

Nutrition Education on Vegetables, Fruit and Fish for Elementary School Children

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ABSTRACT

This study aims to determine the effect of balanced nutrition education interventions relating to vegetables, fruits, and fish in increasing respondents' knowledge, attitudes, and practices. The lecture and video methods were used to convey information on nutrition education interventions. This research used a pre-experimental design involving 160 grade five students in eight public elementary schools in Bogor Regency. There were two treatment groups, namely the lecture method group and the video method group. Nutrition education interventions were carried out three times with the topic of balanced nutrition, the benefits of consuming vegetables, fruit and fish, and the vitamins and minerals contained in vegetables, fruit and fish. Data collection was carried out before and after the intervention using a questionnaire, food recall, and anthropometric measurements. Data analysis was carried out using the Wilcoxon test and Mann Whitney test. The results showed that nutrition education interventions using lectures and videos had an effect ($p < 0.05$) on increasing good knowledge (58.5% and 38.5%), attitudes (78% and 71.8%), and practices (30.5% and 26.9%). There was also an increase in vegetable consumption in the lecture and video groups after the intervention (137.69 g and 137 g). There were respondents who were still in the severe thinness and thinness category; however, rates of overweight and obesity were higher. The results of this study showed a slight difference between the lecture and video methods, but the results of the difference in the median score of knowledge, and the consumption of vegetables, fruit and fish indicated that the lecture method intervention is better than the video method. However, the slight difference between the lecture and video method was not significant, except for the post-test knowledge score ($p = 0.017$). Other outcomes (attitudes, practices, consumption of vegetables, fruit, and fish) were not significantly different ($p > 0.05$).

Keywords: attitude, knowledge, nutritional status, practice

INTRODUCTION

Unbalanced consumption patterns remain a nutritional issue that could influence the rise in the prevalence of undernutrition and overnutrition in Indonesia. This is especially true for the 5–12 year age group who are of school age and need nutritious food intake for growth and development, as well as also needing to sustain their daily food consumption. National statistics show that the behavior of eating risky foods in people >10 years of age such as consuming over-seasoned food is 77.3%, followed by sweet foods and beverages at 53.1%, and fatty foods at 40.7%. Likewise, the behavior of consuming less fruit and vegetables in Indonesian society was 93.5% (MoH RI 2013), which further increased to 95.5%

in 2018 (MoH RI 2018). The Ministry of Marine Affairs and Fisheries (MoMAF 2018) released data on the five provinces with the lowest fish consumption in Indonesia, one of which was West Java province with a fish consumption level of just 31 kg/cap/year, which is still a long way from the consumption target of 46 kg/cap/year. Lack of fruit and vegetable intake and high consumption of sweet and savory foods can render children overweight and obese, as can be seen from the high prevalence of obesity in the 5–12 years age group at 18.8% (MoH RI 2013).

Chaudhary *et al.* 2020 presents the results of a review which shows that school-based interventions in general are able to influence attitudes, knowledge, behavior and anthropometry. Schools are the main target of

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nutrition education because students, parents, and teachers all play an important role in the development of children at school, which encompasses academic, health and social life aspects. Most parents and children nowadays choose instant foods that tend to be cheaper and can be cooked in a short amount of time, such as fried food, fast food, frozen food, and sweet drinks which are all very easy to obtain, always available and affordable for students. The above are the reasons that become their consideration when choosing food to be consumed. According to Contento (2016), the food selection process involves six categories, i.e., taste, habits, health, diet, rules, and filling foods. If the food tastes good and is always available and easy to obtain, it creates a habit for the children to continuously consume it.

Most of the implementation of student nutrition education interventions show a significant increase in nutrition knowledge before and after the intervention (Pittman *et al.* 2018). However, they have not been routinely implemented in schools and does not necessarily change the students' eating habits in consuming healthy foods such as vegetables, fruits and fish. These types of food are rarely consumed by children at every meal and are not consumed according to the recommended portions. The results of our preliminary study found that there was a lack of teachers and also no guidelines for teaching nutrition in schools, so health education, including nutrition, was usually explained by health workers from the *Puskesmas* (Community Health Centre). The results of our initial study also included four methods of nutrition education that were preferred by the respondents, namely through cooking, videos, games, and lectures. We chose two methods that were possible to implement in schools, namely the video and lecture methods.

This research provides modules on balanced nutrition education, vegetables, fruits, and fish. The contents of the module were outlined in the form of delivering information using the lecture and video methods. They were tested on 5th grade elementary school students to see if there were changes in the knowledge, attitudes, and practices of their consuming habits of balanced nutrition, especially vegetables, fruit, and fish.

METHODS

Design, location, and time

The design of the research was pre-experimental. The purposive sampling technique was used for location selection, resulting in the selection of eight public elementary schools in Bogor Regency, West Java. The research was conducted between February and June 2019.

Sampling

Eight schools were selected to participate in this study. The schools were randomly divided into two groups, i.e., lecture and video groups, with at least 20 students from each school. The sample of students were then randomly selected and drawn based on their order number in the attendance book. The inclusion criteria applied were fifth grade elementary school students, physically and mentally healthy, willing to be research subjects by signing an informed consent and informed assent, and able to attend five meetings during research activities (once during the pretest, three times during the nutrition education intervention, once during the posttest). Respondents who cannot cooperate or were absent, were allergic to the consumption of vegetables, fruits, and fish, will be excluded from the study.

Ethical clearance for this study was approved by the Health Research Ethics Committee, Faculty of Medicine, Pembangunan Nasional Jakarta University in the form of ethical approval No. B/1708/2/2019/KEPK.

The intervention

Our initial research conducted on November to December 2018 on 433 elementary school students showed that the knowledge scores were below 60 for 95.4% of the students and still poor on average vegetable consumption (47.11 g), fruit (18.84 g) and fish (23.09 g).

In this study, four schools used the lecture method while four schools used the video method. There were three topics in the nutrition education for the respondents: 1) Balanced nutrition (consisting of pictures, icons and slogans of balanced nutrition, pillars of balanced nutrition, messages of balanced nutrition, as well as examples of balanced nutrition for elementary school children aged 9 and 10 years old); 2) Benefits and impacts of vegetable, fruit and

fish intake; 3) Vegetables, fruit, and fish contain vitamins and minerals.

Nutrition education lessons were based on balanced nutrition guidelines from nutrition teaching materials for elementary school children from the Southeast Asian Ministers of Education Organization Regional Center for Food and Nutrition, and Ministry of Education and Culture (SEAMEO RECFON & MoEC 2016). Pre-test data (corresponding characteristics, availability of food, nutritional status, knowledge, attitudes, practices, and food recall) were collected one week prior to the first intervention. Nutrition education interventions were conducted three times, at one intervention each week. A week after the last intervention, a post-test was carried out using the same pre-test questionnaire.

Data collection

The findings of this study are part of a dissertation on nutrition education for elementary school children. The characteristics of the respondents include age, gender, eating patterns, availability of vegetables, fruit and fish at home, nutritional status, knowledge, attitudes, and practices. Nutritional status was obtained by calculating the student's weight and height using a digital scale and microtoise. The knowledge, attitude, and practice data of students were collected through questionnaires that were checked for validity and reliability. From the result of the validity test, only 15 out of 30 questions of knowledge were valid, whereas 15 items of attitudes were considered valid, and only 16 out of 20 questions were valid for the practice items. The reliability test shows a Cronbach alpha

value ≥ 0.60 for each item. Data on vegetable, fruit and fish intake were obtained using a 24-hour food recall. In this study, data was collected twice: before and after the intervention.

Data analysis

The nutritional status of the students was calculated using BMI-for-agez-score. Classification includes severe thinness if the z-score < -3.0 SD, thinness ≥ 3.0 to -2 SD, normal ≥ 2.0 to ≤ 1.0 SD, overweight > 1.0 to ≤ 2.0 SD, and obesity > 2.0 SD. Knowledge, attitude, and practices were divided into three categories: good ($> 80\%$), fair (60–80%), and poor ($< 60\%$). Nutritional status data was processed by the WHO Anthroplus application. The data were analyzed using univariate and bivariate analysis. Univariate analysis was used to analyze the distribution of the characteristics of respondents: age, gender, availability of food, knowledge, attitudes, practices, nutritional status, and consumption of vegetables, fruit, and fish. The differences in the median scores of knowledge, attitudes, practices and consumption of vegetables, fruit, and fish before and after the intervention were analyzed using the Wilcoxon test and the Mann Whitney test. Data was processed using IBM SPSS version 25.

RESULTS AND DISCUSSION

Figure 1 is the flow chart of the sampling diagram in this study. The selection of schools that were implemented with lecture and video interventions were drawn at random. Four intervention schools were chosen to use the

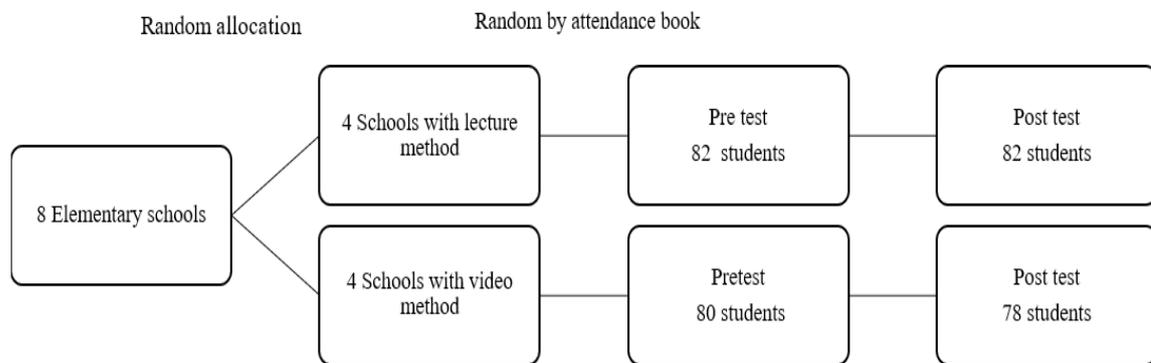


Figure 1. Sampling diagram

teaching/lecture method, while four other were chosen to use the video method. At least 20 students were selected from each school and drawn randomly using their order numbers in the attendance book, with 82 pre-and post-test students using the lecture method, and 78 students using the video method. Two students were excluded because they were not present during the research activity.

Nutrition education and student characteristics

Table 1 shows that there were still issues with the availability of vegetables, fruit, and fish at home, as well as the dietary habits of children that skipped meals and replaced them with snacks. Vegetables, fruits, and fish were rarely available at home. This can be caused by the habit of children who rarely consume vegetables during every meal and instead only eat rice and protein, such as eggs or fried chicken. The reason the children did not want to eat vegetables was because they taste bitter, had an unappealing appearance and had a bad smell. They did not eat fruit because it was expensive, and did not eat fish because it smells fishy and has many bones (Sofianita *et al.* 2019).

Table 1 showed that most children rarely brought food and drink lunch boxes from home. This gives children the opportunity to spend their pocket money to buy snacks at school, which is usually in the form of savory foods and sweet drinks. Lack of nutritional intake and frequent eating and drinking of sweet foods causes undernutrition and overnutrition in school children.

School is the right place for the implementation of nutrition education, because it is where students, parents, and teachers meet and gather. Elementary school students still need assistance from parents and teachers for the provision of food and information on nutritious food.

Nutrition interventions may be more effective in helping children to make healthy food choices if developmental limitations on children's ability to categorize foods are addressed in their learning curriculum (Nicholson *et al.* 2018). This is also discussed in the study of Seshadri *et al.* (2018), who argue that healthy food choices and the importance of having a nutritious and balanced diet should be introduced into the curriculum to increase children's awareness

of the importance of consuming healthy and nutritious foods. According to a study conducted by DaSilva *et al.* (2018), nutrition education can stimulate the development of healthier eating habits and acceptance of food. However, obstacles are often encountered, such as lack of time, working conditions and subject training, as well as the low understanding and awareness of nutrition education in the curriculum and school community. The results of a study by Schmitt *et al.* (2019) describe that intervention participation was marginally correlated with food preferences at post-test and significantly related to the nutrition and health survey. Results from analyses revealed that when controlling for the pre-test nutrition and health survey score, age, gender, ethnicity and parents' education, children in the intervention condition demonstrated significantly higher scores on the nutrition and health survey compared to children in the control condition ($\beta=0.47$; $p=0.001$). Similarly, results suggested that when controlling for the pre-test fruit and vegetable preferences, age, gender, ethnicity and parents' education, children who received the intervention showed greater preferences for fruits and vegetables at post-test than children who did not receive the intervention ($\beta=0.19$; $p=0.003$). Elementary school teachers in Indonesia are still adapting to the 2013 curriculum which is integrated thematically, resulting in their being busy fulfilling the competencies that must be achieved by students and not having enough time to provide nutrition education in schools.

Nutritional status of children

The results showed that the prevalence of overweight and obesity was higher than severe thinness and thinness. This is similar to research conducted by Farsi *et al.* (2016) which found a high prevalence of obesity in elementary school boys and girls (18% obese and 18% overweight). Excess nutrition in children occurs due to various factors. Environmental factors, style preferences, and cultural environment play an important role in increasing the prevalence of obesity. Excess sugar intake, increasing portion sizes, and decreasing continuous physical activity plays a major role in increasing obesity prevalence worldwide (Sahoo *et al.* 2015). Obesity in childhood can severely affect children's physical, social and emotional health and self-esteem which may lead to poor academic achievement and lower quality of life.

Table 1. Distribution of student characteristics

Respondent characteristics	Lecture group (n=82)		Video group (n=78)	
	n	%	n	%
Gender				
Male	33	40.2	24	30.8
Female	49	59.8	54	69.2
Age				
10	25	30.5	28	35.9
11	55	67.1	44	56.4
12	2	2.4	6	7.7
Availability of vegetables				
Available	31	37.8	31	39.7
Rarely	48	58.8	45	57.7
Not available	3	3.7	2	2.6
Availability of fruit				
Available	26	31.7	27	34.6
Rarely	49	59.8	48	61.5
Not available	7	8.5	3	3.8
Availability of fish				
Available	23	28	23	29.5
Rarely	55	67.1	50	64.1
Not available	4	4.9	5	6.4
Breakfast habits				
Everyday	51	62.2	50	64.1
Rarely	20	24.4	25	32.1
Never	11	13.4	3	3.8
Lunch habits				
Everyday	68	82.9	60	76.9
Rarely	14	17.1	14	17.9
Never	0	0	4	5.1
Dinner habits				
Everyday	47	57.3	40	51.3
Rarely	28	34.1	29	37.2
Never	7	8.5	9	11.5
Excuses for skipping meals				
Lazy to eat	20	24.4	16	20.5
Not appetizing	27	32.9	25	32.1
Not available	4	4.9	3	3.8
No time to eat	9	11	6	7.7
Eat less	1	1.2	5	6.4
Studying or playing	21	25.6	23	29.5
The reason for not eating vegetables				
Tastes bad	25	35.2	25	34.7
Not available	35	49.3	38	52.8
Expensive	3	4.2	2	2.8
Not healthy	1	1.4	2	2.8
Vegetables are not filling	7	9.9	5	6.9
The reason for not eating fruits				
Tastes bad	10	14.1	7	10.1
Not available	45	63.4	46	66.7
Expensive	4	5.6	11	15.9
Not healthy	2	2.8	-	5.8
Fruits are not filling	10	14.1	5	7.2
The reason for not eating fish				
Taste bad	13	16.7	15	20.3
Not available	40	51.3	40	54.1
Expensive	1	1.3	2	2.7
Smells fishy	3	3.8	1	1.4
Lots of bones	21	26.9	16	21.6
Packed meals				
Yes	24	29.3	19	24.4
No	58	70.7	59	75.6
Nutritional status				
Severe thinness	1	1.2	0	0
Thinness	3	3.7	9	11.5
Normal	61	74.4	50	64.1
Overweight	8	9.8	13	16.7
Obesity	9	11	6	7.7

Knowledge, attitude, and practice

In this study, information on nutrition was given through lectures and videos because they could be easily applied in schools. The lecture method is still used by teachers to teach conventionally and the method of using video is a method that has begun to be utilized for learning in schools. It is hoped that the video method can slightly replace the teacher's duty in terms of not having enough time to provide nutrition education to students. Table 2 indicates the distribution of respondents' knowledge, attitudes, and practices before and after the intervention. There are three categories of knowledge, attitude, and practice, i.e., poor, fair, and good. The results showed that there was an increase in the knowledge, attitudes, and practices of the respondents after the intervention. The proportion of respondents with good knowledge, attitude and practice in the lecture group increased after intervention to 58.5%, 78%, and 30.5%, respectively. Similarly, the video groups also increased to 38.5%, 71.8% and 26.9%. The findings of this study suggest that the use of both methods (lectures and videos) does enhance students' knowledge, attitudes and practices at school. This is in line with research on snack food conducted by Briawan (2016), which showed an increase in the proportion of children with good knowledge level by 16.2% after education. The average score of snack knowledge increased by 6 points after the intervention, from a score of 75 to 81. Similarly, the results of research on the development of nutrition education media based on android and

websites by Perdana *et al.* (2017) showed that after the education program, good knowledge, positive attitudes, and good practice on balanced nutrition increased by 11.8%, 5.5% and 15.9%, respectively.

Table 3 shows the effect of nutrition education on children's knowledge, attitudes, and practices ($p < 0.05$) before and after on both intervention groups. The results of statistical analysis showed that between the lecture and the video groups, there was a significant difference in the median score of knowledge, with better results in the lecture group ($p = 0.017$). This proves that the provision of nutrition education through lectures is more effective in increasing children's knowledge compared to those who were only shown videos. This may be because this method still has face-to-face interactions between those who provide information (communicators/sources) and those who receive information (communicants). The results of this study are in line with the research by Wahyuningsih *et al.* (2015) regarding the provision of nutrition education using the media of nutrition cards to increase knowledge on snack foods for school children ($p < 0.05$). Likewise, the study conducted by Hamida *et al.* (2012) regarding the use of comics show that those who were given the comics had a better knowledge increase compared to the groups who were not. These studies show that the subjects balanced nutritional knowledge increased after being given nutrition education interventions (Yurni & Sinaga 2017).

Table 2. Distribution of subjects based on knowledge, attitude, and practices before and after nutrition education interventions

Nutrition education method	Pre-test			Post-test		
	Poor	Fair	Good	Poor	Fair	Good
Lecture method						
Knowledge	26.8	54.9	18.3	-	41.5	58.5
Attitude	8.5	40.2	51.2	-	22	78
Practice	59.8	25.6	14.6	15.9	53.7	30.5
Video method						
Knowledge	19.2	71.8	9	-	61.5	38.5
Attitude	12.8	35.9	51.3	-	28.2	71.8
Practice	55.1	30.8	14.1	16.7	56.4	26.9

Table 3. Changes in students' knowledge, attitudes, and practices scores before and after the intervention in the lecture and video groups

Variable	Lecture			Video			p
	Min	Max	Median	Min	Max	Median	
Knowledge							
Pre-test	40	86.67	66.6	33.33	93.33	66.6	0.602 ^b
Post-test	60	93.33	80	60	93.33	73.3	0.017 ^b
Δ Score	-6.67	40	6.67	-6.67	33.3	6.67	0.566 ^b
		p=0.000 ^a			p=0.000 ^a		
Attitude							
Pre-test	20	100	80	40	100	80	0.825 ^b
Post-test	60	100	80	60	100	80	0.989 ^b
Δ Score	0	60	0	0	53.33	0	0.896 ^b
		p=0.000 ^a			p=0.000 ^a		
Practice							
Pre-test	12.5	100	56.25	0	100	56.25	0.716 ^b
Post-test	31.25	100	68.75	37.5	100	68.75	0.917 ^b
Δ Score	0	68.75	12.5	-25	62.50	12.5	0.816 ^b
		p=0.000 ^a			p=0.000 ^a		

a: Wilcoxon test; b: Mann whitney test

Consumption of vegetables, fruit, and fish

There are several reasons why children do not eat vegetables, fruits, and fish. Other than being unavailable, children think that vegetables do not taste good because of their bitter taste so they rarely eat vegetables. Another obstacle to providing vegetables and fruit, especially at schools, is the lack of storage facilities (Wijesinha-bettoni *et al.* 2013). It is important to consume vegetables every day because they contain the fiber, vitamins, and minerals that the body needs. School children today are more likely to eat only rice and chicken/meat without vegetables. Children who prefer to eat meat and not eat vegetables from an early age will be at risk of obesity (Tani *et al.* 2018). Most of the children like fruit, but due to some fruits being expensive they can only buy fruits that are in season. High and unaffordable prices are one of the factors that cause parents to not buy and provide fruit at home. Low consumption of fruit and vegetables happens worldwide and is associated with low affordability (Miller *et al.* 2016). Therefore, policies are needed to increase the affordability of fruit and vegetables. In addition, most children

do not eat fish because it has many bones, making it difficult to eat. It is important for early nutrition education to introduce and encourage the consumption of vegetables, fruit and fish to children so that eating habits are formed in preschool and school age children (Łuszczki *et al.* 2019).

Table 4 shows that the changes in the amount of vegetables, fruit, and fish consumed before and after nutrition education was not significantly different in the lecture and video groups. However, there was an effect of nutrition education on the increase of vegetable consumption in both groups ($p=0.000$) and ($p=0.026$). Changing the eating behavior of children takes time and effort, because besides providing nutritional education, the most important thing is the availability of nutritionally balanced healthy food. Vegetables, fruit and fish that are rarely available at home and at school can also affect a child's eating habits. The time and duration of the nutrition education in this study were only conducted three times in three weeks and was not sufficient to change their habits to increase the consumption of fruit and fish.

Table 4. Changes in the amount of vegetable, fruit, and fish (g) consumed before and after intervention

Variable	Lecture			Video			p
	Min	Max	Median	Min	Max	Median	
Knowledge							
Pre-test	30	155	50	30	150	57.50	0.956 ^b
Post-test	45	300	100	60	500	100	0.497 ^b
Δ Score	-55	250	50	-50	150	35	0.193 ^b
	p=0.000 ^a			p=0.026 ^a			
Attitude							
Pre-test	20	120	90	20	160	80	0.530 ^b
Post-test	50	455	147.5	50	800	97	0.247 ^b
Δ Score	90	120	90	-75	140	54	0.152 ^b
	p=0.102 ^a			p=0.141 ^a			
Practice							
Pre-test	50	150	55	50	150	50	0.240 ^b
Post-test	20	150	75	15	225	70	0.435 ^b
Δ Score	-130	100	0	-50	25	12.5	0.973 ^b
	p=0.825 ^a			p=0.916 ^a			

a: Wilcoxon test; b: Mann whitney test

CONCLUSION

Based on the results of the study, there was a slight difference between the lecture and video methods, but the results of the difference in the median score of knowledge and consumption of vegetables, fruit and fish indicate that the lecture method intervention is better than the video method. However, the slight difference between the lecture and video methods was not significant, except for the post-test knowledge score ($p=0.017$). Other outcomes (attitude, practices, consumption of vegetables, fruit, and fish) were also not significantly different ($p>0.05$).

It is suggested that schools should carry out nutrition education on a regular basis through counseling, cooking demonstrations, and eating healthy food together in order to form nutritionally balanced eating habits that support the nutritional status and health of school children.

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AUTHOR DISCLOSURES

We have no conflict of interest to declare.

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