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## The Effect of Moringa Leaf Extract in Breastfeeding Mothers against Anemia Status and Breast Milk Iron Content

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### Abstract

Moringa leaves contain a wide variety of macro and micro nutrients, the results of the analysis of moringa leaf extract contains vitamin C and minerals iron (Fe) respectively 1514.96 mg and 9.72 mg per 100 g. The purpose of this study was to assess differences in the levels of change in the status of anemia and iron (Fe) of the breast milk in breastfeeding mothers who acquire capsules Moringa leaf extract compared to the control. The study design was a randomized controlled double-blind design. Samples were obtained from the working area of Public Health Centers (PHC) Marusu, Maros District. A total of 71 breastfeeding mothers are willing to become the samples were divided into 2 groups randomly. The intervention group (n = 35) and controls (n = 36) each received 2 x 2 capsules moringa leaf extract and moringa leaf powder each (@ 800 mg). Interventions carried out for 90 days. Statistical test used was the Independent t test, Wilcoxon test, Mann-Whitney U test and the McNemar test. Characteristics of the sample did not differ significantly (p > 0.05). After the intervention increased Hb levels of 0.30 mg / L in the intervention group, but not significantly different (p = 0.195). Status of anemia decreased in the intervention group from 54.3% to 20%, significantly different (p = 0.012).

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Iron content of the milk both groups increased slightly, but not significantly different ( $p = 0.827$ ). It was concluded that administration of Moringa leaf extract has the potential to increase Hb levels so that the lower the maternal anemia, although the iron content of the milk does not increase significant.

**Keywords:** Moringa leaves, breastfeeding mothers, anemia status and breast milk

## **1. Introduction**

Insufficient nutrient intake, infection, and good parenting is not a direct cause of malnutrition in infants and children [1]. This has an impact not only on the macro nutrient deficiencies but also micronutrients that are essential for the growth and development of young children. Fulfillment of the nutritional needs of infants 0-6 months of absolute obtained through breast milk for exclusively breastfed infants [2,3,4,5). Based on this, the efforts to improve infant nutrition infants 0-6 months through improved maternal nutrition before and during exclusive breastfeeding. World Bank [6] suggests that efforts to improve nutrition infants 0-6 months based on that malnutrition is less than 2 years of age will have an impact on reducing the physical growth, brain development, intelligence, and productivity; where the impact is largely irreversible.

In the physiological state of the nutritional needs of breastfeeding mother increased because of the need to produce milk that is prone to the occurrence of malnutrition [6]. The low micronutrient consumed by breastfeeding mothers will affect the ability to provide breast milk containing sufficient micronutrients for growing baby. The prevalence of iron deficiency anemia in breastfeeding mothers as a whole is not known but is thought to almost the same as the prevalence of iron deficiency anemia in pregnant mothers with the assumption that pregnant mothers will be Breastfeeding mothers. The prevalence of anemia at 6 months postpartum mothers 31.65% [7]. Anemia in Breastfeeding mothers will have an impact on the ability to produce enough milk where network backup or mother will be used to produce milk that the mother is at risk for malnutrition and anemia occurrence greater.

Research results in the malnourished communities in Senegal, Africa with moringa leaf powder therapy showed significant results on the nutritional status of individuals [8). Research Tshikaji [9] states that one of the efforts to address malnutrition is the use of Moringa as a source of additional dietary, because moringa leaves contain complete protein (contains 9 essential amino acids), calcium, iron, potassium, magnesium, zinc and vitamins A, C, E and B which have a major role in the immune system. A study on the provision of Moringa leaf powder randomly assigned to two groups of breastfeeding mothers with babies 3-4 months each given moringa leaf powder and tablets of iron / folic acid (control), after 3 months therapy, the average levels of hemoglobin concentration increased significantly both treatment and control groups, although plasma ferritin levels were not significant in the group receiving Moringa flour [10]. Furthermore concluded that the leaves of Moringa is a food that can increase your milk supply. Research results indicate that administration of Moringa leaf powder can increase milk production of mother rats significantly. Dosing from 42 mg / kg bw significantly can make milk secretion increased white rats and mice body weight increased with increasing dose given [11].

Preliminary data analysis results nutritional composition of Moringa leaf extract Sulawesi varieties in 100 g of

protein respectively 12.31%, 18.62% fat, provitamin A ( $\beta$ -carotene) 313.47 mg, 1549.4 mg of vitamin E, vitamin C 1514.96 mg, iron (Fe) 9.72 mg, zinc (Zn) 3.7 mg and 47.45 mg selenium. The purpose of this study was to assess differences in the change of status of anemia and iron content of breast milk in Breastfeeding mothers who acquire capsules moringa leaf extract compared to the control.

## **2. Materials and Methods**

### **2.1 Research site**

The study was conducted in the working area of Community Health Centers (CHC) Marusu. Regency Maros, South Sulawesi, Indonesia.

### **2.2 Intervention materials**

Moringa leaves are green dry extract using 80% ethano, maceration carried out for 24 hours, extract rotary evaporator at a temperature of 50°C for 2 x 24 hours. The result dried frozen (freeze dryer) for 2 x 24 hours. Results moringa extract mixed with flour in the ratio (1: 4) and then inserted into an extract of Moringa capsules weighing 800 g.

### **2.3 Design and variables**

Type of research is the design of randomized controlled intervention Double Blind where intervention will be carried out of 90 days with variables assessed were hemoglobin (Hb) and the status of anemia and iron content of the milk before and after intervention.

### **2.4 Research subjects**

The study subjects were Breastfeeding mothers 15-20 days after a normal delivery who live in the region of CHC Marusu, Maros regency taken purposively based on inclusion criteria, a total of 71 Breastfeeding mothers were divided into 2 groups of 35 intervention and 36 control group randomly selected to obtain the moringa capsules for 90 days. Mothers who are willing to participate in this study had previously signed informed consent issued by the health research ethics committee of the Medical School, University of Hasanuddin with number: 1642 / H4.8.4.5.31 / PP36-KOMETIK / 2013. A total of 12 samples dropped out of the study for reasons moved away and did not consume capsules 3 days in a continued.

### **2.5 Data collection**

Data were collected using a questionnaire for socio-economic characteristics including, age, education, employment and food expenditure. Breast milk taken using a breast pump as much as 10 ml were accommodated in a sterile glass bottles, before analyzed stored in a freeze dryer at a temperature of -18°C. Hemoglobin (Hb) was measured by cyanmethemoglobin method using a HemoCue Hb 201+ and iron content of breast milk in a measuring method Spectrometri Atomic Absorption (AAS) at the Center for Health Laboratory

Makassar.

### 2.6 Data analysis

Bivariate analysis was used to assess differences in the average group before and after treatment is paired t test when the data are normally distributed and the Wilcoxon test when the data are not normally distributed. To assess differences in mean changes between the two intervention groups and the control used independent t test when the data are normally distributed and the U Mann-Whitney test when the data are not normally distributed. McNemar's test was used to analyze categorical pairwise comparisons. Univariate and bivariate analysis using SPSS.

### 3. Results

Socioeconomic characteristics consist of a number of members of the family, mother's age and education and employment, income and household food expenditure. In general, social and economic characteristics in both groups were relatively the same as presented in Table 1.

**Table 1:** Characteristics of the sample family socioeconomic

Variable	Group		Total (n = 71)	p Value
	Intervention (n = 35)	Control (n = 36)		
Age of Mather (years)	24,91 ± 5,27	26,27 ± 5,46	25,59 ± 5,36	0,286*
Number of Family Members (people)	5,22 ± 1,53	5,69 ± 2,09	5,45 ± 1,81	0,279*
Number of children < 5 y	1,27 ± 0,51	1,38 ± 0,54	1,32 ± 0,52	0,378*
Mother education (y)	8,02 ± 2,84	7,58 ± 1,96	7,80 ± 2,40	0,443*
Occupation (%)				
- Does not work	35 (100)	35 (97,2)	70 (98,6)	1,000**
- Working	0	1 (2,8)	1 (1,4)	
Family Income (Rp/month)	1.458333,33 ± 765273,06	1.761111,11 ± 1.167910,90	1.609722,22± 9666591,98	0,198*
Food expenditure (Rp/ month)	82,54 ± 45,50	88,61 ± 51,25	85,57 ± 48,37	0,599*

Source: Primary Data, 2015; \*= Independent T Test; \*\*= Fisher Exact Test

A total of 71 samples, 35 samples each intervention group and 36 samples of the control group. Total average family member of 5 people, nationally not meet the ideal family, therefore according to population and family planning agencies nationwide (BKKBN) family size is 4 people. Generally families have 1-2 children. Age mother including age well for earning and reproduction produces offspring.

Mother's education level is still relatively low at an average of 7-year study period. The average family income is at the regional minimum wage Rp.1.612.920,18 ± 836,570.165. Food expenditure for families is high at 85.57%, the family of this sample is classified as income was low. Mother most do not work so incomes are generally derived from the father, the father work quite vary but when taken in conjunction with the acquisition of income then this is the kind of job you work with a relatively low income. This type of work in both groups as private sector employees, working in factories, construction workers and peasants, merchandise mix, vegetables circumference, fish, driver / motorcycle. Work father is still more reliant on physical strength and thus require greater energy.

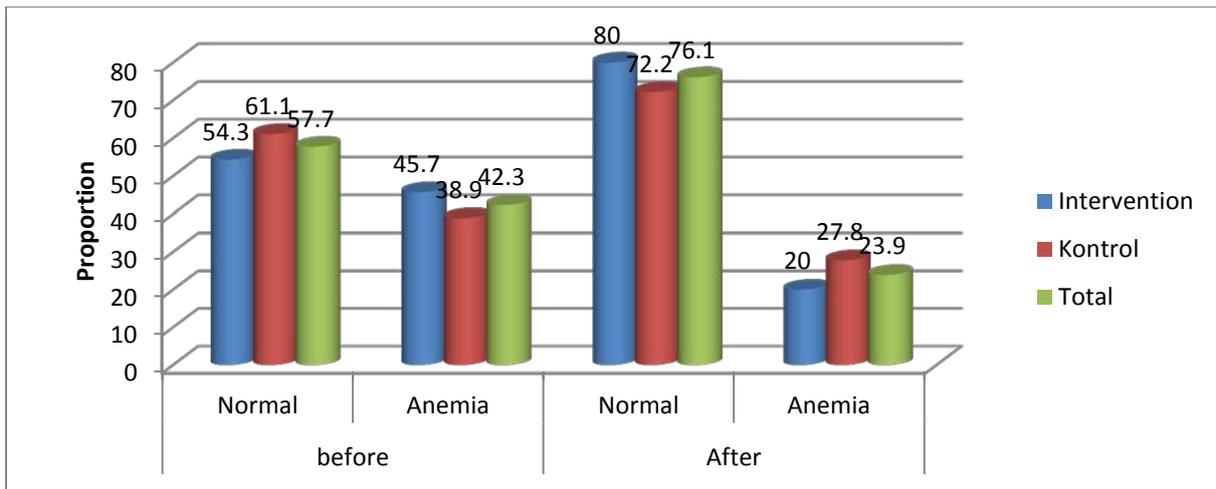
Table 2 shows that in general Hb Breastfeeding mothers on average > 11 g / dl). Hb level at the beginning of the intervention Breastfeeding mothers did not differ significantly (p> 0.05). After the intervention showed Hb level Breastfeeding mothers in the intervention group increased by 0.30 g / dL, whereas in the control group decreased 0.02 g / dL. Increased levels of Hb Breastfeeding mothers showed no significant difference either in the intervention group and the control (p> 0.05). At the end of the Hb level between the intervention and control groups also showed no significant difference (p> 0.05).

In the iron content of breast milk indicate the beginning and end of treatment between the intervention and control groups did not differ significantly (p> 0.05), both treatment groups were equally increased after intervention respectively 0.09 ± 0.49 mg / L in the group intervention and 0.09 ± 0.24 mg / L in controls, but the increase did not show a significant difference (p> 0.05) before and after the intervention.

**Table 2:** The mean Hb and iron Breastfeeding mothers before and after intervention by the intervention and control groups

Variable	Before (X±SD)	After (X±SD)	P Value <sup>a</sup>	Δ(after-bifore) (X±SD)	P Value <sup>b</sup>
<b>Hb (g/dL)</b>					
Intervention	11,27±1,77	11,57±1,23	0,195	0,30±-0,54	0,739
Control	11,51±1,82	11,49±1,37	0,666	-0,02±-0,45	
<b>Content Iron (mg/L)</b>					
Intervention	0,69±0,51	0,78±1,00	0,632	0,09±0,49	0,827
control	0,58±0,63	0,67±0,87	0,574	0,09±0,24	

Source : Primary Data, 2015, <sup>a</sup>=Wilcoxon test, <sup>b</sup>=Mann-Whitney test



**Figure 1:** Comparison of the proportion (%) of anemia between groups before and after intervention

Figure 1 shows the status of anemia in the intervention group decreased from 45.7% to 20%, while the control group decreased from 38.9% to 27.8%. Statistically based McNemar Test decrease anemia status in the intervention group were significantly different ( $p = 0.012$ ), whereas the control group did not differ significantly ( $p = 0.388$ ). Despite the end of the intervention and control kolompok intervention did not differ significantly ( $p > 0.05$ ). This means that the status of anemia occurs improvement after the intervention.

#### 4. Discussion

Breastfeeding mothers who have just given birth (postpartum) including a group prone to anemia, therefore gave birth occurs when blood expenditure despite a normal delivery. Needs the nutrients essential for the formation of Haemoglobin (Hb) as iron increased in the puerperium and lactation further, so that the use of iron stores in the body also increases. This happens because in addition to iron intake daily breastfeeding mothers does not meet the needs of increasing due process of milk production and high activity, also due to inadequate intake of nutrients which helps iron absorption such as vitamin C, which is one of the elements that will determine the in the incidence of anemia in breastfeeding mothers.

Intervention in the form of extract of Moringa leaf increases Hb levels breastfeeding mothers. Hb level breastfeeding mothers in the intervention group were consuming Moringa leaf extract increased 0.30 g / dl. However, the results of statistical tests (paired test) showed no significantly different between Hb level Breastfeeding mothers before or after the intervention ( $p = 0.195$ ). However, based on the status of anemia in the intervention group were consuming Moringa leaf extract decreased from 45.7% to 20%, the result of statistical test (Mc Nemar test) decreased significantly ( $p = 0.012$ ) after the intervention. It can match with the results of the study Dossou et al., (2011) in her study of Breastfeeding mothers. Provision of Moringa leaf powder 100 g per week (14.28 g / hr) for 3 months can increase the Hb concentration significant Breastfeeding mothers and Breastfeeding mothers anemia status, the better.

Studies conducted in Gowa reported that administration of Moringa leaf extract can improve hemoglobin levels

of pregnant mothers [12], different things reported in Makassar given to pregnant mothers informal workers concluded extract Moringa leaves cannot increase maternal hemoglobin concentration, but both of these studies Moringa leaf extract combined with iron folate and most of the research subjects were pregnant mothers are anemic [13].

Statistically Hb breastfeeding mothers showed a positive correlation to the direction of the iron content of the milk with the strength of a weak correlation ( $p = 0.084$ ,  $r = 0.206$ ). The results of this study indicate that the iron content of breast milk in mothers who consume greater Moringa leaf extract is  $0.78 \pm 1.00$  mg / L compared to i.e  $0.67 \pm 0.87$  mg / L. of control. Although statistically significant (Mann-Whitney test) did not differ significantly between the groups that received the extract of Moringa leaves with a share of moringa leaf powder ( $p > 0.05$ ), but the standard deviation seen in the intervention group who received the extract of Moringa leaf is larger  $1.0$  mg / L, so that the leaf extract of Moringa assumed to contribute in increasing the iron content of the milk. Iron content of breast milk in this study is lower than the results study in Bogor [14] with the provision of instant noodles fortified with iron multi mikronutrien consumption of instant noodles in the treatment group  $6.2 \pm 0.9$  mg (19% RDA) can increase the iron content of breast milk amounted to  $6.66 \pm 5.3$  mg / L were  $4.92 \pm 2.90$  previously mg / L.

Protein intake  $77.22 \pm 38.22$  g (105.34% RDA) and other nutrients such as Fe  $8.42 \pm 5.17$  mg of vitamin C from food and moringa leaf extract ( $40.00 \pm 7.93$  mg) also plays a role in maintaining the stability of the iron content of breast milk. Consumption of this protein plays a role in iron transport into the mammary gland. Transferring and lactoferrin is an iron transport proteins that are structurally and functionally similar. The amount of transferrin and lactoferrin as well be decisive against the iron content of breast milk, so in addition to the consumption of iron, protein consumption is also expected to determine the iron content of the milk.

Moringa leaves have the potential for large enough nutrients, amino acids and contains a wide range of micronutrients, especially iron is quite high at 28.29%. Besides, Moringa leaves also contain a number of important nutrients to help the digestion of iron in the body such as vitamin C is 220 mg% [9]. Vitamin C content of Moringa leaf extract expedite the process of absorption of iron [15]. The results of chemical research analyst in the Research and Development Agency showed Moringa leaves have a high nutritional value due role in 100 g contains 26.79 mg Fe; 1249.25 mg Ca; K 0.09%; Protein 24.27%; 24916.85 IU of vitamin A and vitamin C 413 mg [16]

We conclude that the leaf extract of Moringa can increase hemoglobin concentration and anemia status of breastfeeding mothers and iron content of the milk, to the need for increased knowledge of breastfeeding mothers in consuming Moringa leaves and provision of Moringa leaf extract capsules performance.

## **5. Conclusion**

Status of anemia in breastfeeding mothers who acquire the better of Moringa leaf extract after intervention and significantly different than control ( $p < 0.05$ ), but the iron content of breast milk obtain Moringa leaf extract did not differ significantly ( $p > 0.05$ ) with obtain Moringa leaf powder.

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