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The Provision of Carrot Catfish Dumplings Affects the Weight of Elementary School Students with Low Nutritional Status

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Abstract

BACKGROUND: A good nutritional status will improve health for average growth and physical development, and intelligence. The prevalence of schoolchildren (5–12 years) with malnutrition status based on brachial fat area is 11.2%, and the number of elementary schoolchildren with malnutrition status in Cibereum village is 107 students. The government has a School Child Supplement Program to meet schoolchildren's dietary needs. It is necessary to have additional food for schoolchildren to improve their nutritional status, especially for students with low nutritional quality.

AIM: The purpose of this study was to determine the effect of carrot catfish dumplings on the bodyweight of elementary school students with poor nutritional status as a form of supplementary food for schoolchildren.

METHODS: Researchers conducted this study in January 2020 at Elementary Schools at the Cibereum Health Center (SDN Cibeureum 5, Cibeureum 7, and Cibereum Mandiri 2) with a sample of 25 people. The research design used is quasi-experimental using one-group pretest-posttest and statistical tests using the Wilcoxon test.

RESULTS: The research test results showed that carrot catfish dumplings affected elementary school students' body weight with low nutritional status.

CONCLUSION: Carrot catfish dumplings can increase students' energy intake and protein intake so that there is an increase in the average body weight of the sample by 0.55 kg. Suggestions for further research to conduct a similar study using a control group as the comparison group.

Introduction

A good nutritional status will improve individual and community health. Good nutritional status is essential for average growth and physical development, and intelligence for infants, children, adolescents, and age groups [1]. The prevalence of schoolchildren (5–12 years) with malnutrition status based on brachial fat area (BFA) is 11.2% [2]. The number of elementary schoolchildren with malnutrition status in Cibereum village is 107 students [3].

Based on research conducted by Rosita *et al*. in 2014 concerning the relationship between Nutritional Status and Student Achievement at the State Elementary School 01 Guguk Malintang, Padangpanjang City, there is a significant relationship between nutritional status and student achievement with p = 0.02 [4].

According to UNICEF, malnutrition occurs due to comorbidities and inadequate food intake [5]. Many things influence food intake, including refusing to eat, asking for specific food types, eating only a little due to certain factors, namely, diet, eating habits, appetite, family, social trends, mass media, peers, and the influence of drugs [6]. Children's growth and development will be good if their nutritional intake quality and quantity are promising [6].

The government has a schoolchildren's supplementary food program to meet schoolchildren's nutritional needs by providing additional food. The nutritional content of supplemental nutrition for schoolchildren must contain a minimum of 300 calories of energy and 5 g [6].

Therefore, it is necessary to provide additional food for schoolchildren (PMTAS) to help meet schoolchildren's nutritional needs. The results of the 2013 Tanziha research at SDN Pesanggrahan 2, Pesanggrahan Village, Tegalwaru District, Purwakarta Regency showed a significant effect of supplementary feeding for schoolchildren on changes in nutritional status of schoolchildren (BMI/U) from the proportion of normal dietary status 52.5–92.1% (p < 0.005) [7].

The research conducted by Septi Nora in 2018 stated that there was an effect of providing schoolchildren with additional food on the nutritional

status and learning achievement of elementary school students in Solok. Students being given an intervention 30 times by providing supplementary food containing an average nutritional value of 335 kcal of energy and 9.6 g of protein. After the intervention, there was an increase in normal nutritional status from 74.7% to 84.3% there was a decrease in moderately wasted cases from 21.4% to 14.3% and severely wasted cases from 2.9% to 1.4%. There is an increase in learning achievement from 76.0 to 77.0. Based on the results of statistical tests, there are differences in the nutritional status of schoolchildren after giving additional food with the acquisition of $p < 0.0001$. There was a difference in learning achievement after giving additional food to schoolchildren with the acquisition of $p = 0.001$ [8].

One of the favorite forms of supplementary food for schoolchildren is dumplings. The dumplings that we often find in hawker places or other places still do not have many choices in the value of the variety of flavors or the diversity of the raw materials used. Syifa's research (2019) developed local products as a variety of dumplings, namely, carrot catfish dumplings, as an alternative food high in protein, fiber, and Vitamin A for schoolchildren 123.7 kcal of energy and 4.8 g of protein [9].

Based on the explanation above, this underlies the need for additional food interventions for schoolchildren with malnutrition to improve schoolchildren's nutritional quality. Thus, researchers are interested in conducting research that aims to determine the effect of giving carrot catfish dumplings on the weight gain of schoolchildren under nutritional status in one of the working areas of the Public Health Center in Cibereum Village, Cimahi City.

Methods

The research design used was quasi-experiment using one-group pretest-posttest. This study aims to determine the effect of the intervention of additional feeding in the form of carrot catfish dumplings on body weight. This study design compared body weight before and after the intervention – body weight as the dependent variable and the provision of carrot catfish dumplings as the independent variable. The study involved three elementary schools (Cibereum 5, Cibereum 7, and Cibereum Mandiri 2 Elementary Schools) in the Cibereum Public Health Center's working area South Cimahi District, Cimahi City. The selection of primary schools used purposive based on elementary students with poor nutritional status.

This study's sample population was elementary school students in the Cibereum Puskesmas working area who have a malnutrition status category. The formula calculates the sample size:

$$n = [\frac{Z\alpha + Z\beta.Sd}{d^2}]^2$$

*$Z\alpha$=1.96

$Z\beta$=0.84

Sd=0.9

d2=0.52

Based on these calculations, the minimum number of samples required is 24 people, with the anticipation of the possibility of a sample dropping out of three people (10% of the sample). Sampling using purposive sampling. The criteria determined are elementary school students Grade 1–Grade 5 who are active as elementary school students in the working area of the Cibereum Health Center (SDN Cibereum 5, Cibereum 7, and Cibereum Mandiri 2). In addition, samples must have a Z score BFA - 3SD to <−2SD and have homeroom and parent permission to attend the entire course and not have a fish allergy. In comparison, the exclusion criteria were not willing to be involved in the study. The dropout criteria in this study were students who did not follow the research process as a whole because they were unable to attend and were seriously ill at the time of the survey.

The Ethical Committee has approved this study with the number: 10/KEPK/PE/I/2020.

Catfish dumplings were given to the research sample once a day within 2 weeks of effective school days (12 days). Researchers gave one serving of carrot catfish dumplings containing five dumplings (112.5 g) with an energy content of 309.25 kcal (26.2% of the sample-based daily energy adequacy) on the average recommended dietary allowance (RDA) for children 7–12 years) and 12 g of protein (17.41% of the daily protein adequacy of the sample based on the average RDA for children aged 7–12 years).

The data collected are in the form of secondary data and primary data. Secondary data include sample characteristics, including name, gender, and age. Meanwhile, preliminary data consist of a history of fish allergy samples based on interviews, student food intake based on 1 × 24 h food recall interviews (twice before the intervention and twice during the intervention), and anthropometric data (body weight before and height) obtained from direct measurement results. The researcher measured the sample's weight before and after the intervention (intervention carried out for 12 days). The results of research by Ratnayani *et al*. (2010) that there was an increase in body weight of 0.86 in food products with a mixture of catfish (300 kcal 10 g of protein) given for 3 months with a total of 36 times in 3 months (12×/month) [10]. Measurements using a digital scale with an accuracy of 0.1 kg.

Data processing carried out using NutriSurvey and SPSS Statistic 20 applications. Sample characteristic data presented in the form of a frequency distribution table then analyzed descriptively.

Before and after the intervention, the weight measurement results analyzed using the normality test with the Shapiro–Wilk test. The bivariate test carried out using the Wilcoxon test because the distribution of weight variable data was not normally distributed ($p \leq 0.005$).

Results

The sample in this study was 25 elementary school students with malnutrition status in the Cibereum Health Center working area.

Table 1 shows that the youngest sample age is 7 years. The oldest age is 11 years. The age in the study sample ranged from 7 to 11 years and this is because the model is at Grade 1–Grade 5 primary school level so that the age distribution varies. Most of the sample is male with 14 people, and for the female gender, there are 11 people.

Table 1: Frequency distribution of sample characteristics

Characteristics	n	%
Gender		
Man	14	56.0
Women	11	44.0
Age		
7 years	2	8.0
8 years	7	28.0
9 years	5	20.0
10 years	4	16.0
11 years old	5	28.0
Total	25	100.0

Based on the 1999 Ministry of Health, the level of energy and protein adequacy categorized as severe deficit (<60% RDA), moderate deficit (60–69% RDA), mild deficit (70–79% RDA), good (80–120% RDA), and more (≥120% RDA) [11].

Based on Table 2, before the intervention, no samples had a good level of energy intake. The level of adequacy of energy intake during the severe deficit intervention decreased to 40.0% from 72.0%, and the level of good energy intake increased from 0% to 7%. Likewise, at the level of adequacy of protein intake, there was a decrease in protein intake with a severe deficit from 48.0% to 16.0%. There is an increase in the adequacy of good protein intake to 44.0% from 12.0%.

Table 2: Levels of energy intake and protein intake

Variable	Before the intervention		During the intervention	
	n	%	n	%
Energy intake				
Severe deficit	18	72.0	10	40.0
Moderate deficit	6	24.0	4	16.0
Mild deficit	1	4.0	4	16.0
Good	0	0.0	7	28.0
Protein intake				
Severe deficit	12	48.0	4	16.0
Moderate deficit	7	28.0	2	8.0
Mild deficit	3	12.0	4	16.0
Good	3	12.0	11	44.0
More	0	0.0	4	16.0
Total	25	100.0	25	100.0

Based on Table 3, the contribution of energy and protein for carrot catfish dumpling in one serving to students' nutritional adequacy is 17.41%.

Table 3: Average energy intake and average protein intake and contribution of carrot catfish Siomay on protein-energy adequacy and total intake

Variable	Energy (kcal)	Protein (g)
Average adequacy of students a day	1776.00	45.8
Average total student intake the day before the intervention	1002.25	30.37
Mean total daily intake of students at the time of intervention	1372.23	43.85
Intake of carrot catfish dumplings intervention	309.25	11.00
Contribution of carrot catfish dumplings to nutritional adequacy (%)	17.41	24.02
Contribution of carrot catfish dumplings to total intake (%)	22.54	25.09

The gift of energy and protein of carrot catfish dumplings to the students' daily total consumption was 22.54% and 25.09%, respectively.

Table 4 shows an increase in the average intake of energy and protein, with the difference in energy intake before and after the intervention is 369.98 kcal. The difference in protein intake before and after is 13.48 g.

Table 4: The difference in average protein-energy intake and average body weight

Variable	Mean	SD
Energy intake		
Before the intervention	1002.25	255.91
During the intervention	1372.23	272.19
Protein intake		
Before the intervention	30.37	8.08
During the intervention	44.33	8.91
Weight		
Before the intervention	22.86	3.66
After the intervention	23.41	3.81

Before the intervention, the mean body weight was 22.86 kg, and the mean body weight after the intervention was 23.41 kg. Therefore, based on the average body weight, it can be seen that there is an increase in body weight of 0.55 kg.

The research sample consisted of 25 people, so the normality test used was the Shapiro–Wilk. Based on Table 5, the results of the normality test for "Weight Before Intervention" obtained $p = 0.011$, and the normality test results for "Body Weight After Intervention" received $p = 0.021$, which means that the two distribution variables are not normal. The bivariate carried out on the bodyweight of the study sample was the Wilcoxon test.

Table 5: Data normality test

Weight	Normality test	p-value	Result
Before the intervention	Shapiro–Wilk	0.011	Abnormal
After the intervention		0.021	Abnormal

The statistical test used for bivariate analysis is the Wilcoxon test. The test results obtained are $p = 0.000$ ($p < 0.000$) so that the null hypothesis rejected and the alternative idea is accepted. This research's alternative theory is a relationship between

Table 6: Effect of intervention on weight gain

Weight	Bivariate test	p-value	Z	Negative ranks	Positive ranks	Ties
Before the intervention After intervention	Wilcoxon test	0.000	−4.296	0	24	1

carrot catfish dumplings and the sample's body weight.

Table 6 shows relationship of carrot catfish dumplings to body weight has a significant relationship with a positive effect. In addition, an increase in the nutritional intake of the sample compared to the nutritional information of the research sample before the intervention of giving catfish carrot dumplings supported these results.

Based on Figure 1, it shows that the number of research samples was 25 people and there was an increase in body weight before and after the intervention giving carrot catfish dumplings for 12 effective school days.

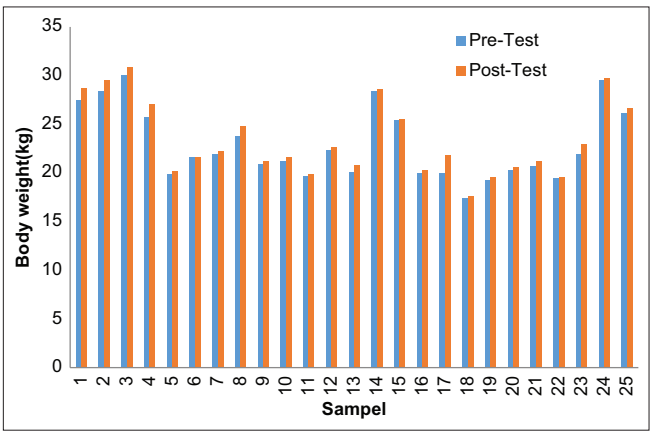

Figure 1: Increase in sample weight before and after the intervention

Discussion

Based on the sex of the research sample, the study consisted of 14 (56.0%) men and 11 (44.0%) women. The sample selection was not gendered specific. Based on Vita 's research, boys are more malnourished than girls [12]. It is the same as the research of Lubiz (2012) that the malnutrition status was 18 people (75.0%) while the malnutrition status was 6 people (25.0%) [13]. A person's nutritional status is a balance between intake and dietary needs. Basal metabolic rate (BMR) and physical activity, where BMR is closely related to lean body mass, are met with the body's inputs [14]. In this study, the most excellent malnutrition status was males because boys had higher physical activity and greater lean body mass than girls, which affected metabolism and caused insufficient nutrients, causing malnutrition. Based on Nurapriyanti research (p = 0.916), there is no relationship between gender and nutritional status and the same thing as Rahmi's research (2017) (p = 0.953) [15], [16]. The sample in this study is in the age range of 7–11 years, because the model used is Grade 1–Grade 5 elementary school students. According to Gunners and Gunarsa (2010), elementary school children are children aged 6-12 years, have physical abilities that are tougher, active and independent than adults. Many experts consider this period as a period of the calm or latent period. Where what happened in the past will continue for the future [17].

The research sample was 8.0% 7 years old, 28.0% 8 years old, 20.0% 9 years old, 16.0% 10-year-old respondents, and 28.0% 11-year-old sample. Based on these data, it shows that the research sample, which is elementary school students with the most nutritional status, is at the age of 8–9 years (48%), this is in line with the research Vita that 9-year-old children have many nutritional problems, including nutrition, poor nutrition, lack of food, and overnutrition [12]. Yunita and Tuti's research (2016) shows that the 6–9 years age group is the largest age group with malnutrition. Children aged 6–9 years have started to be affected by the outside environment and have activities outside the home. The incidence of malnutrition status at the age of 10–11 years (44%) is different from the results of Yunita and Suyanto study of Dian and Indah that the most underweight nutritional status is at the age of 10–13 years [18], [19]. Based on this theory, there is a transition period between 10 and 19 years, and there is an acceleration of growth [20]. Therefore, the sample is children aged 10–19 years. Weight gain in this age range is not significant. Nutritional status is directly affected by nutrient intake. Nutritional intake measured in this study is energy intake and protein intake. The sample's energy intake and protein intake were obtained based on the 1 × 24 h recall results, carried out twice before the intervention and twice during the intervention.

Growth, metabolism in the use of foodstuffs, and physical activity can occur due to energy intake. Lack of energy intake will cause malnutrition. The number of levels of sound energy intake in the sample before the intervention was 0%. It could be one of the causes of the lack of nutritional status in the model. It is in line with Yulni *et al.*'s (2013) 's research that there is a relationship between energy intake and schoolchildren's nutritional status [21]. Likewise, in Bertalina's (2013) study that there is a relationship between energy intake and nutritional status of school-aged children (6–12 years), the results of Qomariyah's (2018) study with p = 0.000, there is also a relationship between energy intake and nutritional status [24], [26]. AQ8

In addition to energy intake, measurement of protein intake in the sample is based on recall 1 × 24 h twice before the intervention and twice during the intervention. Based on the study results, the difference between the increase in the average energy intake before and during the intervention (403.77 kcal) and the

energy contribution of carrot catfish dumplings (309.25 kcal) is 94.52 kcal. Many factors outside the variables studied by researchers affect these results, such as increasing nutritional knowledge, appetite, and food security. Before the intervention, 48.0% of the sample had a protein intake deficit and 28.0% of the sample had a low protein intake. With deficit protein intake and models with insufficient protein intake at the intervention time, the percentage reduced to 16.0% and 8.0% [24].

The samples with moderate and reasonable protein intake before the intervention were 12.0% and 3.0%, respectively. When the intervention took place, there was an increase in the sample proportion of moderate protein intake and good protein intake by 16.0% and 44.0%, respectively. The increase in the proportion of samples with reasonable and good protein intake levels increased intake at intervention compared to pre-intervention protein intake. The difference in the average difference in protein intake before the intervention and at the time of intervention was 13.48 g. It is in line with Salawati and Nurjannah (2014) research with sample children with ARI with undernutrition and overnutrition. There is a significant difference between body weight before and after giving protein intake to Salawati and Nurjannah [25]. Sari's research (2018) shows a relationship between protein intake and elementary schoolchildren's nutritional status [26]. The discussion contains the meaning of the results and comparisons with the theory and similar research results.

The intervention was carrot catfish dumplings as additional food for schoolchildren (MTAS) with an energy content of 309.25 kcal and 11 g of protein. PMTAS by standards (minimum energy 300 kcal and minimum protein 5 g) predictably affect good food consumption to achieve goals, including increasing student body weight, rising student nutritional status, improving nutritional intake, and improving physical endurance [27].

Giving carrot catfish dumplings increase the hope of being able to gain weight for elementary school students. The sample's body weight measurement in this study used a digital scale measuring instrument with an accuracy of 0.1 kg. The intervention duration was given for 2 weeks of effective school days (12 days) with one portion of it each day. The researcher carried out the final weighing with the same conditions as the initial weighing. The weight measurement results showed an increase in body weight after the intervention of 24 people, and one person did not experience an increase or decrease in body weight. Research samples that do not experience weight gain, seen based on food intake after the intervention, still increased. Still, this weight loss was due to the study sample experiencing fever for 2 days, namely, at the 11th and 12th interventions and on a weighing day after the intervention. However, the model did not complain of severe illness and continued to participate in the study. There was no increase in body weight in one sample, which is in line with the theory that illness incidence can interfere with growth in the body [28]. Based on Tanziha's (2013) research, the inclusion criteria for the study of PMTAS were students who did not experience severe illness. Therefore, the research sample includes students with mild disease [12].

There was an increase in the average body weight after the intervention giving carrot catfish dumplings. Several factors can affect weight gain, including energy intake and protein intake. This study showed an increase in energy intake before the intervention (1002.25 kcal) on energy intake during the intervention (1372.23 kcal), which means that it has a difference of 369.98 kcal. In line with Yulni *et al*.'s (2013) [21] research, there is a relationship between schoolchildren's energy intake and nutritional status [23].

Bodyweight data tested using Wilcoxon test bivariate analysis because the data distribution was not normal. The test results obtained p = 0.000 so that Ho rejected and the alternative hypothesis is accepted. This research's alternative hypothesis is a relationship between carrot catfish dumplings and the sample's body weight. The relationship of giving carrot catfish dumplings to body weight has a significant relationship with a positive effect. It is in line with the research conducted by Syarfaini et al. (2016) that there is an effect of giving snakehead fish tempeh nuggets on the bodyweight of the case group with p = 0.000, which is more small from the alpha value. Based on Oktaviani's research (2016), the results of the weight difference test before and after giving PMT showed a significant difference (p = 0.003) [29], [30]. The results of this study are also in line with the results of research by IEP *et al*., Iskandar (2017), and Tanziha *et al*. The results of this study support a change in the nutritional status of the sample for the better after the intervention of giving additional food 42 times [6], [31], [32].

Based on Susilowati's research, there is a relationship between nutritional status before and after giving additional food. The results of Titi's research show that there are differences in the nutritional status of students before and after giving additional food while in the Kalibening subdistrict, with a sample of 340 students [33], [34].

Several factors affect weight gain, including energy intake consumed. Energy intake comes from consuming foods containing carbohydrates, proteins, and fats. Carbohydrates, proteins, and fats are macronutrients that act as energy sources in the body. When energy intake is by the needs, the malnourished students will gain weight so that their nutritional status will be good. It is in line with Qamariyah's and Nindya research that there is a relationship between energy intake and nutritional status [26].

These carrot catfish dumplings have a protein content of 11 g. Based on Hikmawati *et al*. research, catfish dumplings' protein content has a higher protein content than the usual dumplings [35]. The results of research by Ratnayani *et al*. (2009) showed that there was an increase in body weight of 0.86 in catfish mixed foodstuff products (300 kcal 10 g of protein) given for 3 months (August–October) with a total of 36 times in 3 months (12×/month) [36]. Protein functions for growth, making hormones and enzymes that are important for body metabolism. If the body is deficient in protein, it will cause the body to be susceptible to infection, which is one factor that hinders the intake from decreasing to cause weight loss. If it lasts long, it will decrease nutritional status and vice versa; if protein intake is by the needs, then weight growth is not disturbed, and nutritional status will be good [37].

Protein intake in the body will undergo a deaminase process, separating amino groups from amino acids, which causes nitrogen to be released, and acetyl Co-A formation occurs. Acetyl Co-A formed will undergo a process of fat breakdown or lipolysis so that it turns into triglycerides [38]. Based on this study's results, the average protein intake consumed by the sample at the time of the carrot catfish dumplings intervention increased by 13.44 g compared to before the intervention. According to Parinduri and Safitri research (2018), there is a relationship between protein intake and nutritional status [23]. In line with Atika's (2015) research, there is a relationship between protein intake and nutritional status [39].

Factors other than the influence of intake are genetics, psychological knowledge, hormones, diet, and culture [40], [41], [42]. Bodyweight is one indicator of determining the value of nutritional status. The nutritional status is also influenced by the knowledge related to the nutrition they have, based on Hartono's research (2016) that there is a relationship between knowledge and nutritional status [43]. In this study, before the intervention giving carrot catfish dumplings, the researchers conducted nutritional counseling on balanced nutrition and healthy snacks as an introduction before the intervention. It can affect the increase in the sample's nutritional knowledge, increasing knowledge, even the sample's attitude to eating better.

Conclusion

The research shows that carrot catfish dumplings can increase students' energy intake and protein intake so that there is an increase in the average body weight of the sample by 0.55 kg.

Suggestion

It is necessary to do further research on giving carrot catfish dumplings on body weight for a longer time. There is a control group as a comparison group to obtain maximum results.

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Author Query???
AQ8: Kindly review the sentence as it seems to be incomplete.