



Determinant of school children's nutritional status in Musi Rawas district

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ABSTRACT

Background: The phase of school-age children really needs nutritious food intake to support their growth and development. Consumption of diverse foods can complement the advantages of the nutritional arrangement of other types of food so that a balanced nutritional input is obtained.

Objectives: The purpose of this study was to analyze the determinant of school children's nutritional status

Materials and Methods: This study used a cross-sectional design. Data collection was carried out using cluster random sampling to select sub-district and school, simple random sampling techniques to select respondents. The sample in this study was 208 respondents. Data Characteristic (age, gender, pocket money, parental education and income, history of infectious diseases) and nutritional knowledge was collected using questionnaires independently, food consumption diversity was measured using Individual Dietary Diversity Score (IDDS), and nutritional status was measured using CDC 2000. Chi square test was used to analyze association between two categorical variables and multivariate analysis was carried out using risk factor models to determine the impact of multiple potential risk factors on nutritional status.

Results: The results of respondents on the dietary diversity variable were diverse at 84.6%. There was a relationship between dietary diversity ($p=0.021$), nutritional knowledge ($p=0.02$), history of infectious diseases ($p<0.001$) to nutritional status but there was no relationship between pocket money, parents education, parents income, parents occupation and nutritional status of elementary school children. The results of the multivariate analysis indicated a significant association between food consumption diversity and children's nutritional status ($p = 0.021$). This relationship continued to be significant even after adjusting for nutritional knowledge, parental income, and previous infectious diseases

Conclusion: The diversity of children's food consumption plays a significant role in shaping their nutritional status, even when other factors such as nutritional knowledge, parental income, and history of infectious diseases are taken into account

Keywords: Children; dietary diversity; nutritional status; school children

BACKGROUND

Malnutrition is one of the biggest health problems in the world, affecting people in both developed and developing countries. Children are particularly vulnerable to nutrient deficiencies due to their high nutritional needs for growth. The nutrient density of the food given to young children is often insufficient to meet their nutritional requirements, and increasing the variety of foods provided to young children, especially meat, poultry, fish, eggs, fruits, and vegetables, is recommended to improve nutrient intake.¹ According to data from the National Monitoring of Nutritional Status, among elementary school children, the prevalence of very thin is 1.2%, thin 3.5%, fat 15.1%, and obese 4.3%. According to data, Indonesian children often consume foods with high energy content. In South Sumatra Province, the percentage of severe thinness was 4.4%, thinness is 6.4%, overweight was 12.5%, and obesity was 2.2%.² Factors that worsen the nutritional situation of elementary school aged children are the behavior of choosing and determining the type of food they like. Nutritional status is a condition resulting from a balance between the intake of nutrients from food and the need for nutrients needed for body metabolism.³ Malnutrition is a condition when the body does not receive sufficient nutritional intake due to an imbalance between food intake and the body's needs to stay healthy.⁴

Low food diversity can be a major cause of malnutrition in growing children and women of childbearing age because they have higher nutritional needs.¹ Switching from a monotonous diet to a more varied diet has been shown to improve energy and micronutrient intake in developing countries.⁵ The consumption of varied foods is expected to meet all the nutrients needed in daily life and is an important factor in determining nutritional status.⁶ From existing data, efforts to improve the food consumption of the population of South Sumatra need to emphasize increasing consumption of animal foods, nuts and vegetables and fruit. Data shows that the quantity of food consumed, which is measured based on the total energy

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consumption indicator, is still below the total energy consumption according to the Desirable Dietary Pattern (DDP) norm of 2,000 kcal per capita per day.⁷ The quality of food consumption in Musi Rawas district tends not to change much, so efforts are needed to improve the quality of food consumption, especially by increasing food affordability for the poor.⁸ Most of the areas in Musi Rawas are irrigated rice fields and fast water fish ponds or regular system fish ponds, or even in the mina padi system.⁹ This situation is indeed supported by a good irrigation system and sufficient land area, making it possible to plant rice throughout the day.¹⁰

Health screening coverage for elementary school children in Musi Rawas district is the lowest in South Sumatra, at 20.5%. In 2018, Musi Rawas had the highest number of child malnutrition, at 37%. In 2021, the malnutrition status of children in Musi Rawas Regency remained high, reaching 22%. Then the overweight category was 10.32%, and the obesity category was 1.59%.⁸ This varied nutritional status indicates that the Musi Rawas district is indeed facing a triple burden of nutrition problem. Previous research shows that the causes of malnutrition in school-aged children vary and the factors affecting the nutritional status of school-aged children in Musi rawas have not been identified. The purpose of this study is to analysis the determinant of school children nutritional status.

MATERIALS AND METHODS

This research was observational and analytic, employing a cross-sectional approach, which emphasizes measuring or observing data at a single point in time.¹¹ The population involved in this research consisted of elementary school students in the Musi Rawas district. This research was ethically approved by Ethics Committee for research and Community Health Services at the Faculty of Public Health, Universitas Sriwijaya, with the Ethical approval number 324/UN9.FKM/TU.KKE/2023.

Samples were taken in 2 ways, the first using cluster random sampling to select sub-district and school and simple random sampling to select respondent. The samples taken in this study were from 6 elementary schools (SDN 1 Muara Beliti, SDN 2 Muara Beliti, SDN 2 Tegal Rejo, SDN 2 Srikaton, SDN 1 Mandi Aur, and SDN Karya Teladan) in the Musi Rawas district, spanning 3 sub-districts (Muara Beliti, Tugu Mulyo, and Muara Kelingi). Each school contributed 35 elementary school students. The Inclusion criteria sample are students of 4th, 5th, and 6th graders, and the exclusion criteria are students who have chronic diseases or have a history of diseases such as ARI, diarrhea, measles, malaria. The sample size in this study was obtained from the two-proportion hypothesis test formula.

$$\{Z_{1-\alpha/2} (2P(1-P)) + Z_{1-\beta} (P1(1-P1)) + P2(1-P2)\}^2$$

$$n = (P1 - P2)^2$$

The P1 is the proportion of children with less diverse food diversity among those with malnutrition status (0.6), and P2 is the proportion of children with diverse food diversity among those with malnutrition status (0.38). The sample is added as much as 30% of the sample to anticipate errors in sampling. So that the sample in this study was 208 respondents. Nutritional status was measured using CDC 2000 with category, Normal (5th percentile to < 8th percentile, abnormal (< 5th percentile, ≥ 85th percentile to < 95th percentile, ≥ 95th percentile).¹² The nutritional status of children over 5 years old can be assessed using the CDC 2000 guidelines (percentile measurements) because Indonesian children are shorter than the global average, using the WHO standards means many are actually undernourished, resulting in an overestimation of nutritional status. Before measuring the diversity of food consumption, the student's mother respondents filled out a 24-hour recall first to make it easier for them to remember what food they had eaten. Food consumption diversity was measured using the Individual Dietary Diversity Score (IDDS) questionnaire for 9 food groups. Each group of food consumed was given a score of 1, while those not consumed were given a score of 0. The level of diversity of food consumption is grouped into 2 categories, namely children with a total score of ≥6 (6 kinds of food groups) will be categorized into “consuming diverse foods”. While children with a score of <6 will be categorized into “consuming less diverse foods”.¹³

For nutritional knowledge, self-administered questionnaire given to the mothers of the students, a multiple-choice question questionnaire with a total of 18 questions was given. Using the Guttman scale, namely: true-false, correct answers are given a value of 1, and incorrect answers are given a value of 0, and vice versa. On good knowledge is coded 1 and poor knowledge is coded 2. Nutrition knowledge is divided into 2 categories, namely “good” categories when the answer is correct ≥ 70% and “poor” when the answer is correct < 70%.¹⁴

In the pocket money variable, the categorization is divided into two: "high," coded as 1, and "low," coded as 2. "High" is defined as \geq IDR 2,000, and "low" as $<$ IDR 2,000. Parent Education variable is the last level of education from Mother, but for children who are no longer there Mother can be replaced by Dad. Parent education is divided into 2 categories, namely "High" (\geq High School) and "Low" ($<$ High School). The income variables of parents are divided into 2 categories, namely "high" is coded 1 and "low" is coded 2. According to the Ministry of Investment / BKPM (2023), the Musi Rawas minimum wage is categorized as high if it is \geq IDR 2,595,995 and as low if it is $<$ IDR 2,595,995.

The categorization for parental work variables is divided into 2 categories, namely "work" is coded 1, and "not work" is coded 2. The categorization for infectious disease history variables is divided into 2 categories, namely "once" given code 1, and "never" given code 2. History Infectious disease is the history of diseases in children caused by microorganisms such as pneumonia, diarrhea, measles, dengue fever, worm infections, and upper respiratory tract infections, it is divided into 2 categories, namely "once" given code 1, and "never" given code 2. Respondent distribution data obtained through filling in the questionnaire will be processed to check data validation using a Statistic software. Nutritional status was measured using CDC 2000 with category, "Normal" (5th percentile to $<$ 8th percentile, "abnormal" ($<$ 5th percentile, \geq 85th percentile to $<$ 95th percentile, \geq 95th percentile).¹² This study used univariate, bivariate analysis with the chi square test, and multivariate analysis with multiple logistic regression tests using risk factor models.

RESULTS

Univariate Analysis

The results of the frequency distribution of 208 respondents on the food consumption diversity variable were mostly varied at 84.6%. The result can be seen in table 1.

Table 1. Univariate Analysis Frequency Distribution (N: 208)

| Characteristics | n | % |
|--------------------------------------|-----|-------|
| Age (Years) | | |
| 8 | 18 | 8.6 |
| 9 | 45 | 21.6 |
| 10 | 69 | 33.1 |
| 11 | 76 | 36.5 |
| Gender | | |
| Man | 89 | 42.78 |
| Woman | 119 | 57.21 |
| Nutritional status | | |
| Normal | 94 | 45.2 |
| Abnormal | 114 | 54.8 |
| Diversity of food consumption | | |
| Diverse | 176 | 84.6 |
| Less diverse | 32 | 15.4 |
| Nutrition Knowledge | | |
| Good | 168 | 80.8 |
| Not enough | 40 | 19.2 |
| Pocket money | | |
| Big (\geq IDR 2000) | 92 | 44.2 |
| Small ($<$ IDR 2000) | 116 | 55.8 |
| Parental education | | |
| High (\geq IDR 2.595.995) | 30 | 14.4 |
| Low ($<$ IDR 2.595.995) | 178 | 85.6 |
| Parental income | | |
| Good | 20 | 9.6 |
| Not enough | 188 | 90.4 |
| Parents' job | | |
| Work | 198 | 95.2 |
| Not Work | 10 | 4.8 |
| History of infectious disease | | |
| Never | 180 | 86.5 |
| Once | 28 | 13.5 |

Source: Primary Data, 2023

Bivariate Analysis

The results of the bivariate analysis were that there was a relationship between food consumption diversity ($p=0.021$), nutritional knowledge ($p=0.02$), ($p=0.088$), parents' education ($p=0.982$), parents' income ($p=0.23$), parents' occupation ($p=0.117$) and nutritional status of respondents. The result can be seen in table 2.

Table 2. Bivariate Analysis Frequency Distribution

| Variable | Nutritional status | | | | <i>p value</i> | OR value (95%CI) |
|--------------------------------------|--------------------|------|--------|------|----------------|----------------------|
| | Abnormal | | Normal | | | |
| | n | % | n | % | | |
| Dietary Diversity | | | | | | |
| Less diverse | 24 | 75.0 | 8 | 25.0 | 0.021 | 1.955 (1.053-3.629) |
| Diverse | 90 | 51.1 | 86 | 48.9 | | |
| Nutrition Knowledge | | | | | | |
| Poor | 29 | 72.5 | 11 | 27.5 | 0.020 | 1.797 (1.062-3.040) |
| Good | 85 | 50.6 | 83 | 49.4 | | |
| Pocket money | | | | | | |
| Small | 57 | 49.1 | 59 | 50.9 | 0.088 | 0.748 (0.545-1.026) |
| Big | 4 | 62.0 | 35 | 38.0 | | |
| Parental Education | | | | | | |
| Low | 97 | 54.5 | 81 | 45.5 | 0.982 | 0.952 (0.614-1.478) |
| High | 17 | 56.7 | 13 | 43.3 | | |
| Parental Income | | | | | | |
| Low | 100 | 53.2 | 88 | 46.8 | 0.230 | 0.641 (0.323-1.273) |
| High | 14 | 70.0 | 6 | 30.0 | | |
| Parental job | | | | | | |
| Not Work | 8 | 80.0 | 2 | 20.0 | 0.117 | 2.323 (0.667-8.097) |
| Work | 106 | 53.5 | 92 | 46.5 | | |
| History of infectious disease | | | | | | |
| Once | 25 | 89.3 | 3 | 10.7 | <0.001 | 4.719 (1.604-13.880) |
| Never | 89 | 49.4 | 91 | 50.6 | | |

Source: Primary Data, 2023

Table 2 shows that respondents who have abnormal child nutritional status with a diversity of food consumption that is not diverse is 23.9% higher than respondents who have a diversity of food consumption. Respondents who had children whose nutritional status was not normal with poor nutritional knowledge were 21.9% higher than respondents who had good nutritional knowledge. Respondents who have children with abnormal nutritional status with large pocket money are 12.9 % higher than respondents who have small pocket money. Respondents who have children with abnormal nutritional status and high parental education are 2.2 % higher than respondents with low education. Respondents who have children with abnormal nutritional status and high parental income are 16.8% higher than respondents whose parental income is low. Respondents who have children with abnormal nutritional status and whose parents do not work are 26.5% higher than respondents who work. Respondents who had children whose nutritional status was abnormal and had a history of infectious diseases were 39.9 % higher than respondents who had never had a history of infectious diseases.

Multivariate Analysis

Based on the results of multivariate analysis, there is a relationship between diversity of food consumption and children's nutritional status (OR= 2.917; CI= 1.178-7.234) after being controlled by the

variables of nutritional knowledge, parental income, and history of infectious diseases. The result can be seen in table 3. Multivariate analysis show that the R-squared value (R^2) = 0.218.

Table 3. Results Finals Model Multivariate

| Variable | Model Beginning | | | Model End | | |
|---------------------------|-----------------|--------|----------------------|-----------|--------|-----------------------|
| | B | p | OR (95%CI) | B | p | OR (95%CI) |
| Dietary Diversity | 1,129 | 0.016 | 3.091 (1.232-7.754) | 1,070 | 0.021 | 2.917 (1.178-7.234) |
| Nutrition Knowledge | 1,271 | 0.002 | 3.566 (1.592-7.754) | 1,273 | 0.002 | 3.571 (1.610-7.918) |
| Pocket Money | -0.455 | 0.161 | 0.634 (0.336-1.198) | - | - | - |
| Parental Education | -0.130 | 0.765 | 0.878 (0.374-2.061) | - | - | - |
| Parental Income | -0.938 | 0.094 | 0.392 (0.131-1.173) | 1,208 | 0.023 | 0.299 (0.105-0.849) |
| Parental job | 1,307 | 0.127 | 3.695 (0.688-19.838) | - | - | - |
| History Disease Infection | 2,264 | <0.001 | 9.619 (2.720-34.013) | 2,311 | <0.001 | 10.087 (2.865-35.508) |

Source: Primary Data, 2023

It is known that there are two variables that have a p-value <0.05 and are maintained in the model and are confounding, namely the knowledge and disease history variables. Based on these results, it is known that there is a relationship between food consumption diversity and children's nutritional status with a p-value of 0.021 after being controlled for nutritional knowledge, parental income and history of infectious diseases.

DISCUSSION

The multivariate analysis show a p-value of 0.021 (p-value < 0.05) so that it was concluded that there was a significant relationship between the diversity of food consumption and the nutritional status of children. OR value is 2.917 it means the diversity of food consumption that less diverse is 2.917 times more likely to adversely affect the nutritional status of children compared to diverse food consumption, after controlling for the variables of nutritional knowledge, parental income, and history of infectious diseases. In the general population, researchers are 95% confident that food consumption diversity is a risk factor for children's nutritional status with a confidence interval of 1.176 to 7.234. This research is the same as research by Febry et al. in 2021, data obtained that there is a relationship between various foods and nutritional status, namely p = 0.047.¹⁵ Other research from Uzosike et al. in 2020 is also the same, namely that there is a relationship between food diversity and the nutritional status of elementary school children in Nigeria with (p= 0.018).¹⁶ Food consumption patterns that lack diversity and low nutritional quality of food consumption are thought to be chronic problems, which can affect children's nutritional status, because the diversity of nutrients needed by the body is very difficult to fulfill if the types of food consumed are not diverse. The low diversity of children's food reflects family food insecurity that is still ongoing in this study area. Low dietary diversity can be a major cause of malnutrition in growing children because they have higher nutritional needs. Because according to Yulianti et al. in 2024, consuming a variety of foods is expected to fulfill all the nutrients needed in daily life, and is an important factor in determining nutritional status.¹⁷

The statistical test results produced a p-value of 0.020 (p-value < 0.05) so that it was concluded that there was a significant relationship between nutritional knowledge and children's nutritional status. Likewise, research from Yuliana et al. in 2024, shows that there is a significant relationship between maternal knowledge and children's nutritional status with p value = 0.01. Mother's knowledge is needed to improve diet so that the child's nutritional adequacy is met, and also the child can grow and develop well.¹⁸ Maternal nutritional knowledge which is put into practice in daily actions has a big influence on the nutritional condition of the family.¹⁹ Maternal nutritional knowledge greatly influences the nutritional status of the family, especially children, because mothers will be able to shape food consumption patterns, especially for their children. Mothers with good nutritional knowledge and more experience in providing food will have varied ways of serving food to their children, so that consumption of the food needed by the family is more guaranteed and the family's health will be better.²⁰ However, this research is not the same as research before in that found there is no significant relationship between maternal knowledge about nutritious food and children's nutritional status (p = 0.703; α < 0.05).²⁰

The statistical test results produced a p-value of 0.088 (p-value > 0.05) so that a statistical decision was obtained, namely that it failed to reject H0 with the conclusion that there was no significant relationship between pocket money and children's nutritional status. The pocket money allocated is not for food but for transportation, buying gifts, books and clothes. The larger pocket money received does not affect energy and nutrient consumption. Children have a wrong perception about pocket money, resulting in careless snacking behavior.²¹ Because according to Muna et al. in 2019, giving small or large nominal pocket money can

consume food by eating healthy snacks or unhealthy snacks. In this study, it was concluded that pocket money was not related to children's nutritional status because most children used pocket money not to buy food, but to buy toys. Even though children buy food at school using their pocket money, it does not necessarily mean that the food they buy is healthy and nutritious which can affect their nutritional status.²²

The statistical test results produced a p-value of 0.982 (p-value > 0.05) so that it was concluded that there was no significant relationship between parental education and children's nutritional status. Education is one of the factors that contributes to parents' ability to process information obtained for themselves and their families, including how to care for children and consuming appropriate food.^{23,24} This is because mothers with low education do not necessarily have no knowledge about nutrition. A high level of maternal education does not guarantee that the child will avoid malnutrition because a high level of education does not mean that the mother has sufficient knowledge of good nutrition.

The statistical test results produced a p-value of 0.230 (p-value > 0.05) so that it was concluded that there was no significant relationship between parents' income and children's nutritional status. This research has the same results as research by Lubis et al. in 2020, namely that there is no relationship between parental income and the nutritional status of children.²⁵ According to researchers, nowadays many parents have high incomes but don't have much time at home and hanging out with their children, for reasons of being busy with work, one of which will have an impact on children's nutritional status. So even if the parent's income is high, if the parent cannot manage the money to provide the child with nutritious nutrition, it will have no effect on the child's consumption patterns. As for parents with low incomes, they pay more attention to their family's nutritional intake by being smart in choosing foods that are relatively cheap but still nutritious so that they can have an impact on their children's nutritional status.

The statistical test results produced a p-value of 0.177 (p-value > 0.05) so that it was concluded that there was no significant relationship between parents' work and children's nutritional status. Some respondents who provided information regarding the nutritional status of children whose mothers worked could conclude that the nutritional status of children whose mothers left them to work was not necessarily worse, because the mothers continued to monitor it. Supported by Lartriyani's opinion, namely that in some types of work mothers do not spend one day at work so that mothers can manage their time in taking care of children's nutritional needs.²⁶

The statistical test results produced a p-value of <0.001 (p-value <0.05) so that it was concluded that there was a significant relationship between the history of infectious disease and the child's nutritional status. Scrimshaw said that there is a close relationship between infectious diseases and malnutrition. There is a synergistic interaction between malnutrition and infection, infection will affect nutritional status. Pathologically, the mechanism is a decrease in nutritional intake due to lack of appetite, decreased absorption and the habit of reducing food when sick, increased loss of fluids or nutrients due to diarrhea, nausea or vomiting due to continuous bleeding, increased needs due to illness and parasites. found in the body.

Based on the results of multivariate analysis, there is a relationship between diversity of food consumption and children's nutritional status (OR= 2.917; CI= 1.178-7.234) after being controlled by the variables of nutritional knowledge, parental income, and history of infectious diseases. This is in accordance with Olumakaiye's theory, namely that diversity of food consumption in addition to total energy intake is a key factor in nutritional well-being for children. Lack of sufficient supply of energy-dense foods for growth and energy needs, and reliable access to key food groups such as animal products and fruit/vegetables with required micronutrients, increases the risk of negative effects on abnormal child nutritional status.²⁷ The nutritional knowledge factor also plays an important role in controlling the variable level of food diversity which influences the nutritional status of children. This is in line with Setiyaningrum's assumption, namely that the more knowledge about nutrition a mother has, the more aware she is of the impact of nutritional status on her child.²⁸ This knowledge can be obtained during formal education or through various information obtained during non-formal education. Scrimshaw's theory states that there is a close relationship between infectious diseases and malnutrition. There is a synergistic interaction between malnutrition and infection, infection will affect nutritional status. Therefore, nutritional knowledge, parental income, and history of infectious diseases are confounding factors in the diversity of food consumption. Hence, The results are solely based on data analysis obtained from the questionnaires provided in the research using quantitative methods. Therefore, it is expected that further research will use a combination of quantitative and qualitative methods by adding data collection through in-depth interviews to better illustrate each variable, especially the variable of diversity in food consumption.

CONCLUSIONS

There is a relationship between food consumption diversity and children's nutritional status after being controlled for nutritional knowledge, parental income and history of infectious diseases. It is hoped that mothers will pay more attention to and prioritize children's nutritional needs and increase their awareness so that they can pay more attention to the diversity of each food group to be eaten every day but still according to the body's needs and according to the child's daily portion of food also regularly maintain the cleanliness of their environment to avoid infectious diseases which can affect their children's nutritional status.

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest regarding the publication of this article.

DECLARATION USE AI

The authors used artificial intelligence (AI)-assisted tools solely to improve the language, grammar, and readability of this manuscript. All scientific content, data analysis, interpretation of results, and final manuscript preparation were performed and verified by the authors. The authors take full responsibility for the accuracy and integrity of the manuscript.

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