35 non-malnutrition children aged 2-5 years were calculated using the formula for a case-control study in an independent population:

$$n = \frac{(Z1-\alpha/2\sqrt{2P(1-P)} + Z1-\beta\sqrt{P1(1-P1)+P2(1-P2)^2}}{(P1-P2)^2}$$

With the significance level of 95% and the power of 80%, as well as the proportion result from a previous study. [8] The initial data from medical records of Kutukan Health Center shows 93 malnutrition children and 270 non-malnutrition children. We selected 35 subjects for each group from medical records using simple random sampling by a computer system, i.e., Statistical Applets Simple Random Sample. Subjects' selection was done randomly to ensure that each member of the population had an equal chance of being selected as a research sample, regardless of strata or specific categories within the population.

Selection of case-study and case-control groups

The research was conducted in January 2024, sampling toddlers aged 2-5 years in Kutukan Village, Randublatung District, Blora Regency. Sampling of toddlers' nutritional status was obtained from the medical records of Kutukan Health Center in December 2023. The total number of toddlers in Kutukan Village was 363, with 93 malnourished toddlers and 270 non-malnourished toddlers after collecting medical record data. Researchers excluded toddlers with a history of Low Birth Weight (LBW) and found 1 LBW child in the malnutrition group, resulting in a sample of 92 children, while in the non-malnutrition group, 7 LBW children were found, resulting in a sample of 263 children. The exclusions from the two groups were then randomized using a simple random sampling technique, with 42 samples for each group, as 20% of the 35, which was the sample size in this study. Out of the 42 samples in each group, mothers were asked to fill out the Child's Eating Behavior Questionnaire (CEBQ). After that, 25 children were excluded from the malnutrition group and 16 children from the non-malnutrition group due to not exclusively breastfeeding and frequent illness. The remaining samples were 17 in the malnutrition group and 26 in the non-malnutrition group. The second sampling was done the same way as the first, using simple random sampling on the remaining samples not selected during the first sampling. After the second sampling and questionnaire completion, 18 children in the malnutrition group and 19 children in the non-malnutrition group met the inclusion criteria. However, only 17 children were selected in the non-malnutrition group to balance with the malnutrition group, as the required sample size was 35.

This study was conducted on 35 toddlers with normal Weight-For-Age-Z score (WAZ) >-2.0 SD and 35 malnourished toddlers with WAZ <-2.0 SD using a case-control research design. Data from these two groups, the case group and the control group, were divided into two categories based on picky eaters and non-picky eaters.

Data collection

Picky eating behavior was determined using the Child Eating Behavior Questionnaire (CEBQ), [9] which measures 2 main categories with 8 subscales. The food Approach consists of Food responsiveness (FR), Emotional overeating (EOE), Enjoyment of food (EF), and Desire to drink (DD). The food Avoidance consists of Satiety responsiveness (SR), Slowness in eating (SE), Emotional undereating (EUE), and Food fussiness (FF). The questionnaire was filled out by the mother. Responses consist of: 1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = always. Picky eaters were defined as a combination of high food avoidance scores and low food approach scores. Children who do not meet these criteria were considered non-picky eaters. [10] Nutritional status was determined using the Weight-For-Age-Z score (WAZ) indicator based on Z-scores. Children in this study were considered malnourished if WAZ <-2.0 SD. [3]

Statistical analysis

The gathered data were analyzed utilizing SPSS (version 25.0). We employed both univariate and bivariate analyses. The Chi-Square test was applied to assess the correlation between picky eating behavior and the incidence of malnutrition in children aged 2 to 5 years.

Ethical considerations

This study had obtained approval from The Health Research Ethics Committee of The Medical Faculty of Unissula Semarang with number 478/XII/2023/Komisi Bioetik.

RESULTS

Characteristic of participants

(Table 1) showed the characteristics of the research sample based on nutritional status. The majority of malnutrition children were boys, with 20 (57.1%), while non-malnutrition children were mostly girls, with 18 (51.4%). The average birth weight of malnutrition children was 3000 grams, and for non-malnutrition children, it was 2900 grams. The majority of malnutrition in children occurs in the age range of 24-35 years, with 19 (54.3%). Both malnutrition and non-malnutrition children are routinely taken to posyandu. Rare illness is observed in all toddler groups. The majority of mothers in both malnutrition and non-malnutrition toddler groups were aged 26-35 years. The majority of mothers have completed their education up to junior high school and senior high school in the malnutrition group, whereas in the non-malnutrition group, the majority of mothers have completed their education up to junior high school. The majority of fathers have completed their education up to senior high school in the malnutrition group, while in the non-malnutrition group, the majority of fathers have completed their education up to elementary school and junior high school. The majority of mothers of children work as housewives, and the majority of fathers of children work in the informal sector.

Picky eater behavior

The determination of picky eater behavior in children was done by filling out the Child's Eating Behavior Questionnaire (CEBQ), which consists of 35 questions divided into 16 food approach questions and 19 food avoidance questions. Each question item was scored from 1 to 5, so the total food approach score ranges from 16-80, and the food avoidance score ranges from 19-95. Children were considered picky eaters if the food avoidance score was higher than the food approach score. The average scores for food approach and food avoidance, as well as the difference, are shown in (Table 2).

Incidence of malnutrition in children

(Table 3) describes the malnutrition profile of respondents by explaining the median, minimum, and maximum Weight-for-Age-Z score (WAZ) of children aged 2-5 years in Kutukan Village, Randublatung Sub-district, Blora Regency.

Relationship between picky eater behavior and incidence of malnutrition in children

Bivariate analysis was conducted to determine the relationship between two variables, namely picky eater behavior and incidence of malnutrition in children aged 2-5 years in Kutukan Village, Randublatung Sub-district, Blora Regency, using the Chi-Square statistical test with a significance level of 5% (p <0.05). As explained in (Table 4), the chi-square test yields a p-value of 0.673 (p> 0.05), indicating no significant relationship between picky eater behavior and incidence of malnutrition in children aged 2-5 years in Kutukan Village, Randublatung Sub-district, Blora Regency.

DISCUSSION

The research in Kutukan Village, Randublatung Sub-district, Blora Regency in January 2024 showed that the characteristics of children in the village with the highest number of malnutrition children were males, totaling 20 (57.1%). These findings were consistent with a previous study, which states that the highest prevalence of malnutrition occurs more frequently in boys, 38.1%. In addition to age aspects, malnutrition in this study mainly occurred in children aged 24-35 months (51.4%). [11] This was consistent with the results of the Indonesian Nutrition Status Survey (SSGI) in 2022, which showed that the highest prevalence of malnutrition occurs in the age range of 24-35 months. [12]

The research results obtained in Kutukan Village, Randublatung Sub-district, Blora Regency indicate that there was no relationship between picky eater behavior and incidence of malnutrition in children aged 2-5 years, with a p-value of 0.673 (p<0.05). These findings align with previous research, which explained that there was no difference in eating patterns and nutritional status between picky eaters and non-picky eater children. Although children are considered picky eaters in their usual food consumption, the intake of other energy sources, such as milk, is sufficient to meet their energy and protein needs, thus preventing a decline in nutrition (p=1.000). [7] However, this contradicts the findings of a study by other researchers doing the same topic, which

Table 1: Characteristics of respondents

Characteristics of subjects	Nutritional Status				*P*-value
	Malnutrition (n=35)		Non Malnutrition (n=35)		
	%	%	%	%	
Gender					
Boys	20	57.1	17	48.6	0.632
Girls	15	42.9	18	51.4	
Birth Weight (grams)	3.03 ± 0.27		2.98 ± 0.27		
<2500 grams	0	0	0	0	0.625
≥2500 grams	35	100	35	100	
Aged (months)	36.77 ± 9.1		37.25 ± 8.7		
24-35 months	19	54.3%	18	51.4	0.963
36-47 months	10	28.6%	11	31.4	
48-59 months	6	17.1%	6	17.1	
Frequency brought to posyandu					
Routine (every month)	31	88.6	31	88.6%	1.000
Not a routine (Not every month)	4	11.4	4	11,4%	
History of illness					
Rarely get sick (≤ 1x/month)	35	100	33	94.3	0.493
Often get sick (>2x/month)	0	0	2	5.7	
Mother's age	32 ± 6.37		33± 5.05		
17-25 years	8	2.9	2	5.7	0.448
26-35 years	16	45.7	25	71.4	
36-45 years	10	28.6	7	20	
46-55 years	1	2.9	1	2.9	
Mother's latest education					
Elementary School	9	25.7	9	25.7	0.253
Junior High School	11	31.4	18	51.4	
Senior High School	11	31.4	5	14.3	
College	4	11.4	3	8.6	
Mother's job					
Housewife	22	62.9	26	74.3	0.494
Farmer	5	14.3	2	5.7	
Government Employees	4	11.4	2	5.7	
Entrepreneur	4	11.4	5	14.3	
Father's latest education					
Elementary School	11	31.4	13	37.1	0.218
Junior High School	7	20	13	37.1	
Senior High School	13	37.1	7	20	
College	4	11.4	2	5.7	
Father's job					
Government Employees	3	8.6	1	2.9	0.715
Farmer	11	31.4	11	31.4	
Seller	1	2.9	2	5.7	
Entrepreneur	20	57.1	21	60	

Table 2: Average of food approach and food avoidance in malnutrition and non-malnutrition groups

Variable	Nutritional Status of Children	
	Malnutrition (n=35)	Non Malnutrition (n=35)
Average Food Approach	46.5 ± 8.1	46.9 ± 9.7
Average Food Avoidance	56.4 ± 8.6	55.9 ± 7.9
Average difference between food approach and food avoidance	9.9 ± 7.6	8.9 ± 8.8

Table 3: Median, Minimum, and Maximum Values of Children's WAZ

Nutritional Status of Children	WAZ		
	Median	Minimum	Maximum
Malnutrition (n=35)	-2.28	-2.94	-2.01
Non Malnutrition (n=35)	-1.38	-1.95	0.45

Table 4: Relationship between Picky Eater Behavior and Incidence of Malnutrition in Children

Variable	Malnutrition		Non Malnutrition		Tolal		*p*-value	CI: 95%
	n	%	n	%	n	%		
Picky Eater	33	94.3	31	88.6	64	91.4	0.673	0.364-12.459
Non Picky Eater	2	5.7	4	11.4	6	8.6		
Total	35	100	35	100	70	100		

stated that the percentage of children with stunted growth was more dominant in children with picky eating behavior, accounting for 9.1%. [6] Some literature suggested that picky eating behavior can be a cause of malnutrition in children, but other factors, such as environmental sanitation, also play a significant role. Poor environmental sanitation can trigger infectious diseases, ultimately affecting the nutritional status of children. [13]

Furthermore, economic status can also lead to malnutrition. Low family economic status can affect the quality of food consumed by children. The study also evaluated the frequency of children's visits to posyandu, where the majority of children are regularly monitored every month. However, children experiencing malnutrition despite regular visits to posyandu may be due to the lack of active involvement of posyandu cadres. [14] Just like the explanation above, if cadres were not active, it could hinder the early detection of poor nutritional status in children. Most cadres only weigh children and do not provide health education to mothers, leading to a lack of understanding of their child's nutritional status. [15]

Basic immunization status also affects the occurrence of diseases in children and correlates with their nutritional status. Immunization can reduce the prevalence of diseases and strengthen the body's immunity. [16] Genetics can influence height and linear growth. Factors affecting human growth include genetics, environment, and hormones. Hormones play a significant role in regulating body growth by affecting cortical bone deposition and stimulating growth and height increase. Genetic factors influence height by up to 15%. Short parents tend to have children with similar heights due to inherited genetic factors. [17]

Limitations

We have no detailed data on children's food intake, no data on parental economic status, and no history of toddler immunization which could be factors contributing to malnutrition in children. The picky eater assessment questionnaire used in this study does not cover the duration of children experiencing picky eater behavior, which could affect their nutritional status.

CONCLUSION

We found that there was no relationship between picky eater behavior and the incidence of malnutrition in children aged 2-5 years. We recommend that future research to more explore information regarding children's food intake, immunization history, and parental economic status. Additionally, further research is needed to develop a similar questionnaire that is more suitable for the characteristics of Indonesian children.

AUTHORS' CONTRIBUTION

All authors have made a significant contribution to the work reported, whether in conception, study design, implementation, data collection, data analysis, and interpretation, or all of these areas; they also participated in drafting, revising, or critically reviewing the article; and gave final approval to publish the version.

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None.

CONFLICT OF INTEREST

None.

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