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The Effect of Giving Gajaberry Cookies on Weight Changes in Undernutreted Toddlers in Sako Health Center District, Palembang

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Abstract

Under nutrition refers to a condition caused by inadequate intake of energy and protein in daily food, characterized by a body weight-for-age (BB/A) z-score of less than -2 standard deviations (SD). The purpose of this study was to assess the impact of Gajaberry cookies on weight changes in undernutreted toddlers within the area served by the Sako Health Center in Palembang. This study utilized a true-experiment design featuring a pretest-posttest control research framework. The statistical analyses conducted included both t-dependent and t-independent tests, which were examined using both univariate and bivariate methods. The results of the independent t-statistical test showed that the difference in mean body weight in the treatment group increased by 135 grams and in the control group it increased by 11 grams with a p-value = 0.000. From the research results, Giving gajaberry cookies has an effect on changes in the weight of malnourished toddlers and it can be recommended for mothers of toddlers to make gajaberry cookies with the basic ingredients of corkfish flour and corn flour with strawberry jam filling as one of the additional foods in order to overcome the problem of under nutrition in toddler.

Keywords: Undernutrition, Weight, Gajaberry Cookies, Corkfish Flour, Corn Flour

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1. Introduction

Under nutrition is defined as a body weight-for-age (BB/A) *Z-score* of less than -2 standard deviations, according of World Health Organization (WHO). This condition results from insufficient calorie and protein intake in the daily diet [1]. Under nutrition is characterized by a very thin condition, accompanied or not by edema on both insteps. The nutritional status assessment used to measure undernutreted in toddlers is by Body Length or Height (PB/BB or BB/TB) or Body Mass Index by Age (BMI/U) [2]. According to the 2018 Riskesdas data, national prevalence of nutritional status among toddlers based on the BB/A indicator showed that 3.9% categorized as underweight, while 13.8% experienced under nutrition. This represents a slight decrease of 0.1% from 2013, when rate of under nutrition was 13.9%. While, the prevalence data for children experiencing undernutreted in South Sumatra is 4.9%, and undernutrition is 12.3%. When compared to national prevalence of undernutrition, the achievement of South Sumatra province is 1.5% better [3]. Undernutrition in toddlers can result from various direct and indirect factors. Direct causes include infectious diseases and dietary consumption, whereas indirect factors involve parenting practices, economic conditions, maternal knowledge, and environmental hygiene [4].

The mother's approach to eating is the cause of undernutrition. An attitude toward food can also be linked to one's eating preferences, beliefs, and group culture [5]. Environmental cleanliness is another indirect factor affecting undernutrition, as it plays a crucial role in fostering a healthy environment, supports children's growth and development. Toddlers who live in unsanitary environments are more likely to contract infectious diseases, which may have an impact on their nutritional health in long run [5]. Increasing intake of well-balanced foods that provide sufficient levels of energy, protein, and other nutrients is one way to help toddlers who are struggling with their diets. Providing more food or PMT are examples of positive actions that can be taken. Attaining outcomes, 78.5% of toddlers nationwide are undernutreted and require PMT. But this number falls short of the 85% Renstra objective for 2020 [6]. The form of additional food for toddlers that can be given is *Cookies*. Cookies are a type of biscuit made from a soft dough, characterized by a high fat content. They are relatively crisp when broken, and their cross-section has a firm texture [7]. Gajaberry cookies is modified by adding strawberry jam and using corn flour and corkfish fish flour. Fish can be made into flour for various purposes, one of which is corkfish fish flour. The use of cork fish flour serves as an alternative primary ingredient for producing protein-rich cookies [8].

Corn flour per 100 grams contains quite high energy, carbohydrates, protein, and fat. The nutritional content of corn flour includes 418.66 Kcal, water 6.25%, ash 2.2.21%, protein 12.28%, fat 10.50%, and carbohydrates 68.76% [9]. According on the results of the 2017 weighing operation data, it was reported that the Sako Health Center had an incidence of thin toddlers (BB/TB) of 8.9%. The results of the study

conducted by [10] revealed that 36 toddlers (7.4%) experienced wasting in the Sako Palembang Health Center work area out of 488 toddler samples. Based on a previous study in 2023 on the acceptability and nutritional content of Gajaberry Cookies formulation, a substitute for corkfish flour and corn flour with the addition of Strawberry jam, a selected formulation product (F3) with a comparison formula of corkfish fish flour and corn flour (60:40). *Gajaberry Cookies* have been tested in a registered manner at the Bogor's SIG Laboratory, producing a total energy of 500.54 kcal, 21.40 grams of protein, and 27. 50 grams of total fat, 44.01 grams of carbohydrates, 2.93% ash content, and 5.10% water content in 100 grams of Gajaberry Cookies [9]. Based on this, the researcher aims to investigate the impact of Gajaberry Cookies on body weight changes in undernutreted toddlers within the Sako Health Center's district in Palembang.

2. Materials and Methods

This study will be conducted in two phases. The first phase focuses on developing the cookie formulation, baking the cookies, and conducting an acceptance test at the Food Technology Science Laboratory, Nutrition Department, Ministry of Health Polytechnic, Palembang and Nutrient Analysis (Proximate Test) carried out at the Saraswanti Indo Genetech Bogor Laboratory by sending samples of *Gajaberry Cookies* products. The second stage of the study used a true experiment to directly assess the effect of the cookies on weight changes in undernutreted toddlers, comparing the experimental group to the comparison group, by conducting home visits to toddlers who have undernutrition status to be given Cookies made from cork fish flour and corn flour in the working area of the Sako health center district Health Center and Multiwahana District Health Center, Palembang, which was carried out for 30 days in one month. This research was conducted in June-July 2024. This research is pre-experimental and employs a pretest-posttest control design. In this study, the control group received cookies made with cork fish flour and corn flour, while the control group received only regular cookies without the addition of cork fish flour and corn flour. The control group was the Sako health center district Health Center and the comparison group was the Multiwahana District Health Center.

The first stage of this type of research is an experimental research with a non-factorial Completely Randomized Design (CRD) method, an experiment that uses homogeneity or no other factors that influence the response outside the factors studied. The formula is divided into 4 types of controls with 3 repetitions of each control. In the second stage, the sampling technique employed was non-random sampling, specifically purposive sampling. The population in this study was all toddlers with undernutrition status in the working area of the Sako Health Center and the Multiwahana Health Center, Sako health center district, Palembang. The sample in this study was entire population of toddlers with undernutrition status with the criteria of toddlers aged 24-59 months. The data analysis techniques used in this study included both univariate and bivariate analyses. Univariate analysis was employed to describe frequency distribution of each variable, including both dependent & independent variables. Bivariate analysis was performed to test the hypothesis, using the dependent t-test (paired) and independent t-test, with a 95% confidence level. A conclusion was drawn based on the p-value: if the p-value was greater than 0.05, the null hypothesis (Ha) accepted. The findings indicated that administration of cookies made from catfish flour, corn flour, and strawberry jam had an effect on changes in weight of undernutreted children.

3. Results and discussion

The sample characteristics in this study consisted of gender and age of undernutreted toddlers. Table 1 show the result of the characteristics, it can be seen that based on gender in the control group men 21 people 60% and women 14 people 40%, in the comparison group men 16 people 45.7% and women 19 people 54.3%. Based on age in the control group aged 24-36 months 28 people 80% and 7 people aged 37-59 months 20%. In the comparison group aged 24-36 months 16 people 45.7% and aged 37-59 months 19 people 54.3%. Based on table 2, it is evident that the average intake of energy, protein, fat, and carbohydrates increased in both control and comparison groups following the intervention.

1) Energy Intake

Food intake affects a person's nutritional status [11]. Low energy intake in toddlers can also impact their growth and cognitive development [12]. The research conducted in the service areas of the Sako Health Center and Multiwahana Health Center revealed that the average energy intake of toddlers in the control group was 832.8 Kcal before the intervention, which increased to 1196.65 Kcal after the intervention. In comparison, the energy intake in the comparison group was 720.28 Kcal before the intervention, rising to 849.36 Kcal. Although both groups experienced an overall increase in energy intake, the control group showed a greater gain compared to the comparison group. Apart from that, when compared with the Nutritional Adequacy Rate (NAR) for toddlers, energy intake is still less than the daily energy needs of toddlers. This research is supported by [13], most toddlers who experience undernutreted have less intake than their needs because toddlers consume the wrong amount and the frequency of food, and many toddlers prefer snacks to eating.

2) Protein Intake

Based on results of research conducted in Sako Health Center and Multiwahana Health Center working areas, researchers found that average protein intake of toddlers before intervention in control group was 27.25 g, after intervention it increased to 43.27 g. In the comparison group, protein intake rose from 25.9 g before intervention to 28.85 g afterward. Control group's rise in protein intake was greater than that of comparison group, despite an increase overall. If protein intake increases, body weight will increase [14].

3) Fat Intake

The average protein intake of toddlers in the control group was 33.17 grams before the intervention, and after the intervention, it was 33.17 grams (51.11 grams) according to research conducted in the Sako Health Center and the Multiwahana Health Center work areas. Meanwhile, in the comparison group, protein intake before the intervention was 31.91 g and increased to 38.51 g after intervention. Low fat consumption can lead to a deficiency in energy intake, which affects changes in body mass and tissue and body's ability to absorb fat-soluble vitamins. One of macronutrients in the body that serves as main source of energy support is fat.

Table 1. Characteristics of Undernutreted Toddlers based on Gender and Age

Variable	Control		Comparison	
	(n)	(%)	(n)	(%)
Gender				
Boys	21	60	16	45,7
Girls	14	40	19	54,3
Total	35	100	35	100
Age				
24-36 months	28	80	16	45,7
37-59 months	7	20	19	54,3
Total	35	100	35	100

Source: secondary data, 2024

Table 2. The Mean Energy, Protein, Fat and Carbohydrate Intake of Sample before and after Intervention

Intake	Control		Comparison	
	(Pre)	(Post)	(Pre)	(Post)
Energy (Kcal)	832,819	1196,65	720,278	849,36
Protein (g)	27,25	43,27	25,9	28,85
Fat (g)	33,17	51,11	31,91	38,51
Carbohydrate (g)	113,106	149,40	95,73	105,54

Source: secondary data, 2024

Table 3. The Mean Body Weight Before and After Intervention

Groups	Body Weight	Mean	Min	Max
Control	Before	9,89	8,45	12,60
	After	9,98	8,50	12,80
Comparison	Before	10,33	8,10	14,10
	After	10,35	8,10	14,20

Source: secondary data, 2024

Table 4. Differences mean Body Weight of Toddlers in the Control and Comparison Groups

Body Weight	Mean pre ±SD	Mean post ±SD	SE	t	*p-value*
Control	9,88 ± 1,065	10,022 ± 1,098	0,0195	-6,957	0,000
Comparison	10,38 ± 1,527	10,35 ± 1,533	0,0798	-0,826	0,415

Source: secondary data, 2024

Table 5. Differences in Average Body Weight of Toddlers between the Control and Comparison Groups

Groups	n	Mean Selisih ±SD	SE	t	*p-value*
Control	35	10,025 ± 0,115	0,0195	5,251	0,000
Comparison	35	10,035 ± 0,079	0,0135	5,251	0,000

Source: secondary data, 2024

4) Carbohydrate Intake

According to research conducted at the Sako Health Center and the Multiwahana Health Center's service area, toddlers in control group consumed an average of 113.1 grams of carbohydrates before intervention, which increased to 149.4 grams afterward. In comparison group, carbohydrate consumption rose from 95.7 grams prior to intervention to 105.5 grams following the intervention. However, toddlers' daily carbohydrate intake is still less than the toddler's daily carbohydrate needs according to toddler's Nutritional Adequacy Rate (NAR). A low intake of carbohydrates is brought on by a diet low in foods high in carbohydrates, such as rice, noodles, vermicelli, etc. Carbohydrate intake is correlated with energy sufficiency, as the body uses them as its primary energy source (Siregar, 2014). Low carbohydrate intake in toddlers increases the risk of Wasting by 7.12 times [15]. Meanwhile, for toddlers whose nutritional status is normal, their carbohydrate consumption is also normal. Therefore, toddlers with larger carbohydrate intakes have better nutritional statuses [14]. According to Table 3, the comparison group gained an average of 10.33 kg with a minimum value of 8.10 kg and a maximum value of 14.10 kg, whereas control group gained an average of 9.89 kg with a minimum value of 8.45 kg and a maximum of 12.60 kg.

Based on table 4, indicates that in control group was significant weight after being given *Gajaberry* Cookies made from corkfish fish flour and corn flour with strawberry jam filling for 30 days. The results of dependent t-test for control group showed a p-value of <0.05, specifically 0.000, indicating a significant difference in average weight of toddlers before & after administration of Gajaberry Cookies, made from cork fish flour, corn flour, and strawberry jam.

This demonstrates a noticeable change in body weight among undernourished toddlers in control group. According to researchers, weight gain observed in undernourished toddlers is attributed to energy and protein provided by the Modified PMT (Supplementary Feeding) consumed by toddlers. This is further supported by an increase in energy & protein intake from other foods, ensuring most of their daily nutritional needs are met [16]. This study aligns with Iskandar [17] who found that results of statistical tests using repeated ANOVA tests at 95% confidence level obtained a p-value of 0.007, so it concluded giving more food to toddlers in a modified form significantly improved their nutritional condition.

The results of statistical analysis (independent t-test) showed a *p-value* of <0.05, indicating a significant difference in effect of Gajaberry Cookies made from cork fish flour and corn flour with strawberry jam filling on undernutreted toddlers in service areas of Sako Health Center and Multiwahana Health Center. This finding is further confirmed by results of the statistical analysis (independent t-test), which yielded a p-value of 0.000 ($\alpha < 0.05$). This indicates a significant effect on body weight in the group treated with Gajaberry Cookies compared to group given regular cookies. Weight difference in control group was 0.135 kg, while weight difference in comparison group was 0.011 kg. These results demonstrate a noticeable change in body weight after administration of Gajaberry Cookies. Research by Fitriyanti Farida et al, 2012 in Besti Verawati et al, (2021) indicated that changes in nutritional status based on weight for age (BB/U) and weight for height (BB/TB) were significantly influenced by PMT-P. According to Soumokil [18]. The nutritional status of toddlers can improve if energy intake they consume is better [19-30].

4. Conclusion

Giving *Gajaberry Cookies* to undernutreted toddlers in Sako Health Center District, Palembang, has an effect on changes in their weight. Giving gajaberry cookies to undernutreted toddlers has an impact, as indicated by the research findings, which show a substantial difference in the average increase in child weight. The mean body weight before being given gajaberry cookies was 9.89 kg and after being given gajaberry cookies was 9.98 kg.

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