

# Innovation of Millet (Foxtail Millet)-Tuna Cookies on Nutrition Status and Zinc Value for Children Aged 6-24 Months with Less Nutrition Status in Regency of Pacitan – Indonesia

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## Abstract

**Objective:** Indonesia provides support in preparing children as a nation's investment through the Scaling Up Nutrition (SUN) movement. The focus of the SUN movement is meeting the needs of 1000 first day of life in order to reduce the number of malnutrition. Giving millet (foxtail millet)-tuna cookies to children aged 6-24 months with under malnutrition status is one of the innovations in reducing malnutrition. The number of malnutrition children aged 6-24 months reaches 48% in region of Gemaharjo-Pacitan. This product contains 449.03 Kcal and 10.24 gr protein per 100 grams. It is hoped that the provision of these cookies combined with local food will improve nutritional status and zinc values in children aged 6-24 months with under malnutrition status. **Method:** this study was experimental and conducted to 48 infants for 2 months and used a T-test. **Results:** Millet (foxtail millet)-tuna cookies increased nutritional status ( $p = 0, 001$ ) and zinc value ( $p = 0.00$ ). **Conclusion:** Cookies millet (foxtail millet)-tuna can improve nutritional status and zinc values in children aged 6-24 months of malnutrition in Pacitan - Indonesia.

**Keywords:** Millet-tuna cookies, nutritional status, zinc values, children aged 6-24 months.

## Background

According to the World Health Organization (WHO, 2014), 45% of under-five aged childrens' deaths are caused by malnutrition<sup>18</sup>. A nutrition status assessment conducted in Indonesia on 2017, shows that 11.3% of children aged 0-23 months are malnutrition (based on weight for age indicators). In Pacitan district alone there are 10.9% of children aged 0-23 months got malnutrition in 2018<sup>14</sup>. The problem of malnutrition in children under two years is a problem that needs to be addressed seriously<sup>6</sup>. The attention of developing countries is now shifting from breastfeeding to complementary food which side with breastmilk<sup>9,18</sup>. WHO recommends that supplementary feeding begin with 6 months with a gradual amount and form<sup>17</sup>.

The provision of millet (foxtail millet)-tuna cookies for children aged 6-24, from local foodstuffs ( foxtail millet and tuna) is expected to improve nutritional status (weight for age)<sup>8,10</sup>. Improvement of nutritional status according to age is also a priority in this intervention<sup>1</sup>. Body weight index according to age describes relative body weight compared to the age of children<sup>3</sup>. This index is used to assess children who are underweight or severely underweight<sup>17</sup>. It is important to know that a child, whose weight is low according to age, may experience growth problems<sup>12</sup>. In addition to nutritional status, this intervention is expected to increase zinc value as one of the trace minerals or micro minerals that are important for life<sup>5</sup>. In children if the amount of zinc absorbed is very small, they will experience improperly growth<sup>4</sup>.

## Method

This research was conducted in Regency of Pacitan - Indonesia. The first phase was carried out by testing the millet (foxtail millet)-tuna cookies product, in accordance

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to SNI (Indonesian National Standard) 2973: 2011 and Indonesian Ministry of Health's standard followed by the acceptability test. The targets in this study were children aged 6-24 months with malnutrition status who were joined in twenty "Breastmilk Village" groups, which had agreed to informed consent. The purpose of using the "Breastmilk Village" group is to facilitate the level of obedience in providing interventions. The second phase of this experimental design was an experiment with randomized control (Randomized Controlled Trial / RCT)<sup>15</sup>. For sample calculation using G \* Power (V.3.1.9.2), the T-test statistic test obtained a minimum sample size of 19 children per group. From the screening results in August 2019 it was found that 48 children aged 6-24 months who were malnutrition, which in this experiment, 48 children aged 6-24 months were targeted for the study (additional samples were needed to anticipate the possibility of selected subjects dropping out, loss to follow-up, or disobedient subject).

So that each group consist of 24 children aged 6-24 months with under malnutrition status (group 1 = the control group was given a biscuit intervention from the Ministry of Health and group 2 = the intervention group was given millet (foxtail millet)-tuna cookies). Ethical clearance, taken from Health Research Ethics Committee Universitas Sebelas Maret (UNS). This research has obtained information on ethical conduct under number 349 / UN27.06 / KEPK / EC / 2019. The study was conducted for 60 days (October-December 2019), with 8 times nutritional education. The nutritional status and zinc values check up conducted before and after the intervention. The final goal in this study is to find out how the two intervention groups compare to their nutritional status and zinc values. In addition, to find out whether the provision of local food can increase nutritional status and zinc values in children aged 6-24 months with under malnutrition status<sup>9,11</sup>.

## Result

**Table 1. Characteristics of research subjects**

Variabel	Before intervention (biscuit from Ministry of Health) n=24)	After intervention (biscuit from Ministry of Health) n=24)	Before intervention (Millet -Tuna Cookies ) n=24)	After intervention (Millet -Tuna Cookies ) (n=24)
Age	16,75±3,124		18,71±4,154	
Weight (kg)	7,875±0,5439	8,237±0,6240	8,058±0,7751	8,688±0,7456
Father's Education :				
High School	18 (75%)		14 (58,33%)	
Middle School	6 (25%)		10 (41,67%)	
Mother's Education :				
High school	9 (37,50%)		7 (29,17%)	
Middle school	15 (62,50%)		17 (70,83%)	
Father's occupation :				
Farm worker	3 (12,50%)		5 (20,83%)	
Farmer	19 (79,16%)		16 (66,66%)	
Tradesman	2 (8,34%)		3 (12,51%)	
Occupation :				
Farm worker	3 (12,50%)		4 (16,67%)	
Farmer	17 (70,83%)		16 (66,66%)	
Tradesman	4 (16,67%)		3 (12,50%)	
Government employee			1 (4,17%)	
Family income				
< Rp. 2.000.000	21 (87,5%)		23 (95,83%)	
≥ Rp. 2.000.000	3 (12,5%)		1 (4,17%)	

From table. 1 it can be seen that there was an increased body weight before and after the intervention of the two groups given the biscuit intervention from the Ministry of Health and the intervention of giving millet (foxtail millet)-tuna cookies.

**Table 2. Test Results of Nutrition Value for Millet (Foxtail Millet)-Tuna Cookies**

Parameter	Unit	Result	Methods
Calorific value	kcal/100 g	449,03	By Calculation
Protein	gr/100 g	10,24	SNI 2973-2011; point A.4
Fat	gr/100 g	15,3	SNI 01-2891-1992; point 8.1
Carbohydrate	gr/100 g	69	By Different

Source: SUCOFINDO Laboratory (2019)

Based on SNI 2973: 11 test, it can be seen that the nutritional content of millet (foxtail millet)-tuna cookies are safe to be consumed chemically and biologically. Also the nutritional content between millet (foxtail millet)-tuna cookies and supplementary feeding from the Ministry of Health for toddlers are compared. SNI and nutrient content test was conducted by the SUCOFINDO laboratory in Surabaya. Ingredients tested were millet (foxtail millet)-tuna cookies with 100 gr of millet and 50 gr of tuna.

**Table 3. The Comparison of Nutritional Value of Millet (Foxtail Millet) –Tuna Cookies with Biscuit from the Ministry of Health per 100gr**

Nutritional Value	Millet (foxtail millet)-Tuna Cookies	Biscuit from Ministry of Health	Gap
Energy (Kkal)	449,03	450	-0,97
Protein (gr)	10,24	10	0,24
Fat (gr)	15,3	15	0,3
Carbohydrate (gr)	69	70	-1

Source: SUCOFINDO Laboratory (2019)

The nutritional value of millet (foxtail millet)-tuna cookies per 100 grams compared to biscuit from Ministry of Health has a gap that can still be tolerated, which is for energy there is a gap (-0.97 Kcal), protein (0.24 gr), fat (0.3gr ), and carbohydrates (-1gr). With nutritional

values adjusted to the Ministry of Health standards, it is expected that the millet (foxtail millet)-tuna cookies which made from local food ingredients, has the same nutritional values which are in accordance to Ministry of Health standards and SNI 2973: 11.

**Table 4. T-Test Results for Nutritional Status (Weight for Age) in Two Intervention Groups**

Group	n	Mean	SD	p
<b>Before :</b>				
Control	24	-2,31	0,27	0,959
Experiment	24	-2,31	0,24	
<b>After :</b>				
Control	24	-2,24	0,20	0,000
Experiment	24	-1,95	0,19	

Source: Stata 13 data (2019)

From table 4 it can be seen that the nutritional status (weight for age) for the experimental and control groups before the intervention did not differ significantly ( $p = 0.959$ ), it means that the two groups had almost the same intake before the intervention. However, with the intervention (giving millet (foxtail millet)–tuna cookies and biscuits from the Ministry of Health) and nutritional education (eight times) for 60 days, there was a significant difference in nutritional status (weight for age) intake between the experimental and control groups ( $p = 0,000$ ).

**Table 5. T-Test Results for Zinc Values in Two Intervention Groups**

Group	n	Mean	SD	p
<b>Before :</b>				
Control	24	52,75	6,73	0,398
Experiment	24	54,58	8,08	
<b>After :</b>				
Control	24	71,95	5,97	0,000
Experiment	24	92,75	4,98	

Source: Stata 13 data (2019)

From table 5 it can be seen that the zinc values for the experimental and control groups before the intervention did not differ significantly ( $p = 0.398$ ) it means that the two groups had almost the same intake before the intervention. However, with the intervention (giving of millet (foxtail millet)–tuna cookies and biscuits from the Ministry of Health) and nutritional education (eight times) for 60 days, there was a significant difference in zinc values between the experimental and control groups ( $p = 0,000$ ).

Zinc is one of the micro minerals needed for every cell in the body. Adequacy of this mineral is important in maintaining optimal health. Zinc functions as a cofactor for various enzymes, cell structure and integration, DNA

synthesis, hormonal storage and expenditure, immune-transmission and has a role in the immune system. Zinc deficiency can cause decreased appetite, dermatitis, slow growth, and immunodeficiency<sup>6</sup>.

Pregnant women, breastfeeding mothers, children in their infancy and also parents, those are included in the range of zinc deficiency group. Zinc deficiency experienced by almost all respondents in this study could be caused by the lack of consumption of foods with high zinc content<sup>7,17</sup>.

Based on laboratory results before and after the intervention, there was an increase with a significant average from 53.66 mg to an average of 82.5 mg of zinc

value. Through this study, the administration of foxtail millet-tuna, and nutritional education for eight times, was able to increase the zinc value on average to 92.15 mg. For the intervention of millet (foxtail millet)-tuna cookies had added higher value than the intervention of biscuits from the Ministry of Health, this is because the zinc content in tuna flour affects the increases in zinc value<sup>2</sup>. The acceptability of millet (foxtail millet)-tuna cookies as additional food is higher than the acceptability of biscuits from the Ministry of Health.

### Conclusion

Biscuit interventions from the Ministry of Health and millet (foxtail millet)-tuna cookies (from local food) both improve nutritional status and zinc values in children aged 6-24 months with underweight nutritional status in Pacitan Indonesia. But cookies millet (foxtail millet)-tuna from local food ingredients, with proper processing will increase the nutritional status and zinc value greater in infants aged 6-24 months with under malnutrition status.

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