

Knowledge of Breakfast, Protein Intake of Breakfast, and Nutritional Status on Primary School Children

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Abstract—Nutritional status of children can be influenced by breakfast habits. One factor that influences the consumption of breakfast is knowledge of breakfast. Based on the results of a preliminary survey, 65% of students have less knowledge about the importance of breakfast. The objective of this research was to determine the correlation between knowledge of breakfast with protein intake and nutritional status on elementary school children at Madrasah Ibtida'iyah Muhammadiyah (MIM) Innovative Gonilan Kartasura Sukoharjo Indonesia. This was an observational study with a cross-sectional approach and sample size of 245 children selected by simple random sampling. The knowledge was assessed using a questionnaire containing 20 items with a true or false response. The protein intake was assessed by an interview using a 24-hour food recall form while the nutritional status was obtained using anthropometric measurements and was interpreted by Z-score of body mass index (BMI-for-Age). The correlation test in this study was done by rank Spearman correlation test. The knowledge and protein intake were considered adequate with the respective values of 55.1% and 49.0%, while the nutritional status was classified as normal with the number of 65.3%. There was a correlation between knowledge with protein intake ($p=0.032$) and nutritional status ($p=0.001$). It is expected that the school can cooperate with community health centers to conduct nutrition education, especially about the breakfast behavior to improve the nutritional status of primary school students.

Keywords— knowledge; protein intake; breakfast; nutritional status.

I. INTRODUCTION

The children are essential for national development; thus, their health, especially their nutritional status, needs to be considered properly. Children with good nutritional status will become qualified human resources. One factor that affects the nutritional status is children's attitude in selecting their food. One important message in the Balanced Nutrition Guidelines is to get used to breakfast. Breakfast is a morning mealtime to supply nutrients to the body, especially energy used for daily activities [1]. In 2010, the Ministry of Health of Republic Indonesia explained that breakfast has an important contribution in the total daily diet of children aged 4 to 18. However, the Ministry of Health also reported that there were 40.6% of the population consuming food below 70% of Recommended Dietary Allowance (RDA) [2]. Of these numbers, 4.2% was reported in school-age children.

The excess or lack of food intake can trigger nutrition problems in the community, such as can inhibit the growth and adversely affect the nutritional status of children [3]. A routine breakfast can improve the concentration during learning and can help to comprehend the information given easily [4]. To improve knowledge of school-aged children to

have a routine breakfast, the Indonesia government develop a program called Pekan Sarapan Nasional (PESAN). PESAN is an annual National Breakfast Week program held by the Ministry of Health to address food and nutrition problem in Indonesia.

According to Gotthelf research, there were 65.8% of children aged 9 to 13-year-old with poor quality of breakfast [5]. Factors influencing the lack of breakfast in primary school student are economic status, individual attitudes, parent's knowledge, culture, infectious diseases, and food availability. Knowledge and perceptions about breakfast can shape consumption behavior in choosing food both in quality and quantity. Perception is one of the psychological elements that shape and influence a person's quality eating habits. Perception will bring understanding and then become an important indicator for children's behavior. Knowledge and perception affect a person's attitude, so they can shape a person's behavior to determine the quality of breakfast [6].

Indrasari et al. [6] found that the variety of food on primary school children were included in the less category. This study showed that 29 subjects (50.9%) had less variety of food. The variety of food was one of indicator of quality of food. The subjects are considered to have less variety of

food if they consume ≤ 3 varieties of food, adequate if they consume 4-5 varieties of food, and high if they consume > 5 varieties of food. The quality of food on primary school children can also be measured by energy and protein intake. The previous study about the energy intake on primary school children show that most of the children (93.0%) have a more energy intake. The subjects are considered to have less energy intake of breakfast if the energy intake percentage $< 20\%$, adequate if the percentage is 20-25%, and more if the percentage $> 25\%$ [6].

Children who have breakfast generally have significantly higher nutrient intakes than children who do not [7]. Breakfast consumption habit is influenced by the knowledge that a good breakfast can affect nutritional status in children. Some studies show that knowledge and protein intake may affect the nutritional status of children [8]. Someone who has a good knowledge of breakfast is expected to maintain the habit of breakfast consumption to establish good nutritional status [9], [10].

This study was conducted to determine the correlation between breakfast knowledge and protein intake of breakfast to nutritional status based on Z-Score of BMI-for-Age of elementary school students in MIM Innovative Gonilan Kartasura. The results of the preliminary survey show that 65% of students have less knowledge about the importance of breakfast. Types of food that are often consumed for breakfast are rice, noodles, biscuits and cereals. In this type of rice and noodles is not balanced with side dishes containing protein and vitamins. The types of drinks most often consumed for breakfast are mineral water, syrup, milk with high sugar content and milk with low sugar levels. This food pattern chosen because the behavior of children to do breakfast only to fill their energy and not prioritize nutritional balance. If school-age children have knowledge of the importance of a good breakfast, the child can understand which foods have good quality for their nutrition requirement. So, this study was expected to have a positive impact on the knowledge of primary school children about the importance of breakfast so that children can have good nutritional status.

II. MATERIAL AND METHOD

This research was conducted at MIM Innovative Gonilan Kartasura with observational research design through a cross-sectional approach. There were 245 children involved as respondents, which were selected using random sampling technique. The variables in this research were knowledge of breakfast as the independent variable and protein intake of breakfast and nutritional status based on Z-Score of BMI-for-Age as dependent variables. The stages of this research were the development of the instrument based on the construction stage, conducting the initial survey, the literature review, conducting the instrument validation, and scoring.

The knowledge of breakfast was measured using a questionnaire containing 20 items with the choice of true and false answers. The correct answer had a score of 1 and the wrong answer had a score of 0. The questionnaire of the breakfast knowledge was tried out on 20 respondents. The tryout was done to analyze the instrument reliability. The results based on the inter-item correlation show that the

questionnaire obtained excellent results with a Cronbach's alpha coefficient of 0.983. The results of the item-total correlation analysis of 20 items show that they had acceptable reliability ($r \geq 0.3$).

Protein intake status was obtained by interview using 24-hour food recall form, and then it was compared with total protein intake per day based on RDA and expressed as a percentage (%). Protein intake was interpreted through categorization into three categories: deficit ($<80\%$); mild deficit (80-99%); and sufficient ($\geq 100\%$). Meanwhile, the children's BMI was obtained by measuring the anthropometry of the height and weight of the child. Then, the nutritional status based on BMI-for-Age was calculated using the WHO Anthro Plus application and the Z-score was interpreted based on a standard from the Ministry of Health of Republic Indonesia. The Z-score of BMI-for-Age interpreted by categorization into three categories: underweight when the Z-score is in the range of $-3SD$ to $-2SD$, normal if the score is in the range of $-2SD$ to $+1SD$, and overweight if the score is larger than $+2SD$.

Univariate analysis was done by describing the frequency of each variable. Bivariate analysis was conducted to determine the correlation between variables. The normality of data was tested using the Kolmogorov-Smirnov test and rank Spearman correlation was used for not normally distributed data. This study was approved by the Ethics Committee for Health Research, Faculty of Medicine, Universitas Muhammadiyah Surakarta with a number of ethical clearance No: 371/B.1/KEPK-FKUMS/X/2016.

III. RESULT AND DISCUSSION

The respondents' characteristics including sex, age, knowledge of breakfast, protein intake of breakfast and nutritional status can be seen in Table 1.

TABLE I
CHARACTERISTICS OF PRIMARY SCHOOL CHILDREN

Variable	Frequency	Percentage
Gender		
Male	135	55.1
Female	110	44.9
Age		
9 years	120	49.0
10 years	95	38.8
11 years old	30	12.2
Knowledge of Breakfast		
Poor	50	20.4
Fair	135	55.1
Good	60	24.5
Protein intake		
Deficit	70	22.4
Mild Deficit	120	49.0
Sufficient	55	28.6
Nutritional Status		
Underweight	20	8.2
Normal	160	65.3
Overweight	65	26.5

Most of the respondents (55.1%) were males. The gender percentage was similar to a study conducted by Indrasari et al., which had 56.1% males as respondents [6]. Male

generally have more muscle mass than female, which requires more energy and protein. In this study, the respondent age ranged from 9 to 11 years old. The children around this age are in a vulnerable state during their growth and very active; thus, the children need to get nutrition based on not only the appropriate quantity of food but also its quality to support their health [11], [12]. Most of the respondents (49.0%) in this study aged 9 years old.

The knowledge categories were classified as poor, fair, and good categories. This classification was based on the mean and standard deviation. The knowledge was classified as good if it has a value > 93.3; while the fair category had a value in the range of 75.9 – 93.3; and the poor category had a value < 75.9. The results show that there were 55.1% of subjects had a fair knowledge of breakfast. This study still found that as many as 20.4% of school children had a poor knowledge of breakfast, which affected attitudes and behavior towards breakfast patterns to be inadequate.

Based on the questionnaire, some of the subjects who had fair breakfast knowledge, explained that they already knew the nutritional and health information through magazines, newspapers, books, and television ads [6]. The questionnaire results show that there were 87.7% children who did not know the importance of breakfast recommended in the Guidelines of Balanced Nutrition and 89.5% children who did not understand the variety of food consumed at breakfast.

The categorization of protein intake (see Table 2) is based on the comparison between the breakfast protein intake percentage and the RDA [13]: deficit (<80%); mild deficit (80-99%); and sufficient (≥100%). The categorization of nutritional status based on Z-Score of BMI-for-Age was based on the Ministry of Health report in 2013, that school children is considered underweight when the Z-score is in the range of -3SD to -2SD, normal if the score is in the range of -2SD to +1SD, and overweight if the score is larger than +2SD [14]. In this study, 65.3% of subjects were in the normal category.

TABLE II
CROSS TABULATION BETWEEN KNOWLEDGE OF BREAKFAST AND PROTEIN INTAKE

Knowledge of breakfast	Protein Intake								p
	Deficit		Mild Deficit		Sufficient		Total		
	n	%	n	%	n	%	n	%	
Poor	10	20.0	30	60.0	10	20.0	50	100	0.032
Fair	15	11.1	65	48.1	55	40.7	135	100	
Good	30	50.0	25	41.7	5	8.3	60	100	
Total	55	28.6	120	49.0	70	23.6	245	100	

The percentage of nutritional status (see Table 3) in the normal category in this study (65.3%) was higher than the study conducted by Soheilipour, with 57.4% elementary school student had a normal Z-Score of BMI-for-Age and Shahraki's research which reported 54.0% children had a normal Z-Score of BMI-for-Age [15], [16]. Based on the Z-score categorization, this study found that there were 8.2% of subjects who were underweight and 26.5% of students who were overweight. This finding shows that prevalence of overweight in schoolchildren was labelled as very high

category (≥ 15%) and the prevalence of underweight in schoolchildren was labelled as medium category (5-10%) [17]. The percentage of school children with deficit protein intake was 71.4% (deficit 22.4% and mild deficit 49.0%), this result higher than national percentage in Indonesia was 31.9% [13].

TABLE III
CROSS TABULATION BETWEEN KNOWLEDGE OF BREAKFAST AND NUTRITIONAL STATUS

Knowledge of breakfast	Nutritional Status								p
	Underweight		Normal		Overweight		Total		
	n	%	n	%	n	%	n	%	
Poor	5	10.0	25	50.0	20	40.0	50	100.0	0.001
Fair	5	3.7	95	70.4	35	25.9	135	100.0	
Good	10	16.7	40	66.7	10	16.7	60	100.0	
Total	20	8.2	160	65.3	65	26.5	245	100.0	

The variables in this study were knowledge of breakfast, protein intake of breakfast and nutritional status (Z-Score of BMI-for-Age). The distribution of subjects based on descriptive statistics can be seen in Table 4. The average knowledge of breakfast was 84.59 ± 6.63 , which means that subjects had adequate knowledge of breakfast. The average of protein intake in primary school children was $24.42\% \pm 12.80\%$, thus indicating that the average percentage of protein intake in schoolchildren falls into the deficit category. The children consume rice (carbohydrate source) with side dish of fried tempeh (protein source), glass of milk (source of fat), various dark green or non-green vegetables and fruits (micronutrients) but in less numbers, so many children still deficit in protein intake, on the other hand the children had less variety of food. Less diverse consumption of daily food can result in an imbalance between the input and nutritional needs needed for a healthy and productive life to achieve a balanced intake of nutrients that cannot be obtained only in one type of food [6].

TABLE IV
DESCRIPTIVE STATISTICS OF KNOWLEDGE OF BREAKFAST, PROTEIN INTAKE, AND NUTRITIONAL STATUS

Variable	Average	Std Deviation	Median	Minimum	Maximum
Knowledge of breakfast	84.59	8.63	85.00	70.00	100
Protein intake (%)	24.42	12.80	20.70	7.00	59.20
Nutritional status (Z-Score)	-0.17	1.37	-0.40	-3.06	2.40

The results of this study show that there were 50% of subjects who had good knowledge of breakfast but less protein intake. Meanwhile, there were 48.1% and 60.0% of subjects who had respective fair and poor knowledge of breakfast with adequate protein intake. The rank Spearman

correlation results indicates that there was a correlation between knowledge of breakfast with a protein intake of breakfast on the respondents of the study ($p=0.032$). A higher nutrition knowledge level has significantly associated with a higher nutrition intake [18]. Someone who has the better knowledge of breakfast will increasingly take into account the type and amount of food. Providing complete and continuous counselling and nutrition counselling with media can change a person's behaviour and habits.

The number of subjects who had good and fair knowledge of breakfast but with normal Z-Score of BMI-for-Age reached 66.7% and 70.4%, respectively. Meanwhile, there were 40% of respondents who had poor knowledge of breakfast and overweight. The rank Spearman correlation results, show that there was a correlation between knowledge of breakfast and nutritional status (Z-Score of BMI-for-Age) on the subjects of the study ($p=0.001$). The subjects with a fair knowledge of breakfast are more likely to know nutrition and health information through magazines, newspapers, books, and television. The information is then interpreted and the primary school children checks whether it is true or false [19].

Someone who has sensed information about breakfast will be accepted as a stimulus. Then the stimulus is forwarded to the brain through sensory nerves to be interpreted. This interpretation process runs from time to time, so that someone can bring a reaction to take action from the breakfast information that has been obtained, which includes the quality of breakfast based on variety of food and energy intake. Knowledge will affect perception; the adequate perception of breakfast is caused by the acceptance of child stimulation from various sources of information about breakfast that can be accepted by them. The previous study found that children's perception about breakfast can influence the quality of breakfast. The result of the children's perception categorized are low (17.5%); adequate (66.7%); and good (15.8%). However, in the process of reaction, an individual—whose perception has been formed—does not necessarily practice it directly into actions in accordance with the perceptions that have been formed in the stimuli [6].

Based on the results of 24-hour food recall interviews, the respondents with sufficient protein intake have rice with tofu and tempeh (food made from fermented soybeans) for breakfast and bring milk boxes to drink in the first break at 9 AM in school. The types of breakfast foods that are mostly consumed by children are cereals (92.9%), beans (35.1%), fresh meat (33.4%) and milk (31.6%). The results of the 24-hour intermittent recall interview found that cereal types consumed by children were rice and bread, beans types are tofu and tempeh, while the types of fresh meat were fried chicken and fried fish. On the other hand, primary school children in this study rarely consume fruit at breakfast, as in the results of interviews with food questionnaires there are only 5.3% who consume fruit at breakfast. Previous studies indicate that students choose food for its taste [20]. Students with adequate energy and protein intake are more willing to participate in learning activities when they are in good health [21]. Moreover, previous studies show that breakfast has a positive effect on children's cognitive performance [22].

When respondents who have normal Z-Score of BMI-for-Age were interviewed, they explained that tend to have breakfast before leaving for school, and bring food if they do not have time for breakfast at home. Protein intake is essential to build damaged cells, which affects the growth and nutritional status of children. Inadequate protein and micronutrient intakes increase the risk of impaired immunity [23]–[25]. Protein intake of protein contributes to the body in the process of producing the energy needed by schoolchildren. Energy at breakfast can meet the body's needs for 5 to 7 hours before lunch. Last night's energy reserves stored in the liver and brain can last for approximately 14 hours. This reserve must be kept in place, so that the fulfillment of breakfast energy is needed to replace the energy reserves overnight. Energy sources for breakfast that are consumed by children include staple foods such as rice, noodles, side dishes such as chicken and eggs [6].

The respondents who have good knowledge of breakfast but deficit breakfast protein intake can be caused by factors such as parents' knowledge, socio-economic conditions, children behaviour, and the availability of breakfast meals. These factors were not directly investigated in this study. The respondents with adequate protein intake but low breakfast knowledge can be caused by factors such as food availability, which was not studied directly by in this study.

In this study, the 24-hour food recall show that 35.1% respondents consumed beans, while 31.6% respondents drank milk. Variety of nuts that are often consumed by respondents were soybeans that were processed to tofu and tempeh. Previous studies reveal that nuts and seeds are recommended sources of vegetable protein [26]. Knowledge is influential in shaping a person's attitude in choosing food consumption. A person with good knowledge of breakfast is expected to implement that in his daily life to form a habit of choosing a variety of foods. The perception process starts from receiving stimuli through the senses, which are preceded by attention, so that the individual is aware of something that is owned and needed. The individual to encourage the individual to shape his habitual behaviour to do a quality breakfast based on the type of food and energy intake [6] will interpret acceptance of stimulus from information about breakfast. A person with a habit of eating diverse foods can maintain a normal nutritional status. Hudayani and Harake state that providing education and nutrition counselling with a comprehensive and continuous educated media can change the behaviour and habits of a person [27].

School children who are accustomed to breakfast every day or eat in schools with adequate food, are proven to be able to improve their scholastic achievement through several mechanisms, for example by brain activation, which are sensitive to short-term variations in the availability of reserves of nutrients. This indication is also very strong in reverse, namely for children who are malnourished. Provision of additional food in schools also plays an important role in reducing the risk of short-term hunger in children who are malnourished or even well nourished. Efforts are needed to motivate parents (especially in groups of low-income parents) to enrol their children in school and ask them to attend regularly, this can overcome the lack of

macro and micro nutrient among children and increase community participation and involvement school manager. A previous study found a link between providing breakfast and lunch with the academic achievements of schoolchildren, and provided an overview of the experiences of schoolchildren in the countryside. The study show significantly higher achievement and better feeding patterns were observed among children from the less poor households. Achievement was significantly associated with consumption of breakfast and a midday meal, particularly for boys, and a greater likelihood of scoring well was observed for better-nourished children [28].

Higher nutrition knowledge on the primary school children was significantly associated with higher vegetable intake [29]. This means that knowledge of nutrition in primary school children, in this case including knowledge of breakfast, can influence attitudes in choosing the types of food that will determine the quality of food. With good knowledge, primary school children will prefer nutritious and healthy foods such as side dishes as a source of protein, vegetables and fruits as a source of vitamins and minerals. Knowledge of nutrition in students becomes an influential factor to improve nutritional status, the better the nutritional knowledge, the better the nutritional status, because good knowledge can improve attitudes and good dietary pattern, which ultimately improves nutritional status. Students who have better knowledge of nutrition will adopt good dietary habits. There have been many studies prove that knowledge of nutrition is one of the important factors that influence for selection of healthy and nutritious foods. Insufficient knowledge of nutrition, will lead to bad attitudes and behaviour, become one of the main causes of nutritional problems, which adversely affect eating behaviour. In addition, an understanding of people's attitudes and beliefs about the importance of nutritious food is an important factor that is very effective for improving healthy eating patterns [30].

IV. CONCLUSION

There were 20.4% of children who had a poor knowledge of breakfast; there were 87.7% children who did not know the importance of breakfast recommended in the Guidelines of Balanced Nutrition and 89.5% children who did not understand the variety of food consumed at breakfast. There were 22.4% of children with deficit and 49.0% mild deficit breakfast protein intake, the types of breakfast foods that are mostly consumed by children are cereals (92.9%), beans (35.1%), fresh meat (33.4%) and milk (31.6%). There were 26.5% of children with overweight and 8.2% underweight.

There was correlation between knowledge of breakfast and protein intake. There was correlation between knowledge of breakfast and nutritional status (Z-Score of BMI). It is expected that the school can cooperate with health administration such as community health centres to conduct counselling regarding the introduction of Balanced Nutrition Guidance to the students, especially on the point of getting breakfast routinely. Therefore, the students can know the portion and variety of food that is recommended to be consumed at breakfast. Schools and health centres can also work together to conduct the supplementary feeding program for schoolchildren.

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