




# Socioeconomic Status and Protein Intake Adequacy in Elementary Children in Surakarta

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**Abstract.** Socioeconomic status has been related to healthy dietary eating habits. The study aimed to examine the association between the socioeconomic status of the family and the adequacy of protein intake in elementary children. A survey of children's food consumption was conducted in public elementary schools in Surakarta selected by multistage random sampling; 113 children completed the survey. Socioeconomic status includes the parents' educational background, job, and income and were obtained by a socioeconomic questionnaire. The children's protein intake was obtained by a 7-days food diary. The types of food consumed were converted to grams and analyzed using the Nutriture program and then compared to the recommended dietary allowances (RDA) for Indonesian children. The results showed that 85% of the children had insufficient protein intake. There was an association between maternal education and protein adequacy in the children ( $p=0.014$ ). Mothers with low education had 1.2 times higher risk of protein deficiency in their children compared to those with high education.

**Keywords:** Children, Educational Background, Family, Mother, Protein Intake, Socioeconomic

## 1 Introduction

Elementary children require adequate nutrient intake to support their growth spurt period, school performance, and to maintain optimum health. During this period, however, children in developing countries such as Indonesia easily experience nutritional problems due to insufficient food intake. It has been reported that 41% of food consumption of school children in Indonesia is below the minimum dietary requirement and 60% have insufficient protein intake which is under 80% of the protein adequacy rate [1]. This percentage can be higher or lower in many regions or districts which reflects the family's food security, socioeconomic status, and common health/nutritional-related problems in the society, such as stunted prevalence in children. There is a large disparity in the prevalence of child stunting in Indonesia, ranging from 26% in Riau to 52% in East Nusa Tenggara, with a national prevalence of approximately 37% [2]. Determinant factors such as low socioeconomic status and low education have been reported to influence this condition [3].

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Proteins are the main component of cell structure which is responsible for the human body's metabolism [4]. It has been reported that the quality of dietary protein intake is associated with linear growth [5,6], and cognitive and motor development in children [7]. Low percentage of energy derived from dietary protein has been reported to correlate strongly with a decline in length for age [8], the risk of being stunted [9], and with low serum albumin levels [10]. In Indonesia, the recommended dietary allowance (RDA) for protein intake is 49 g/day for children aged 7-9 years; which increase to 56 g/day and 60 g/day for boys and girls before the age of 12 years, respectively [11].

Socioeconomic status including income, parental educational background, and occupation has been related to the availability of purchasing power in a community and has shown to affect the quantity and quality of food consumption and nutritional status in school children [12]. Children with good socioeconomic conditions tend to consume expensive foods with high protein and fat content, while children with low socioeconomic conditions were more likely to consume foods that were cheap and high in carbohydrates [13]. A study in Trenggalek regency in Indonesia showed a relationship between families with middle to lower socioeconomic conditions and food shortages or higher food insecurity, while parents with food insecure conditions had children with insufficient levels of protein adequacy [14].

High parental education is expected to influence good and healthy habits and lifestyles. It has been reported that the parents' educational level is related to the nutritional adequacy in their children [15]. The number of stunted school children were higher in low-educated parents compared to those with higher education [15,16], as well as in rural areas and low family income [16]. Currently, limited data exists on this topic in school children in Surakarta. Hence, the aim of this study was to explore the association between socioeconomic status of the family and the adequacy of protein intake in elementary children in Surakarta.

## 2 Methods

This study is a part of the FIKI (fish for kids) study conducted in 2017 in public elementary children in Surakarta. The children were selected using multi-stage random sampling. The study design and the data collection have been published elsewhere [17]. The research permission was obtained from the Health Research Ethics Commission, Faculty of Medicine, Universitas Muhammadiyah Surakarta with reference number 713/B.1/KEPK-FKUMS/VI/2017. In this paper, we used data from a 7-days food diary to measure the protein intake of each child. The food diary was filled out by each child at home under her/his parent's supervision using an aid food image book which was specifically designed for the FIKI study. Before the data collection, we taught the children how to fill out the food diary and they practiced it in a school class session. Information about how to fill out the diary was also sent to the parents' after they sent back a signed participation form for their children. The completeness of the food diary was used as inclusion criteria for our data analysis; 113 children completed the food diary.

Data on socioeconomic status of the families were obtained using a questionnaire of socioeconomic, and included parental education, occupation, and income. Parental education was categorized as basic and high for those with elementary and/or junior high school background, and high school and/or university background, respectively. Average family income was based on minimum wage (MW) or salary in Surakarta of IDR 1,534,985 and was categorized into less than the MW and enough or at/above the MW. The types of food consumed from the 7-day food diary were converted to grams and analyzed using the Nutrisurvey program and then compared to the recommended dietary allowances (RDA) for Indonesian children [11]. Chi-Square test was used to examine the association between the mother's education, father's education, mother's occupation, and family income and protein adequacy in the children. Fisher Exact test was used to examine the association between the father's occupation and protein adequacy in the children.

### 3 Results

Boys were more dominant (54.0%) than girls (46.0%), and 30.1% of the children were 10 years old. Of the mothers, 56.6% reported low educational background and 54.9% worked outside the home. Sixty percent of the families reported low income (Table 1). In terms of the distribution of protein intake adequacy, the children had a mean intake of dietary protein of 32.7 g/day which was about 53% to 65% of the RDA for protein intake. Overall, the majority of children (85.0%) had insufficient protein intake (Table 2). The analysis between socioeconomic status and the adequacy of protein intake showed that maternal education was associated with the adequacy of protein intake in the children ( $p=0.014$ ). Mothers with low educational background had 1.2 times higher risk of protein deficiency in their children compared to those with high educational background (Table 3).

**Table 1.** Characteristics of the participants (n=113)

	Variable	n	%
Gender	Boys	61	54.0
	Girls	52	46.0
Age (year)	8	21	18.6
	9	27	23.9
	10	34	30.1
	11	22	19.5
	12	9	8.0
Father's education	Basic <sup>a</sup>	56	49.6
	High <sup>b</sup>	57	50.4
Mother's education	Basic <sup>a</sup>	64	56.6
	High <sup>b</sup>	49	43.4
Father's job	Self-employed	54	47.8
	Laborer	59	52.2
Mother's job	Working	62	54.9
	Housewife	51	45.1
Average parental income	Low <sup>c</sup>	68	60.2
	Enough <sup>d</sup>	45	39.8

<sup>a</sup> Elementary and/or junior high school background; <sup>b</sup> High school and/or university background; <sup>c</sup> Less than the minimum wage (MW) or salary in Surakarta of IDR 1,534,985; <sup>d</sup> At or above the MW in Surakarta.

**Table 2.** Protein intake adequacy

Variable	n	Protein intake (g/day)		Adequacy of protein intake			
		Means±SD	Median	Insufficient <sup>a</sup> (n)	%	Sufficient <sup>b</sup> (n)	%
Age (year)							
8	21	33.3±6.5	32.7	18	85.7	3	14.3
9	27	34.0±12.0	33.0	19	70.4	8	29.6
10	34	32.6±11.1	30.5	30	88.2	4	11.8
11	22	31.3±10.8	31.8	21	95.5	1	4.5
12	9	32.1±13.1	31.7	8	88.9	1	11.1
Gender							
Boys	61	32.9±10.5	32.0	50	82.0	11	18.0
Girls	52	32.5±10.9	32.0	46	88.5	6	11.5
Total	113	32.7±10.7	32.0	96	85.0	17	15.0

<sup>a</sup> Less than 80% and <sup>b</sup> above 80% of the 2013 recommended dietary allowance (RDA) for Indonesian children.

**Table 3.** Parental socioeconomic status and protein intake adequacy

	Adequacy of protein intake				Total		p-value
	Insufficient	%	Sufficient	%	n	%	
Father's education							
Basic	50	44.2	6	5.3	56	49.5	0.202
High	46	40.7	11	9.7	57	50.4	
Mother's education							
Basic <sup>a</sup>	59	52.2	5	4.4	64	56.6	0.014*
High <sup>b</sup>	37	32.7	12	10.6	49	43.3	
Father's job							
Self-employed	43	38.1	11	9.7	54	47.8	0.311
Laborer	53	46.9	6	5.3	59	52.2	
Mother's job							
Working	53	46.9	8	7.1	51	45.1	0.863
Housewife	43	38.0	11	7.9	62	54.8	
Average parental income							
Less <sup>c</sup>	59	57.8	9	10.2	68	60.2	0.508
Enough <sup>d</sup>	37	38.2	8	6.8	45	39.8	
Total amount	96	85.0	17	15.0	113	100	

<sup>a</sup> Elementary and/or junior high school background; <sup>b</sup> High school and/or university background; <sup>c</sup> Less than the minimum wage (MW) or salary in Surakarta of IDR 1,534,985; <sup>d</sup> At or above the MW in Surakarta; \* Ratio prevalence=1.221

## 4 Discussion

We observed inadequate protein intake in the majority of the children in all age groups and in both sexes. This result is in line with a previous study reported that about 53% of elementary children (n=400) in Medan city and Langkat regency, North Sumatra province had low protein intake [18].

In terms of the association between the parental socioeconomic level and the adequacy of children's protein intake, our results are not in line with previous results, except for the mother's educational background. In previous studies the results show that socioeconomic status was related to the purchasing power of a community which influenced the dietary quality and quantity [12]. Children with good socioeconomic conditions tended to consume expensive foods with high content of protein, while children with low socioeconomic conditions were more likely to consume foods that were cheap and high in carbohydrates [13]. A study in Trenggalek Regency reported that families with lower socioeconomic status tend to have children with insufficient levels of protein adequacy [14].

Parents with high education tend to pay attention to nutritional needs in the family. High parental education is expected to influence good and healthy habits and lifestyles. It is expected that mothers with high education will positively affect the level of fulfillment of nutrients and the adequacy of nutrients in elementary school children. Parents with high education will also indirectly show their knowledge and skills [19]. An association between the parents' educational level and nutritional adequacy has been reported previously. The percent of stunting children were found to be higher in mothers with low education compared to those with higher education [15,16,20]. It has been shown that mothers with high education have better understanding and easier adopt information about healthy foods, and this influence the feeding behaviour or strategies practiced for their children [21]. Maternal education is also important in determining children's eating behavior and food selection applied [21].

Our results are in contrast with the income theory, that is, if a person's income increase, purchasing power will also increase, and individuals with low income will reduce the purchasing power of food which includes quantity and quality [22]. This study shows that the amount of family income is not used as a benchmark for determining total protein adequacy in the children. In line with a previous study, family income did not affect the type of food and food consumed by school-age children [23]. The lack of protein intake in our study could be influenced by many factors, e.g., the availability or variety of food served at home and inadequate portion sizes. It has been reported that approximately 50% of elementary children (n=848) in Lampung left their breakfast due to unavailability of food served at home ( $p=0.005$ ) [24]. Our previous study reported that the common food sources and portion sizes of protein consumed by the children in this study were chicken egg (consumed by 98% respondents in average 39 g/day), chicken meat (consumed by 96% respondents in average 20 g/day), tempeh or fermented soybean and tofu (consumed 71% respondents in average 13 g/day and 10 g/day, respectively) [25]. These portions provided protein intakes of 4.9 g, 5.1 g, 2.5 g, and 0.8 g, respectively. These portion sizes are below the recommended portion sizes for e.g., one egg of 50 g, meat of 50 g, and tempeh or tofu of 50 g. It has been shown

that parents' who have low income prefer food sources of vegetable protein [26]. Vegetable protein has less content and quality than animal protein sources, but consuming various and sufficient amounts of vegetable protein can increase the intake of proteins. Vegetable protein is cheaper than animal protein and the choices may thus be depended on the income. Families living in poverty or having low incomes have limited opportunities to choose food. The low purchasing power of food results in the unavailability of food to meet the nutritional needs and this may result in malnutrition.

This study used a 7-day food diary to collect data on food consumption with an aid food picture model and under parents' supervision at home. This could improve the dietary data collection compared to e.g., 24-hour recall. The food diary method has the advantage of real-time collecting a lot of information obtained in days so that the respondent's food consumption data is more detailed, easy to apply to various groups with various eating habits, and can be used to estimate the average intake in certain populations [27]. Possibly under or over-reporting bias might be found due to the children's capability in converting the portion size of foods they consumed using the food picture model. However, the parents' supervision in our study is expected to reduce this bias.

## 5 Conclusion

There was a relationship between the education level of the mother and the adequacy of protein intake in elementary children aged 8-12 years in Surakarta. Mothers with low education tend to have 1.2 times higher risk of protein deficiency in their children compared to those with high education.

**Authors' Contributions.** SR leded the FIKI Study and involved in the data interpretation and wrote this manuscript; AK, DNK, UMS, AMN, and NDA performed the dietary analysis; JØ reviewed and provided feedback to the manuscript.

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**Conflict of Interest.** The authors have no conflicts of interest to declare.

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