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Infant Nutritional Status of 0-6 Months of Exclusive Breastfeed Due to The Application of Moringa Leaf Extract in Breastfeeding Mothers

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ABSTRACT

The objective of this study was to assess the difference between 0-6 months of exclusive breastfeeding status in breastfeeding mothers who received Moringa leaf extract and Moringa flour. Intervention study with double blind with randomized controlled. implemented in Maros regency of South Sulawesi. A total of 70 nursing mothers and infants were sampled, 35 intervention and 35 controls. purposive sampling based on the inclusion criteria. Material of intervention in the form of Moringa leaf extract and control in the form of Moringa leaf powder, encapsulated in the same color and weight. The data were analyzed statistically with T test. Generally 25-year-old research subjects (53%), primary school (56%), daddy labor (54%), generally had 1 infant (70%), and family food expenditure above 70% (57%). Maternal characteristics did not differ significantly between groups. The results showed that the infant's nutritional status based on the Z score of body weight by age (WA) at 4 months of age was significantly different (p = 0.030) and was not significantly different (p = 0.062) at 6 months. Infants' nutritional status based on Z score of body length by age (HA) was not significantly different at age 4 and 6 months (p = 0.339 and 0.265).

Keywords: Moringa extract, Infant, Nutritional status

INTRODUCTION

Fulfilling the nutritional needs of infants 0-6 months is absolutely obtained through breast milk for infants with exclusive breastfeeding(1). Based on this case, the effort to improve the nutrition of infants 0-6 months is done through the improvement of mother's nutrition before and during the exclusive breastfeeding. Onis and Onyango(2) suggested that nutrition improvement efforts for infants 0-6 months are based that under-nutrition at age less than 2 years will have an impact on decreasing physical status, brain development, intelligence, and productivity; this impact is largely irreversible. In the physiological state of breastfeeding the nutritional needs of the mother increases due to the need to produce milk, Rahayu's research results(3) states that the dietary factors significantly affect the production of breast milk in addition to psychic factors and baby sucking. Moringa oleifera a local food that has the potential to be developed in culinary breastfeeding mothers, because it contains phytosterol compounds that function to improve and facilitate the production of breast milk (lactagogum effect)(4). Increased milk production, the nutrient intake in infants is also increasing which is expected to result to the infant nutritional status.

The aim of this research is to know the effect of giving extract of moringa on breastfeeding mother to infant nutritional status 0-6 months based on body weight by age (WA) and height by age (HA) indeks.

METHODS

The dried green moringa leaves were extracted using ethanol 80%, maceration was done for 24 hours, extracted dirotavapor at 500 C for 2 x 24 hours. The result is freeze dried for 2 x 24 hours. The extract result was mixed with Moringa leaf starch flour with ratio (1: 4) then put into one capsule weighing 800 mg. Control using moringa flour without extract. Each Moringa extract capsule contains 0.10g protein, 0.15g fat, vitamin A 2.5µg, vitamin E 11.72mg, vitamin C 10.25mg, and 0.08mg iron, and moringa flour capsules contain 0.22g protein, fat

0.02g, vitamin A 0.13µg, vitamin E 0.90mg, vitamin C 0.14mg, and iron 0.28mg. This research was conducted in Maros Regency of South Sulawesi Province. Experimental research with Double blaind design with randomized control. Each packaging of the intervention material is encoded on the label to ensure participants receive the same preparations. Interventions were administered 2 x 2 capsules daily for 3 months divided into two groups, the intervention group determination was made lottery based on the intervention material codes (A and B), the intervention material code was determined by the consultant prepared in the plastic bag of the kleim. Infants' nutritional status is measured at 4 and 6 months of age. The subjects of this study were breastfeeding mothers and their infants one week after normal delivery were taken purposively based on the inclusion criteria by field officers and researchers. The number of sempel that can be analyzed is 70 mother and baby respectively 35 sample of intervention and 35 control. Data were collected using questionnaires for socioeconomic characteristics of the family such as age, education, occupation and food expenditure. Body weight and body hight/length of infants 0-6 months were measured at 0, 4 and 6 months, Body weight was measured using baby's weight with accuracy of 1 g of Zigma brand and infant length measured using body length (pixasi board) Seca brand with a precision scale of 0.1 cm. Infants' nutritional status is expressed in Z score based on body weight (kg) by age (WA) and body length (cm) by age (HA) index at 4 and 6 months. Bivariate analysis was used to assess the effect difference between 2 intervention groups and controls using independent t test[(5)].

RESULTS

Characteristics of Socio-Economic Family Samples

Table 1. Socio-economic characteristics of family

Variable	Intervention (n=35)		control (n=35)		Total (n=70)		p*
	n	%	n	%	n	%	
Mother's age							
➢ 25 years	14	40.0	19	54.3	33	47.1	0.231
≤ 25 years	21	60.0	16	45.7	37	52.9	
Education mother							
➢ Primary school	14	40.0	17	48.6	31	44.3	0.470
≤ Primary school	21	60.0	18	51.4	39	55.7	
Mother's job							
Housewife	35	100.0	34	97.1	69	98.6	1.000
Civil servants	0	0	1	2.9	1	1.4	
Age of father							
≥ 30 years	15	42.9	17	48.6	32	45.7	0.631
< 30 years	20	57.1	18	51.4	38	54.3	
Education father							
➢ Primary school	27	77.1	22	62.9	49	70	0.192
≤ Primary school	8	22.9	13	37.1	21	30	
Father's occupation							
Civil servants	0	0.0	1	2.9	1	1.4	0.698
Private employees	21	60.0	17	48.6	38	54.3	
Merchants	2	5.7	2	5.7	4	5.7	
Employers	1	2.9	1	2.9	2	2.9	
Farmers / fishermen	0	0	2	5.7	2	2.9	
Labor	5	14.3	7	20.0	12	17.1	
Other (motorcycle taxi / driver)	6	17.1	5	14.3	11	15.7	
Number of family members							
≤ 4 People	11	31.4	11	31.4	22	31.4	
➢ 4 People	24	68.6	24	68.6	48	68.6	1.000
Number of children under five							
➢ 1 Person	8	22.9	13	37.1	21	30.0	0.192
= 1 Person	27	77.1	22	62.9	49	70.0	
Family income (month)							
≥ IDR. 2.000.000,-	6	17.1	8	22.9	14	20.0	0.50
< IDR. 2.000.000,-	29	82.9	27	77.1	56	80.0	
Food expenditure							
< 70 %	18	51.4	12	34.3	30	42.9	0.14
≥ 70 %	17	48.6	23	65.7	40	57.1	

Chi square test result from all sample family characteristics obtained p> 0.05, showed no difference of sample between group of intervention and control.

Weight and Length According to Age

Preliminary analysis (0 months) of body weight and length of infants between intervention and control groups were not significantly different. The analysis of the nutritional status of infants by weight and body length

was performed at 4 and 6 months of age, distinguished between groups of men and women on the basis that men theorists had different weights and lengths than women at the time of his status.

Table 2 shows that the mean weight of infant boys was slightly higher in the intervention group than in the controls at the age of 4 months (6.48 vs 6.42 kg) and the age of 6 months (7.12 vs 7.04 kg) the difference is not significantly different (p> 0.05). For weight at 4 months the intervention group was slightly lower than controls (61.9 vs 62.3 cm) and at the same 6 month average (65.0 vs 65.0). weight and length men between the intervention and control groups were not significantly different at age 4 and 6 months (p> 0.05).

The mean weight of infant female in the intervention group was higher than control at 4 months (6.28 vs 5.96 kg) and 6 months (6.86 vs 6.65). The average difference between female weight at age 4 months was significantly different (p <0.05), but after 6 months was not significant (p> 0.05). For infant lenght at 4 months intervention group was slightly higher than contro (61.6 vs 61.4 cm), but lower at age 6 months (65.0 vs 65.2 cm), lenght female infant difference between intervention groups and controls at age 4 and 6 months were not significantly different (p> 0.05) (Table 2).

Tabel 2. The average of weight and lenght based on sex and intervention

Sex	Group	Age 0 months		Age 4 months		Age 6 months	
		Weight (kg)	Length (cm)	Weight (kg)	Length (cm)	Weight (kg)	Length (cm)
Male	Intervention (n=13)	3.15	49.5	6.48	61.9	7.12	65.0
	Control (n=20)	2.98	49.4	6.42	62.3	7.04	65.0
	p value*	0.141	0.894	0.349	0.250	0.343	0.484
Female	Intervention (n=22)	3.12	49.5	6.28	61.6	6.86	65.0
	Control (n=15)	3.01	49.1	5.96	61.4	6.65	65.2
	p value*	0.352	0.204	0.048	0.374	0.159	0.368

*Independent T test

Infant Nutritional Status

When the age of 4 and 6 months is the point that indicates the cumulative effect received during the administration of Moringa leaf extract in breastfeeding mothers and assessed by nutritional status, then the influence based on nutritional status of infants at age 4 and 6 months is quite good. The distribution of nutritional status of infants at 4 months and 6 months (cut-of-2 Z) is presented in Table 3.

Table 3. Infant nutritional status based on Weight of Age (WA) and Length of Age (HA) cut of -2 Z score

Treatment	Age 4 month		Age 6 month	
	Normal	Less	Normal	Less
WA				
Intervention	35 (50.7%)	0 (0.0%)	33 (51.6 %)	2 (33.3 %)
Control	34 (49.3%)	1 (100%)	31 (48.4%)	4 (66.7 %)
p value	1.000		0.673	
HA				
Intervention	34 (54.7%)	1 (33.3%)	33 (51.6 %)	2 (33.3 %)
Control	33 (49.3%)	2 (66.7%)	31 (48.4%)	4 (66.7 %)
p value	1.000		0.673	

The proportion of infants at age 4 and 6 months was higher in the intervention group than in the control group on the basis of WA and HA, although the difference was not significantly different (p> 0.05) between the intervention and control groups on both indicators. At the age of 4 months based on the index of WA, there is no infant nutrient less, but in the control group there is 1 infant less nutrition. After the age of 6 months in the intervention group found 2 infants less nutrition and 4 infants in the control group.

Stunting at 4 months of age found 1 infant in the intervention group and 2 infants in the control group, after the age of 6 months of infants short (stunting) in the intestine group to 2 infants while in the control group increased to 4 babies. To complete the analysis and look for an average initial and final score of infant nutritional status based on Z score, submit Table 4.

Table 4. Mean score of Z based on index of WA and HA of infant

Variable	Age 4 month (X±SD)	*p value*	Age 6 month (X±SD)	*p Value*
WA				
Intervention	-0.40±0.60	0.030	-0.71±0.62	0.062
Control	-0.74±0.87		-0.98±0.82	
Difference	0.34±0.27		0.27±0.20	
HA				
Intervention	-0.51±0.76	0.339	-0.68±0.82	0.265
Control	-0.58±0.80		-0.83±0.93	
Difference	0.08±0.04		0.13±0.11	

Table 4 shows the mean Z scores based on the infant WA and HA index in the intervention group higher than the control group at 4 and 6 months of age. The average Z score based on WA index at 4 months of age was significantly different ($p < 0.05$), but not significantly different at the age of 6 months. While Z score based on infant HA index was not significant between intervention group and control group at age 4 and 6 months ($p > 0.05$).

DISCUSSION

Nutritional status is one of the foundations for assessing the nutritional adequacy of infants that impact on physical aspects so that anthropometric measurements consisting of body weight, length or height are generally used in nutrition programs to monitor nutritional status. Discussion of research findings in accordance with existing theories, infant status in this study was assessed based on body weight index and body length according to age Z score (cut of -2 Z),

Accumulation of infant weight assessed at the age of 4 months in infant boys showed no significant difference ($p = 0.349$; 95% CI: -0.147-0.216), but the mean infant weight was higher in the intervention group than in the control group (6.48 vs 6.42 kg). However, female infant weight differed significantly higher in the intervention group than in control ($p = 0.048$, 95% CI: -0.031 - 0.301), the empirical facts and the results of fact analysis in this study showed biologically the extract of moringa leaf in breastfeeding mothers can contribute to the infant nutritional status. To reinforce the contribution of moringa leaf extract in breastfeeding mothers to infants' nutritional status, Table 4 shows the mean Z score of WA index at 4 months was significantly different in the intervention group than control (-0.40 ± 0 , 60 vs -0.74 ± 0.87; $p = 0.030$; 95% CI: -0.007-0.348).

The consumption of Moringa leaf extract by breastfeeding mothers in this study had an indirect effect on infant weight status. This can be shown biologically average infant weight, Z score of WA index and infant body weight rate targeted at intervention group better than control. Leaf extracts containing various micronutrients such as iron, vitamin C and E and other phytochemical compounds directly affect the increase in the volume of breast milk[6], so as not to have iron deficiency, zinc, calcium, vitamin C, vitamin E, vitamin A, and B vitamins. In addition to micronutrients, Moringa leaf extract also contains macro nutrients such as energy and protein that have the potential to gain weight[7].

The results of multiple linear regression test showed a negative relationship between infant morbidity with baby's weight status based score Z index WA, which means by the decreasing/low infant morbidity will be better infant weight status. Infant morbidity affects infant weight, especially diarrhea. This weight loss in addition to the reduced appetite is also caused by disruption of nutrient absorption. Impaired absorption of these nutrients affect the nutritional status or other metabolic processes. The primary determinants of a baby's survival after birth are its ability to withstand infections, respiratory illness, diarrhea so that newborns are at high risk for infection during the first 6 months due to imperfect immune function and highly pathogenic exposure[8].

Post-4-month intervention, infants' nutrition status was monitored for up to 6 months, Data showed 6 infants whose weight was disturbed less than the minimum standard (-2 Z), 4 of them in the control group and 2 infants in the intervention group. 3 of which are caused because the three babies have a history of infectious diseases such as itching and boils (dermatitis) in the body at the age of 2-4 months. Field observations indicate hygiene and sanitation conditions of houses that do not meet health requirements such as, damp housing, inadequate ventilation and a plastic floor above the ground. One of them has been given breastmilk substitutes by his mother and is often left behind by his mother so it is suspected of lacking nutritional intake. 2 infants who were underweight in the intervention group, one of whom was due to the infant being ill the past month and one other baby had stopped feeding replaced with formula milk.

Exclusive breastfeeding up to 6 months old infants had significant effect on bording line ($p = 0,062$) on infant nutrition status based on WA Z score index (Table 3). Similarly, Susiloretni[9] in Demak Regency (Central Java) who disclosed exclusive breastfeeding had a protective effect on infants' weight status at 4-6 months with a

weight gain of 0.100 kg (95% CI: 0.01-0.019) was higher in the intervention group. The exclusive breastfeeding protective effect is also found in studies in Bangladesh showing that exclusive breastfeeding and nutrition education may increase the weight and length of the low birth weight children in the intervention area (3620 ± 229 g vs 3315 ± 301 g, p <0.001 and 50.2 ± 1.3 vs. 48.7 ± 1.6 cm)[10].

The deviation of WA Z score occurring at the end of the intervention is when the 4 month old baby is the same as the result of the analysis of the study of the nutritional status of under five children conducted by Atmarita in [11] which states that the failure to grow starts at 4 months. This is confirmed by the discovery of Unicef (1999) which suggests that poor practice of supplementary food breast milk is common in developing countries and is a cause of poor nutritional status in toddlers. In addition, Wargiana[11] also reported that feeding at an early age causes a decrease in breast milk intake so prone to the fulfillment of infant nutritional needs. WHO[12] suggests that infant nutritional needs unmet until the age of two years affect not only the baby's physical status but also affect the baby's health, brain development, intelligence, and productivity. This impact is largely irreversible

The WA index is an overview of the current nutritional stability that is highly sensitive to weight changes, so the nutritional status of the better intervention group is due to the nutritional adequacy of higher breastmilk volume compared to the control group (Table 3), the volume of breast milk consumed by infants can increase fat storage and water content in baby's tissues. so the body weight is heavier.

The presence of disease will decrease appetite, resulting in weight loss. This is as stated by Gibson[13] states that morbidity can reduce the function of nutrients in the body thus affecting the status, especially weight. The effect of morbidity on infant nutritional status has been widely studied. Various diseases have been proven to affect the baby's status is diarrhea. Diarrhea (type, frequency and duration) has been shown to affect the nutritional status of infants[14].

The infant weight gain in this study was still higher than that of Aritonang[15] in the 0-4 months of infants in Bogor, which averaged 2.32 ± 0.82 kg after the intervention, but slightly lower when compared with weight gain a 0-4 month infant body exclusively breast-fed at 3.79 ± 0.46 kg in the Widodo study[16]. Work Bank[17] concluded that the cause of malnutrition in infants in both low-income and high-income families is feeding other than breastmilk before the infant is 6 months old.

CONCLUSION

The consumption of Moringa leaf extract in breastfeeding mothers may contribute to the nutritional status of infants at 4 months of age based on the Z score of body weight index by age (WAZ), but not significantly different at the age of 6 months. Differences in infant nutritional status were not significant based length on Z score by age (HAZ) at age 4 and 6 months.

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