



Fermented soybean cake nugget (tempeh) as an alternative for increasing weight of little children aged 36–60 months[☆]

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ABSTRACT

Objective: This study aims to identify weight gain by giving fermented soybean cake nugget (tempeh) to underweight toddlers.

Methods: This study used a quasi-experiment design with non-equivalent pre test–post test control group design. The sample was taken by using purposive sampling method. The sample size of this study was 30 toddlers.

Results: Based the result of the intervention group the mean \pm SD was 846.67 \pm 333.524 while the control group had a value mean \pm SD 326.67 \pm 349.421 while p value is 0.001 < 0.05. If the p value is 0.05, there is a significant difference between the intervention group and the control group.

Conclusions: Fermented soybean cake nugget provide a good weight gain effect on toddlers, therefore consumption of fermented soybean cake nugget can be recommended and taught to the public. Therefore fermented soybean cake nugget can be given to help supplement food for toddlers.

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Introduction

The nutritional status in children is an indicator of the development level and potential future of the community. The nutritional status of infants and under-five children is the particular concern since the early of essential life for optimal growth and development.^{1,2} The lack of nutrition affects long-term physical growth and development and can cause the advanced disease or the end of stage of disease and disability in adult life. Moreover, the high prevalence of malnutrition jeopardizes the future of economic growth by reducing the intellectual and physical potential of whole population.^{3,4}

Nutrition in under-five children is affected by socio-economic factors and socio-cultural backgrounds related to dietary and nutrition. Inadequate nutrition in the first five years of life caused to irreversible disturbances in growth and physical, mental and brain development.^{5,6} The measure of success in fulfilling nutrition is nutritional status. The nutritional status of under-five children reflects the level of development and welfare of society in a country and is related to the health status of children in the future.^{2,7}

Generally, malnutrition refers to condition of less nutrition, bad nutrition and over nutrition. This condition is one of the causes of mortality and morbidity for under-five children in developing countries, with 54% or 10.8 million children death from

malnutrition.^{3,4,8} Malnutrition in under-five children has an impact on decreasing the immune system so that they are easy to infectious diseases. Infectious diseases such as diarrhea, pneumonia, malaria, measles and AIDS are known to cause the most deaths in under-five children with malnutrition.^{9,10}

Supplementary food provision (SFP) is an activity carried out to overcome malnutrition in under-five children group. Soybean is one of the alternative supplementary food in which has been analyzed the nutritional content of soybean. The nutrients analyzed by soybean are carbohydrates, protein, fat, vitamin C, and iron.^{11–13} The results of research on the protein contained in tempeh can stimulate thermogenesis which leads to an increase in body metabolism. In addition, tempeh has rich in prebiotics, which is a type of fiber that can help the growth of good bacteria in the digestive system, so that it can reduce digestive problems in your children. The content of dietary fiber and enzymes produced by yeast or *Rhizopus oligosporus* fungi after the fermentation process is believed to be very good for children's digestion.^{7,14,15}

Based on the result of study that conducted by Fadillah, Syarfaini and Rusmin (2014), it was shown that there was an increase in body weight after consuming soybean cake or tempeh nuggets in the amount given with provisions for 1–3 years age group, 4–5 years age group in the form of tempeh nuggets for one day. Given for 14 days with an average result of an increase in body weight of 0.20 kg, which means the same as the results of the study in 2016, it was found that the consumption of tempeh nuggets were effective against weight gain for under-five nutrition children in 2016.¹⁶

This research is also in line with Mariyam (2014) that from the results of research conducted on the effect of giving tempeh juice on malnutrition status in under-five children, there is an effect and an increase in toddler weight after giving tempeh juice on the

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Table 1
Respondent characteristics.

Variable	Intervention		Control	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Sex of under-five children				
Boys	11	36.7	10	33.3
Girls	4	13.3	5	16.7
Under-five children age (month)				
36–48	10	33.3	9	30
49–60	5	16.7	6	20
Family income				
Low	13	43.3	13	43.3
Middle	2	6.7	2	6.7
Total	15	100	15	100

Table 2
Effect of giving soybean nuggets on toddler body weight.

Variable		Total (N)	Mean ± SD	Mean rank	Z	p value
Increasing weight	Intervention	15	846.67 ± 333.524	21.00	-3.449	0.001
	Control	15	326.67 ± 349.421	10.00		

malnutrition status of KEP under-five children for one month. Giving tempeh juice to mild KEP under-five children increases their nutritional status.¹⁷ Giving tempeh juice also increases appetite, in the case group the average increase in energy intake before and after the study was 175.135 kcal, while in the control group the average increase in energy intake before and after the study was only 14.282 kcal.

Methods

This research is a quasi experiment with the design used namely the non-equivalent pre test–post test control group design. The population in this study were all under-five children with a malnutrition status with a total of 118 respondents. The samples in this study was some children aged 36–60 months who had a malnutrition status that met the sample criteria where the researchers used a purposive sampling technique, the total numbers of samples were 30 respondents. Where 30 samples will be divided into two groups, namely 15 groups who were given treatment and 15 groups as control. The research was conducted at Health Primary Service of Tamalate in March–June 2019.

Tempeh nuggets were made from grounded soybean, seasoned and covered with bread flour. In the form of nuggets, the nutritional content in soybean cake will be more easily absorbed by the body. Soybean cake (tempeh) nuggets are given for 4 weeks with an intake of 30 g per day. Measurement instruments used were observation sheets, scales using steelyard and health cards. The measurement results were then analyzed by using the Mann–Whitney test to determine whether there was a difference in the average among two sample groups after the intervention.

Result

This research was conducted for 3 months in Health Primary Service of Tamalate. The results obtained are distributed in Table 1.

Table 1 shows that under-five children as respondents were mostly girls, namely 11 (36.7%) in the intervention group and 10 under-five children (33.3%) in the control group. Meanwhile, based on age, the most under-five children aged 36–48 months were 10 respondents (33.3%) in the intervention group and 9 (30%) in the control group. Family income is mostly in the low economic group, namely each 13 families (43.3%).

This research in the intervention group the mean ± SD was 846.67 ± 333.524 while the control group had a value mean ± SD 326.67 ± 349.421 (Table 2). The mean rank of each group is at the treatment group of 21.00, was lower than the average value of the control group, which was 10.00. When converted to a Z value, the amount is -3.449 while p-value is 0.001 < 0.05. If the p-value is 0.05, there is a significant difference between the intervention group and the control group.

Discussion

After the research was conducted, it was shown that there was an increase in the weight of under-five children in the treatment group. The average weight gain of under-five children in the treatment group was 846.67 g. In the control group, there was also an increase in average body weight, but the increase was not so significant, namely 326.67 g. The weight gain in the treatment group was caused by the carbohydrate and protein content in the soybean cake (tempeh) nuggets consumed and also the content of vitamin A and zinc which increased the children's appetite.¹²

Children's appetite from consumption of tempeh nuggets is an alternative to increase body weight in malnourished under-five children.¹⁸ Besides that, tempeh has several advantages over soybeans, the advantages of tempeh include high protein complement, contains 8 essential amino acids, low levels of saturated fat and cholesterol, high vitamin B 12, is easy to digest because of its unique cell texture and contains antibiotics and has the effect of stimulating growth.^{19,20} The quantity and quality of nutrients can be used by individuals to improve nutritional status.

Increasing nutritional status through the indicator of body weight of under-five children is an increase in body weight from the previous body weight, which is due to the fulfillment of protein needs contained in tempeh nuggets. Body weight is one of the parameters that provide an overview of body mass. The growing mass is very sensitive to sudden changes. For example, because of infectious disease, decreased appetite or decreased amount of food consumed. Body weight is a very unstable anthropometric parameter. Body weight is a very unstable anthropometric parameter. Under normal circumstances, where the state of health is good and the balance between consumption and nutritional needs is guaranteed, body weight develops with age. One of the nutrients that play a role in improving the nutrition of under-five children in tempeh nuggets is protein.^{5,17}

Protein plays an essential role in transporting nutrients in the digestive tract through the walls of the digestive tract into the blood, from blood to tissues, and through cell membranes into cells. Lack of protein causes disturbances in absorption and transportation of nutrients.²¹ Protein metabolism begins after protein is broken down into amino acids, amino acids will enter the TCA cycle when needed as an energy source or when they are in excess amounts than needed for protein synthesis.^{17,22} In addition, energy is one of the products of carbohydrate, protein and fat metabolism. Energy functions as a power substance for metabolism, growth, temperature regulation and physical activity. Excess energy is stored in the form of glycogen as a short-term energy reserve and in the form of fat as a long-term reserve.^{9,16,23}

The results of this study are in line with Mariyam's research (2017) which showed that there is an increase in the weight of under-five children after consuming soybean cake or tempe nuggets for 1 day with an average result of an increase in body weight of 0.20 kg.¹⁷ In addition, this research is in line with Mariyam's research which conducted the research about the effect of giving tempe juice on the nutritional status of under-five children to increase the weight of three years old baby. The result showed that the provision of tempeh juice was effective in increasing the weight of under-five children who lack protein energy.¹⁰ Tempeh nuggets can be used as an alternative to additional or supplementary food to help to increase the nutritional status of under-five children. Besides it is cheap and easy to get, the processing of tempeh nugget is quite attractive for under-five children so that it will be easier to give as supplementary food.

Conclusion

Fermented soybean cake nugget (tempeh) provides a good weight gain effect on toddlers, therefore consumption of fermented soybean cake nugget can be recommended and taught to the public. Therefore fermented soybean cake nugget can be given to help supplement food for toddlers.

Conflicts of interest

The authors declare no conflict of interest.

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