Advances in Social Science, Education and Humanities Research, volume 514
Proceedings of the First International Conference on Social Science, Humanity, and Public Health (ICOSHIP 2020)

Modisco With Moringa Leaf for Improving Childhood's Nutritional Status

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***Abstract*—Child growth is recognized as an important indicator of nutritional and health status. But in fact, there are still some cases of undernutrition in some areas of Jember. This is certainly a challenge for health providers because the lack of nutrients that occur in this golden period is irreversible. This research aims to analyze the effects of modisco with moringa leaf for improving the childhood's nutritional status. It was a quantitative research and conducted by using quasi-experimental study. This research used pre-post tests design for experiment and control groups. Data from 40 children (20 from modisco group and 20 from the control group) were analyzed by using paired t-test and simple logistic regression. After one week of treatment, the mean of child weight significantly increased in intervention groups (mean gain weight 0.57 kilogram, p = 0.000), whereas the weight score remained unchanged in the control group (mean gain weight 0.05 kilogram, p = 0.066). The result also showed that there was a significant positive effect of the modisco with moringa leaf for increasing child's body weight (p= 0.026, Exp.B=56,6). It was indicated that the children who were given modisco with moringa leaf for 7 days, potentially had 56,6 times greater for increasing their weight than those who were not given. It could be conduded that the consumption of Modisco with moringa leaf had a beneficial effect to improve the childhood's nutritional status**

Keywords— modisco, moringa, child, body, weight

I. INTRODUCTION

Nutrition is an important factor in the promotion and maintenance of good health [1]. Undernutrition and hidden hunger are threatening child survival, growth, and development. Globally 1 in 3 children are have undernourished, and 1 in 2 children are suffering from hidden hunger [2]. According to the monitoring of nutritional status in 2017, Indonesia is considered to have a high prevalence of stunting (29.6%), the medium prevalence of underweight (17.9%), and poor of wasting (9.5%) [3][4]. Then Jember Regency is one of 100 district priorities for poverty handling and malnutrition. It has a very high stunting prevalence (44.1%), the medium prevalence of underweight (11.7%), and the number of children suffering from deficiencies is 128 toddlers [5]. So, there is an important issue about nutritional status in Indonesia, also in Jember regency.

Inadequate nutrition intake and the incidence of infection is the direct cause of malnutrition in children [6]. While inadequate food supply, inadequate parenting practice, poor sanitation, and health services limited access are the indirect cause of malnutrition in the family level [7]. In the short term, poor nutrition can contribute to brain development disruption, physical growth disorders, also metabolic disorder and long term effect can be reduced cognitive abilities, also developing high risk of some illnesses and other health problems such as: type-2 diabetes, overweight, heart, blood vessel disease, cancer, and stroke [8].

A possible solution for overcoming malnutrition in children is supplementary feeding [9]. Ready to use therapeutic foods (RUTF) such as Modified Dried Skimmed Milk Coconut Oil (Modisco). Modisco is rich in energy and protein so it can improve nutritional status or increase children's weight quickly [10][11]. Based on the research, giving modisco to undernutrition children has a significant effect on their body weight gain and body length [12][13][14].

Modisco is therapeutic liquid food recommended by WHO [10]. It has been tested and meets dietary requirements from Minister of Health decree (Keputusan Menteri Kesehatan or Kepmenkes) no.5/2016 on standard nutritional supplementation product [9][11]. Modisco is a highly nutritious formula [15]. The primary source of energy and protein in modisco are skim milk, sugar, and oil or margarine [11]. Basic of modisco formula contains energy (100-130 kilocalories), protein (3-3.5 grams), and fat (5-7.5 grams) per serving [15]. Modisco has proven to be an alternative formula to help bodyweight gain for undernutrition children [16]. Also can be a food supplement for completing the daily nutrient for improving childhood's nutritional status [11]. Based on previous research, it found that 22 children's bodyweight significantly increased after they had given modisco formulas [12].

Moringa Oleifera is a drought-resistant and fast-growing tree which is present in nearly all tropical and sub-tropical

countries [17]. As a source of good nutrition, moringa leaf found containing many essential nutrients [18]. Moringa oleifera one of a plant can be cultivated in all regions in Indonesia easily [19]. It is a natural variety of the genus Moringa and belonging to family Moringaceae. In English, commonly known as Horseradish tree, Drumstick tree, Never Die tree, West Indian Ben tree, and Radish tree [20]. Moringa leaves are compound 20-60 cm long with each pinnate bearing 4-6 pairs of leaflets that are dark green, elliptical to obovate [21]. It has a slightly bitter taste, are neutral and non-toxic [19]. Moringa leaves can be produced intensively in a family-size small garden [18].

The benefits of consuming Moringa leaves have been tested in the AGADA (Alternative Action for African Development) program. Moringa leaves reported used to prevent or treat malnutrition in pregnant or breastfeeding women also their children [22]. The pods and leaves of Moringa contain of high amount vitamins, minerals, amino acid, anti-inflammatory nutrients, beta-carotene, antioxidants, omega 3 and 6 fatty acids [18][23]. Because of the nutritional values of Moringa, it has potential benefits in malnutrition [24]. The leaves can be easily dried into powder form. Then the powder can be added to milk, soup, tea, sauce, and other food as a dietary supplement or additional foods [17][25]. Previous research in Sinegal indicated that children maintained or increased their weight and improved overall health by using Moringa leaf powder in foods [24][26].

We developed an intervention supplementary food modisco with moringa leaf (Moringa Oleifera) that aims to promote healthy and nutritious eating in children. The main objective of this study was to evaluate the effect of this intervention on children's body weight gain, in Jember, Indonesia. The research questions for this study were: Does give modisco with moringa leaf powder for 7 days is able to increase the bodyweight of children ages 7-12 years?

II. METHOD

A. Research Design

To investigate the effect of the modisco with moringa leaf for children's body weight gain, a field quasi-experimental study was carried among children ages 7-12 years, and based on a pretest-postest control group design. The modisco with moringa leaf as an intervention carried out by the author.

B. Participant

The study was conducted in the outpatient service of the Polres Pratama Clinic in Jember, Indonesia. The research subjects were selected from among children aged 7-12 years and were not currently suffering from an infectious disease. A systematic random sampling method was used to select the participants. The sample size was calculated for an experimental study with the following assumptions, Type 1 error 5% and power of study 90%. A total of 40 children aged 7-12 years were randomly assigned to Moringa group (n=20) or Control group (n=20), using a computer-generated list.

C. Procedure, data collection and statistical analysis

Participants in the intervention group received the modisco with moringa leaf formula as intervention program, while participants in the control group received no intervention program. The moringa leaf formula consist of 13 grams fat, 243 grams dried skim milk, 122 grams vegetable oil and 122 grams sugar per serving per day. Before the implementation of the intervention program, all participants body weight was observed. One week after intervention program, their body weight was re-measured. Paired t-test conducted to test for comparison body weight between pre and post intervention in both of group and independent t-test conducted for comparing base-line body weight score. The Kolmogorov-Smirnov goodness-of-fit test was used for testing normality before data were analyzed by t-test. Simple Logistic Regression models were used in this study to evaluate the effect of modisco with moringa leaf powder on children's body weight gain.

III. RESULT

A. Result

In total, 40 children aged 7-12 years were studied, of whom 20 were in the intervention group and 20 were in the control group. Table 1. shows the baseline body weight of children who entered the intervention group were higher (mean 29.48 kilogram) than of those who participated in the control group (mean 27.60 kilogram). It also shows one week after the intervention and their body weight was re-measured, the scores of the body weight show that there is a significant increase in the intervention group (p-value = 0.000), but an increased non-significant in the control group (p-value =0.066).

TABLE I. AVERAGE SCORES OF CHILDREN'S BODY WEIGHT FOR INTERVENTION AND CONTROL GROUP

Body Weight	**Intervention Group (n=20)**			**Control Group (n=20)**		
	Mean	***SD***	***p-value***	***Mean***	***SD***	***p-value***
Base-line	29.48	7.47	0.000	27.60	6.46	0.066
Post-test	30.13	7.87		27.65	6.42	

Table II. describes that body weight was not significantly different before the intervention. But after 7 days intervention period, we found that the children's body weight gain in the intervention group was higher (mean 0.65 kilograms) than of those who participated in the control group (mean 0.05 kilogram). The logistic regression analysis in table II. shows that there was a significant positive effect of the modisco with moringa leaf powder for increasing children's body weight (p= 0.026, Exp.B=56,6). It was indicated that the child who given modisco with moringa leaf powder for 7 days, potentially has 56,6 times greater for increasing their weight than those of no given.

TABLE II. LOGISTIC REGRESSION ANALYSES EFFECT OF MODISCO WITH MORINGA LEAF FOR INCREASING BODY WEIGHT GAIN

Participant	**Base-line**	**Weight Gain**			
	p-value	***Mean***	***SD***	***p-value***	***Exp.B***
Intervention group (n=20)	0.260	0.65	0.68	0.026	56.6
Control group (n=20)		0.05	0.11		

B. Discussion

The growth of children's age 7-12 years is the most rapid period of growth after the toddler's growth period. Proper

nutrition both the number and the type of food, affecting the growth process [27]. Preliminary studies suggest that children ages 6-12 years understand that "good" and "bad" foods can influence health and growth [28]. So the addition of Moringa flour in this study which is most preferred or accepted based on external and internal attributes [29].

The result found a baseline body weight of childrens who entered the intervention group were higher than of those who participated in the control group. But statistically test show that both of group had same condition before that intervention. Healthy child development depends on the quality of stimulation, support, and care from the social environment where children live. Nurturing qualities of family environments include parenting skills, nutritional supplementation and childcare arrangements [30].

This study found that the children's body weight gain in the intervention group was higher (mean 0.65 kilograms) than of those who no given (mean 0.05 kilogram). These findings are consistent with a recent review report in which giving modisco was significant to increase body weight in children [12][18]. As a nutrient-dense food, modisco contains high proteins, high calories, adequate vitamins, minerals, and fluids that easy to absorb [31]. It known that they are the main nutrients to support cellular activity including cell growth [32].

This study also found a daily addition of 13 grams of moringa leaf powder in modisco for 7 days was able to increase the body weight of children ages 7-12 years. The results of this study are consistent with studies in Bangalore India, which 60% of children who were given 15 grams of Moringa leaf powder twice a day for two months improving their nutritional status from grade I protein energy malnutrition to normal nutritional status [33]. Other studies in Burkina Faso also shown that malnourished children who were given 10 grams of Moringa leaf powder daily for 6 months improved their anthropometric status [34]. Supplementation of 5-10 grams of moringa oleifera powder per daily for 14 days has been able to increase body weight by 0.53 kilograms on children in Kupang Regency [35]. The beneficial effect of Moringa leaves apart from gaining weight, it also reported increase HB levels, reduce disease, and improve the health among children in Tanzania [36].

Using Modisco with moringa leaf powder has benefit for increasing children's body weight, so it has probability to combat malnutrition. The major advantage by using moringa oleifera in this study is the fact that that's leaves easy to find because it is Indonesian local cultivate. Moringa leaves also rich in macro and micro nutrients which are especially important for children health and development.

IV. Conclusion

It can be concluded as follows:

- The child who given modisco with moringa leaf powder for 7 days, potentially has 56,6 times greater for increasing their weight than those of no given.
- Daily addition of moringa leaf powder in modisco was able to increase the body weight of children ages 7-12 years.
- Modisco with Moringa leaves can be used as a menu option to improve the nutritional status of malnutrition children.

It could be suggested that the consumption of Modisco with moringa leaf had a beneficial effect to improve the childhood's nutritional status. even so, further studies that conduct among children with undernutrition are needed to look at the effect of modisco and moringa to improving their nutritional status.

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