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The effectiveness moringa leaf flour biscuits and soybean sprout flour to increasing toddler weight less nutrition

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Abstract
Background: The age of children under five is vulnerable to nutritional problems, namely protein energy deficiency (KEP), iron anemia, disorders due to iodine deficiency (IDD) and lack of vitamin A (KVA). Toddler children need more attention, because it is the most frequent age group and very vulnerable to malnutrition. Handling under five toddlers can be given traditional diet therapy as an alternative to supplementary feeding (PMT), namely moringa leaf flour biscuits and soybean sprout flour.
Method: The type of research used is Quasy Experiment with a pre test - post test control group design. This study arranged two groups, namely the intervention group which was given 22 gr moringa leaf flour biscuits and 22 g soybean sprout flour + classic PMT biscuits, while the control group was only given the classic PMT biscuits. Technique non probability sampling with purposive sampling method was used to get 34 respondents divided into two groups.
Results: The results Independent t test showed a p value 0.008 (<0.05) which means that there were differences in the mean difference in underweight after being given treatment between the intervention group and control group.
Conclusion: The research of results study after being given treatment increased the weight of toddlers who were given additional food in the form of Moringa leaf flour biscuits and soybean sprout flour, so that traditional diet therapy was effectively implemented for toddlers who experienced malnutrition, especially toddlers with underweight.

Keywords: moringa leaf flour biscuits, soybean sprout flour, toddler weight, less nutrition

1. Introduction

Toddler (under five years) is an important period in growth and development, children who experience nutritional disorders affect the process of growth and development both physically and mentallyb [1]. The measure of success in fulfilling nutrition is nutritional status that reflects the level of development and welfare of the people of a country and is related to the health status of children in the future [2]. The age of children under five is vulnerable to nutritional problems, namely lack of protein energy (KEP), iron anemia, disorders due to iodine deficiency (IDD) and lack of vitamin A (KVA) are toddlers in the category of malnutrition [3].

Toddlers need more attention, because they are the most frequent age group and very vulnerable to malnutrition. Malnutrition is caused by low consumption of energy and protein in daily food or certain disease disorders so that it cannot fulfill the nutrients needed by the body [4]. Malnutrition is caused by lack of food, general energy sources and lack of protein sources [5].

Malnutrition in children under five is a condition of malnutrition and malnutrition which is one of the causes of mortality and morbidity in developing countries which is 10.8 million (54%) [6]. Under five years malnutrition affects more than 26% of children worldwide and accounts for one third to half of global child mortality cases. Lack of nutrition causes children to be more susceptible to infection, which causes death [7].

According to the World Health Organization (WHO) in 2016, around 45% of deaths of under-fives experience malnutrition, in low- and middle-income countries [8]. In the category of malnutrition according to body weight, the threshold for WHO malnutrition is 10%. The highest prevalence is in the South Asian region (31.4%), West Africa (19.5%), East Africa (17.8%) and Southeast Asia (15.2%). In Indonesia, more than 3 million or 12% of children under five experience malnutrition [9]. UNICEF reports that 167 million pre-school children in the world suffer from malnutrition, most of them in South Asia [10].

In 2013 Basic Health Research (Riskesdas) Indonesia the prevalence of malnutrition and malnutrition by 19.6% increased compared to 2007 (18.4%), in 2010 (17.9%) [11]. and in 2018 the number of prevalence of malnutrition and malnutrition by 17.7%. Underfive nutritional status in Central Java according to the BB / U index in 2016 was 13.88%, increasing in 2017 by 14.00% [12]. in Pemalang District in 2017 from 28,567 toddlers, consisting of very low BB 531 (1.86 %), and BB is less than 4,114 (14.40%). The prevalence of BB toddlers is less highest in Pemalang District, in Petarukan Health Center 363 toddlers (17.29%), Paduraksa Health Center 329 toddlers (17.20%) and Mulyoharjo Public Health Center 308 toddlers (19.01%) [13]. The 2019 National Medium-Term Development Plan has a target of reducing the prevalence of underweight children under five by 17% [14].

Risk factors for malnutrition include the direct causes of insufficient food intake and the presence of diseases and indirect causes, namely insufficient food availability,

parenting children, difficult access to health services, and poor environmental sanitation conditions, influenced by the level of education, knowledge, food availability, employment opportunities and income [15].

The clinical degree of malnutrition can be determined using several methods and methods, the most frequently used and easy to do is to look at the child's weight and age according to the chart on the Health Towards Card (KMS) [16]. Screening of nutritional status to detect malnutrition is done by general physical examination including anthropometry (weight / age, height / age, weight / height), chest, abdomen, muscles, fat tissue and special physical examination (eye examination, skin, ears, nose and throat), clinical examination (blood sugar levels, hemoglobin, albumin) and laboratory tests including levels of albumin, fat and carbohydrates [17].

According to the Ministry of Health, the handling of malnutrition is currently still focused on sufferers of malnutrition, while malnourished people have not received enough attention. Handling of malnutrition by monitoring growth of children under five in posyandu, counseling and breastfeeding counseling and complementary food breast milk (MP-ASI) and Giving Supplementary Food (PMT) recovery as daily complementary food adapted to local food ingredients local conditions [16].

Giving Supplementary Food (PMT) is stated in the Republic of Indonesia Ministerial Regulation Number 1 of 2014 which has become a nutrition management activity [16]. in the form of biscuits formulated with vitamins and minerals in under-nutrition children [18, 19]. PMT Classic has 11 vitamins (vitamin A, B1, B2, B3, B6, B9, B12, C, D, E, K) and 8 minerals (iron, calcium, selenium, zinc, sodium, iodine, phosphorus and fluorine, containing 540 calories, 14 grams of fat, 9 grams of protein and 71 grams of carbohydrates. If the weight is appropriate, giving PMT Toddler is stopped, then consuming balanced nutrition family food [20].

management of the current PMT Classic program has not achieved maximum results. Based on the nutritional status survey of toddlers who get Classical PMT but still have less weight (18.59%) [21]. while the RPJMN target for 2019 is to reduce the prevalence of underweight toddlers by 17% so that the government still needs hard work in reducing the prevalence of malnutrition in toddlers [14]. From several studies, it has been shown that in terms of HR and PMT Classic materials are adequate, the implementation instructions, facilities and funding are still lacking, in terms of process, storage, transportation and monitoring are still lacking [22].

Handling of malnourished toddlers can be given traditional diet therapy as an alternative to supplementary feeding (PMT), namely kelor leaf flour biscuits and soybean sprout flour. Alternative PMT contains vitamins A, B1, B2, B3, B6, B9, B12, C, D, E, K and minerals, there are calories, fat and carbohydrates. Moringa leaf flour as a nutritious source of nutrients contains high carotenoids and protein, so it is easily digested and absorbed by the body [23, 24]. is rich in nutritional benefits because it contains various macronutrients, micronutrients and essential amino acids [25]. Soybean sprouts are a food source of vegetable protein, when made flour the protein content increases and is easily digested because protein bonds are converted into a more active form, and contain isoflavones which are very strong antioxidants, improve the immune system in malnourished toddlers who are susceptible to infectious diseases [26].

Protein content of kelor leaf flour in 100g (27.1g), while the protein content of soybean sprout flour in 100gr (33.22g). In this study based on the results of the Semarang Ministry of Health Polytechnic nutrition expert consultation, the dosage was 22 g of moringa leaf flour and 22 g of soybean sprout flour. Alternative PMT is given for 21 days for nutritional intake that is catabolized in the child's body for growth.

Laurene Boateng's study, *et al*. (2017) showed that a mixture of moringa leaf powder which was used as a complementary food for infants for 14 days was well received by the baby [24]. Other studies have shown that supplementary feeding in the form of Moringa leaf pudding can increase body weight in underweight children under five [27].

Based on the above background, a study was conducted which aimed to determine the "Effectiveness of Moringa leaf flour biscuits and soybean sprout flour on increasing underweight toddlers' weight.

2. Methods

This type of research uses research Quasy Experiment with a pre test - post test with control group design. The researchers compiled two groups, namely the intervention group which was given additional food with 22 gr moringa leaf flour biscuits and 22 g soybean sprout flour + classic biscuits giving supplementary food, while the control group was only given the classic biscuits giving supplementary food. Giving moringa leaf flour biscuits and soybean sprout flour was carried out for 21 days. Measurement of weight using a toddler scale instrument with a precision of 0.1 kg. Measuring the weight of a toddler with malnutrition is carried out before and after the treatment.

The population in this study were underweight children under five in the Work Area of Petarukan Public Health Center, Pemalang Regency with children aged (12-59) months who received classic biscuits giving supplementary food in Kalirandu Village. Determination of the minimum number of samples using non- probability sampling technique with purposive sampling method and based on inclusion and exclusion criteria as many as 34 respondents were divided into two groups with each of the 17 respondents in the intervention group and 17 respondents in the control group.

In this study researchers conducted data collection by observing, identifying, interviewing and filling out the questionnaire. The collected data was analyzed through the IBM SPSS program version 24.0, and continued with a different test namely non-parametric test (Paired t test and Independent t test). The processed data is used as the basis for discussing problem statements, which are then presented in table form so conclusions can be drawn.

3. Results

Table 3.1: Frequency distribution respondents based on infectious diseases, education mother, mother's job and father's job based on demofigic data

Characteristics		Intervention Group (n = 17)		Control Group (n = 17)		P
		N	%	N	%	
Infectious Diseases	Yes	11	64.7	13	76.5	0.467
	No	6	35.3	4	23.5	
	Total	17	100	17	100	
Education Mother's	Low	13	76.5	16	94.1	0.155
	High	4	23.5	1	5.9	
	Total	17	100	17	100	
Mother's Job	Working	1	5.9	4	23.5	0.155
	Does Not Work	16	94.1	13	76.5	
	Total	17	100	17	100	
Father's Job	Working	17	100	17	100	1.000
	Total	17	100	17	100	

*Levene's Test

Based on the table above the results of the frequency distribution characteristics of infectious diseases, education mother, mother's work and father's work from the intervention and control group respondents obtained p value > 0.05 meaning that there were no significant differences in the characteristics of the respondents between the intervention group and the control group or the same / homogeneous.

Table 3.2: Frequency distribution respondents based on food intake in the intervention group and control group

No	Variables		n	Intervention Group	Control Group	p
1.	Energy intake	Mean±SD	17	709.994±1.8594	660.500±1.5399	0.404
		Min±Max		513.4±1070.0	425.0±959.2	
2.	Protein intake	Mean±SD	17	21.976±3.6395	21.929±6.5887	0.980
		Min±Max		16.6±28.6	11.0±36.4	
3.	Carbohydrates Intake	Mean±SD	17	87.247±30.0109	78.471±26.1061	0.370
		Min±Max		52.1±142.8	49.5±141.6	

*Levene's Test

Based on the table above shows the average energy intake in the intervention group at 556.6 and the mean control group 534.2. While the average protein intake in the intervention group was 12 and the mean control group was 25.4. Then the carbohydrate intake in the intervention group averaged 90.7 and in the mean control group 92.1. The results of the statistical test showed that the average nutrient intake, protein intake and carbohydrate intake had a p value> 0.05, meaning that there was no significant difference between the intervention group and the control group.

Table 3.3: Differences in mean weight before and after intervention in the treatment group and control

Weight	Intervention Group (n=17)			p-value	Control Group (n=17)			p-value
	Mean	SD	Mean Difference		Mean	SD	Mean Difference	
Pre test	9.635	1.5124	0.3706	0.000	11.312	2.3318	0.1353	0.011
Post test	10.006	1.4463			11.447	2.3152		

*Paired t test

Based on the above table, the average weight infants before treatment in the intervention group of 9.635 kg and after treatment 10.006 kg increased by 0.3706 kg, while in the average control group before treatment 11.312 kg and after treatment 11.444 kg experienced an increase of 0.1353 kg, with p-value <0.05, which meant that there were differences in body weight in the intervention group and the control group before and after treatment.

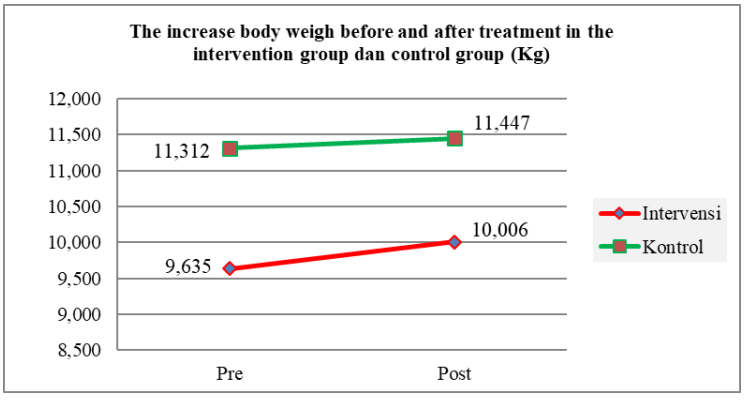

Fig 3.4: The increase in body weight before and after treatment in the intervention group and control group

The fig above shows that there was an increase in the average weight before and after treatment in the intervention group greater than the control group.

Table 3.5: Analysis differences between the mean weight before (pretest) and after (posttest) treatment between in the intervention group and control group

Weight	Before treatment (pre test)		After treatment (post test)		P value
	Mean±SD	Mean Difference	Mean±SD	Mean Difference	
Intervention	9.635±1.5124	1.6765	10.006±1.4463	1.4412	0.018
Control	11.312±2.3318		11.447±2.3152		0.037

*Independent t test

Based on the table above the average body weight between treatment groups (giving additional food with 22 gr moringa leaf flour biscuits and 22 g soybean sprout flour + classic biscuits giving supplementary food) and the control group (classic biscuits giving supplementary food) showed p value = 0.018 which means that there were differences in body weight in the control and treatment groups before being given intervention. Whereas, in the control group the p-value = 0.037 which means that there are differences in body weight in the control and treatment groups after being given intervention.

Table 3.6: Analysis differences in mean weight between in the intervention group and control group

Weight	Mean± SD	Mean Difference	p-value
Intervention	0.371±0.2823	0.2353	0.008
Control	0.135±0.1935		

*Independent t test

Based on the table above, differences in differences the mean of underfive weight between intervention group (giving additional food with 22 gr moringa leaf flour biscuits and 22 g soybean sprout flour + classic biscuits giving supplementary food) and the control group (classic biscuits giving supplementary food) showed a p-value = 0.008 which means that there was a difference in average weight between intervention group and control group.

4. Discussion

Based on the results of the statistical analysis showed that differences in body weight between the control group consuming the PMT Classic biscuits and the treatment group consuming Moringa leaf flour biscuits and soybean sprout flour + Classic biscuits PMT were carried outstatistics independent t-test. Based on the results of the independent t-test obtained p-value 0.037 <0.05, it can be concluded that the administration of Moringa leaf flour biscuits and soybean sprout flour + Classic biscuits PMT for 21 days on a regular basis had a significant effect on weight gain.

The results above can be explained that the administration of Moringa leaf flour biscuits and soybean sprout flour in underfives with poor nutrition can increase body weight, this is due to the Moringa leaf flour biscuits and soybean sprout flour is supplementary feeding which is one alternative to overcome cases of malnutrition in children. Nutrient content in Moringa leaves and soybean sprouts has increased quantity for consumption after being dried and made into powder or flour. Mixed food ingredients are foods that can provide beneficial effects on health, namely for nutritional needs [28].

Moringa leaf flour is a plant that is used for traditional therapies including as a source of nutrition [29]. contains protein, vitamin A, vitamin C, calcium, potassium, iron, and essential amino acids in very high amounts which are easily digested and assimilated by the human body [30-31].

Moringa gives hope as a plant nutrient source that can save humans from malnutrition, rich and dense with nutrients and compounds that the body needs. All parts of Moringa plants can be used for healing, maintaining and improving the quality of human health and especially the source of family nutrition. In fact, the content of moringa is known to be many times compared to food ingredients other sources of nutrition for improving nutrition [33].

Increasing the supply of Moringa leaf flour is added, increasing the content of protein, iron, calcium, fiber content, and ß-carotene, thus indicating the possibility of utilizing Moringa leaf flour to increase nutrient content [34]. The digestibility of amino acids and proteins is close to 60%, this allows the absorption of good nutrients contained by Moringa leaf powder [35].

Soybean sprout flour is a very potential source of protein, used as a mixture of food ingredients such as biscuits can increase nutritional value [36]. high protein content found in soybean sprout flour, where soybeans are a source of food from the group of beans with high protein content especially after germination process, wherein the soybean sprout protein content is higher [37]. Soybean sprouts are one of the food sources of vegetable protein, having proteins that are easier to digest because soy protein bonds are converted into a more active form [38].

The results of the study by Zongo Urbain, *et al.* (2013), showed that the weight of children who received Moringa leaf powder was higher average (8.9 ± 4.30 gr / kg / day, compared to 5.7 ± 2.72 gr / kg / day in group II). Other studies also showed a difference after administration of Moringa leaf pudding in the treatment group and the control group with p-value = 0.035 (p <0.05). Provision of 100 grams of moringa leaves in the morning and afternoon for 3 weeks on a regular basis can increase body weight in toddlers with malnutrition [27]. Juhartini's study (2015) explained that there was a BB difference before and after administration of moringa BMC PMT in the treatment group with a value (p = 0.003) [39]. Research by Tresnani, *et al.* (2017) shows that snack bar forvita contains high energy and protein with compositions of yellow sweet potato composite flour and soybean sprouts that have good digestibility for malnourished children in the rehabilitation phase [40].

Moringa leaf flour and soybean sprout flour as a source of vegetable protein become alternative food ingredients that can be substituted into biscuits. The more kelor leaf flour and soybean sprout flour are supplemented or added to the biscuit, the higher the protein content of the biscuits. Proteins with amino acid content are needed in the growth process, which is an important macronutrient for humans.

Children need protein for growth. So that this study proves that by consuming additional Moringa leaf flour biscuits and soybean sprout flour for 21 days together with consuming PMT Classic biscuits from the Puskesmas can increase body weight in underweight children under five.

5. Conclusion

The administration of 22 gr Moringa leaf flour biscuits and 22 gr soybean sprout flour for 21 days in under-nutrition children who received Classical PMT biscuits had an effect on increasing Body Weight with an average difference in the treatment group of 0.371 kg and a control group of 0.135 kg.

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