

Effect of moringa leaves during pregnancy on growth and morbidity in 0–5 months[☆]



Mahmud Nur Ulmy^{a,b,*}, Abdullah Tahir^c, A.A. Arsunan^c, Bahar Burhanuddin^c, Hadju Veni^c

^a Postgraduate School Students Faculty of Public Health, Hasanuddin University, Indonesia

^b Faculty of Public Health, Universitas Muslim Indonesia, Indonesia

^c Faculty of Public Health, Hasanuddin University, Indonesia

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Abstract

Objective: Moringa leaves (ML) has been proved as a nutrient supplement during pregnancy. This study was undertaken to assess the effect of ML on growth and morbidity of infant 0–5 mo of age.

Method: This study was an intervention study. Subjects were originally pregnant mothers who were divided into three groups: group received ML powder (MLP, $n = 111$), group received ML extract (MLE, $n = 107$), and group received iron folic acid (IFA, $n = 122$). Each group received two capsules a day for 12 weeks during pregnancy and 4 weeks after giving birth. Growth and morbidity measurement were assessed each month during 5 mo period. Data was analyzed using Chi-squares.

Results: Study showed that prevalence of under nutrition at the first sixth months were 2.4%, 3.2%, 6.5%, 7.4%, 9.7%, and 7.9%, respectively for 0–5 mo. In addition, the prevalence of stunting were 3.2%, 9.7%, 20.0%, 24.7%, 19.6%, and 19.4%, respectively for 0–5 mo. The prevalence of wasting were 5.9%, 5.0%, 2.1%, 2.1%, 2.6%, 3.2% respectively for 0–5 mo. Not significantly different among groups in all parameters ($p > 0.05$). Upper respiratory infection was the most infection at the first 6 mo (2.06–4.2%).

Conclusion: We conclude that ML tends to protect from under nutrition to the infant but not stunting.

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* Corresponding author.

E-mail address: nurulmymahmud@yahoo.com (M.N. Ulmy).

Introduction

The neonatal period is an important period for survival of infants. Nutrition and breastfeeding are the most important things in this period for the physical and mental development of the baby.¹ In Indonesia, the coverage of exclusive breastfeeding for infants aged 0–6 months is fluctuating. In 2018, there is only 37.3% of exclusive breastfeeding. For the southern Sulawesi province, the coverage of exclusive breastfeeding from 2009 to 2014 is still below the national standard. In 2014 exclusive breast milk coverage was still 56.31%. Jeneponto district in 2008–2012 showed exclusive breastfeeding coverage was far from the 80% national standard. In fact, from the profile data of the South Sulawesi Provincial Health Office in 2012, Jeneponto district is the area with the lowest coverage of breastfeeding, which is around 20.57%. Furthermore, in 2013 it showed an increase to 67.66% while the proportion of cases of malnutrition in Indonesia was also still low. In 2013 is as many as 5.7% and for 2018 is as many as 3.9%. For a very short proportions in 2018 that is 11.5%, for very thin proportions in 2018 is as much as 3.5%.²

Many mothers start breastfeeding immediately after giving birth. However, the percentage mothers who give exclusive breastfeeding still very small. Most of the nursing mothers start breastfeeding on the first day after giving birth. Some complains of insufficient volume of breast milk. This has encouraged the mothers to stop breastfeeding and replace it with formula milk. *Galactagogues* are herbs that increase volume and facilitate the flow of milk. Several studies confirm the efficacy of *galactagogue* in helping nursing mothers.¹

Moringa leaves increase the effect of *lactation* as evidenced by a greater increase in maternal *serum prolactin levels*. Education lactation can improve knowledge, attitudes and behavior of mother to give breastfeeding up to 6 months.³ *Prolactin* is the most important hormone in *lactation initiation*. Moringa leaf powder is an effective *galactagogues* to increase volume and facilitate breast milk.⁴ The research results prove that *Moringa oleifera* is one source of food that are rich in very important nutrients to prevent disease.⁵

Previous research has discussed about pregnant and breastfeeding women. The facts show that nutritional problems at an early age need to be addressed from the time of pregnancy to the time of breastfeeding. Based on this, the researchers are interested in assessing the effects of giving *Moringa oleifera* to nursing mothers against genesis morbidity. Nutrition problem at an early age 0–5 mo became one of the aspects that affect morbidity and growth problems in infants

Method

The research method used in this study was an intervention study by taking samples of 0–5 month 29 days. Research location in Jeneponto district, South Sulawesi in Indonesia and carried out in 2018, the population in this study was 438 but only 370 met the inclusion criteria (pregnant women in the second trimester and one month after giving birth, parity ≤ 3 , single fetus, willing to take capsules for 4 months and

do not consume multivitamin and other minerals during the research). During the study, 340 were able to take completion because 22 pregnant women moved locations because they followed their husbands to work and 7 pregnant women who were unwilling to continue the study. Involving pregnant women (second trimester) with their babies from birth to age 5 months 29 days.

This study will be divided randomly into 3 groups *Moringa oleifera* flour (MLP, $n = 111$), extracts *Moringa oleifera* (MLE, $n = 107$) and iron Folate tablets (IFA, $n = 122$). Interventions will be given in pregnancies of 4–6 months and followed by intervention after delivery until the baby is 1 month old (Each get 28 capsules per week [500 mg]). Growth variable using anthropometric indicator weight for age score (WAZ), height for age score (HAZ), and weight for height score (WHZ), and morbidity looking at diarrhea and acute respiratory infection/ARI. Samples collected during the study included characteristics, health status and disease history, anthropometric measurements using the length board use to the check the length of the baby's body and digital baby scale marked the baby's weight. The sample was collected through interviews with questionnaires.

Data collection was carried out by researchers assisted by enumerators and health workers in the health center. Infant morbidity data showed diarrhea or ARI recorded through home visits by officers/enumerators. The subject was asked whether the mother or baby had an infectious disease mentioned earlier in the last 1 week. The data were analyzed using Chi square test to see the relationship between maternal and infant characteristic variables. This research was carried out after obtaining approval from the Ethics Commission of the Faculty of Public Health, Hasanuddin University number of 1071909130.

Result

The research was conducted in 6 sub-districts (Tamalatea, Binamu, Bangkala Bontoramba, Tarawang, and Kelara) of Jeneponto of South Sulawesi in 2018. This research was conducted by interviewing respondents in the area.

Table 1 shows the basic characteristics in the family in this study for five months and twenty-nine days. The highest maternal age at ≥ 26 years is 60.6%. The level of education of mothers and fathers mostly did not complete 9 years of primary education with 67.6% and 65.6%, while for father's occupation mostly are farmers/fishermen 42.1% and most mothers are homemakers. Average family income of less than 2 million rupiahs 74.4%

Table 2 shows that most babies born at health facilities are 88.2%. The most birth process is normal 93.8%, as well as the birth weight 95.9% and for birth weight, most mothers give birth with a normal body weight 93.8% and for colostrum 92.4%.

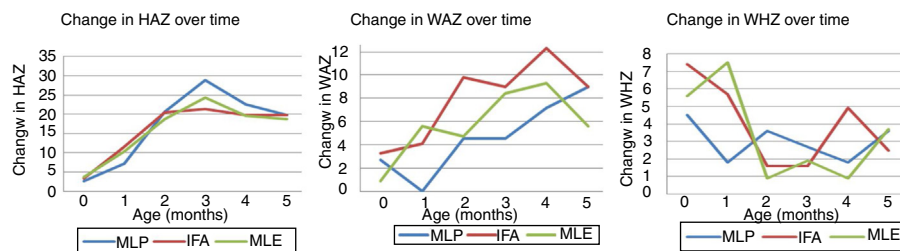
Based on Fig. 1 the distribution of stunting (HAZ) for the MLP group was the highest at age 3 months (28.8%), the MLE group had the most stunting at age 3 months (24.3%) while the IFA was the most at age 3 months (21.3%). Under nutrition distribution (WAZ) showed that the MLP group experienced the most malnutrition at age 5 months (9.0%), for the MLE group at age 4 months (9.3%) while for the IFA group the most many experience poor nutrition and malnutrition at

Table 1 Characteristics of infant parents ($n = 340$).

Variable	MLP ($n = 111$)	MLE ($n = 107$)	IFA ($n = 122$)	TOTAL ($n = 340$)	p value ^a
Mother's age					
<26 years	43 (38.7)	41 (38.3)	50 (41.0)	134 (39.4)	0.904
≥26 years	68 (61.3)	66 (61.7)	72 (59.0)	206 (60.6)	
Mother's education					
≥9 years	38 (34.2)	35 (32.7)	37 (30.3)	110 (32.4)	0.813
<9 years	73 (65.8)	72 (67.3)	85 (69.7)	230 (67.6)	
Father's education					
≥9 years	43 (38.7)	31 (29.0)	43 (35.2)	117 (34.4)	0.307
<9 years old	68 (61.3)	76 (71.0)	79 (64.8)	223 (65.6)	
Mother's job					
Does not work	91 (82.0)	88 (82.2)	98 (80.3)	277 (81.5)	0.920
Work	20 (18.0)	19 (17.8)	24 (19.7)	63 (18.5)	
Father's job					
Farmers/fishermen	43 (38.7)	46 (43.0)	54 (44.3)	143 (42.1)	0.542
Employee	15 (13.5)	16 (15.0)	17 (13.9)	48 (14.1)	
Daily driver/laborer	35 (31.5)	30 (28.0)	25 (20.5)	90 (26.5)	
Entrepreneurship	14 (12.6)	11 (10.3)	23 (18.9)	48 (14.1)	
Etc.	4 (3.6)	4 (3.7)	3 (2.5)	11 (3.2)	
Income (IDR)					
≥2 million	83 (74.8)	79 (73.8)	91 (74.6)	253 (74.4)	0.986
<2 million	28 (25.2)	28 (26.2)	31 (25.4)	87 (25.6)	
Smoking					
Yes	13 (11.7)	9 (8.4)	14 (11.5)	36 (10.6)	0.675
Not	98 (88.3)	98 (91.6)	108 (88.5)	304 (89.4)	

Source: primary data.

^a Chi square.

**Figure 1** Distribution based on infant growth in Jeneponto district.

age 4 months (12.3%). Wasting distribution (WHZ) shows that the three groups began to experience stunting when they were 2 months old (MLP 7.2%; MLE 11.5%; and IFA 18.7%).

Table 3 shows that most infants with diarrheal disease are those who get IFA as much as 50% by the time they are 2 months old and most ARIs in infants who get MLP. This is because 54.7% of fathers smoke near their babies.

Discussion

This study shows that there was no significant difference according to the intervention group for each measurement result for three anthropometric parameters, but it was shown that the prevalence of underweight was higher in the

IFA group compared MLP and MLE groups. In addition, there was a significant increase in the incidence of stunting after the child was 2 months old and this was shown equally in the three groups.

Based on this study, only 1.47% of the infants suffering from diarrhea and those who suffered the most diarrhea were those who were given supplement IFA as many as 60%. While for ARI around 16.47% infant, and the most in the group of babies who get *Moringa oleifera* flour (MLP) as much as 39.29% but for ARI is strongly influenced by the family members where smoke 1.2% uncles, 1.5% grandfathers and 54.7% fathers smoke near the baby in Jeneponto District.

Research conducted in India showed that *moringa oleifera* extract, both mature and soft leaves, has strong

Table 2 Characteristics of infants (n = 340).

Variable	MLP (n = 111)	MLE (n = 107)	IFA (n = 122)	TOTAL (n = 340)	p value ^a
<i>Place of birth</i>					
House	16 (14.4)	13 (12.3)	11 (9.0)	40 (11.8)	0.436
Health facility	95 (85.6)	93 (87.7)	111 (91.0)	229 (88.2)	
<i>Gender</i>					
Man	58 (52.3)	54 (50.5)	65 (53.3)	177 (52.1)	0.913
Women	53 (47.7)	53 (49.5)	57 (46.7)	163 (47.9)	
<i>The process of giving birth</i>					
Section	3 (2.7)	9 (8.5)	9 (7.4)	21 (6.2)	0.167
Normal	108 (97.3)	97 (91.5)	113 (92.6)	318 (93.8)	
<i>Colostrum</i>					
Not	8 (7.2)	7 (6.5)	11 (9.0)	26 (7.6)	0.764
Yes	92.8	100 (93.5)	111 (91.0)	314 (92.4)	
<i>Parity</i>					
1	28 (25.2)	30 (28.0)	51 (41.8)	109 (32.1)	0.014
>1	83 (74.8)	77 (72.0)	71 (58.2)	231 (67.9)	
<i>Birth body length</i>					
≥48 cm	101 (91.0)	91 (85.0)	101 (82.8)	293 (86.3)	0.178
<48 cm	10 (9.0)	16 (15.0)	21 (17.2)	47 (13.8)	
<i>Birth weight (grams)</i>					
<2500	3 (2.7)	5 (4.7)	6 (4.9)	14 (4.1)	0.652
≥2500	108 (97.3)	101 (95.3)	116 (95.1)	325 (95.9)	
<i>PNC</i>					
Yes	24 (21.6)	23 (21.5)	39 (32.0)	86 (25.3)	0.106
Not	87 (78.4)	84 (78.5)	83 (68.0)	254 (74.7)	
<i>Pralacteal</i>					
Not	81 (73.0)	83 (68.0)	77 (72.0)	241 (70.9)	0.679
Yes	30 (27.0)	39 (32.0)	30 (28.0)	99 (29.1)	

Source: primary data.

^a Chi square.**Table 3** Disease events in infants aged 0–5 months.

Month	The incidence of diarrhea and ARI		
	MLP (n = 111)	MLE (n = 107)	IFA (n = 122)
<i>Diarrhea</i>			
Month 1	0	0	0
Month 2	1 (25.0)	1 (25.0)	2 (50.0)
Month 3	0	0	0
Month 3	0	0	0
Month 5	0	0	1 (100)
Total	1 (20.0)	1 (20.0)	3 (60.0)
<i>ISPA</i>			
Bulan 1	1 (11.1)	3 (33.4)	5 (55.5)
Bulan 2	5 (38.5)	3 (23.0)	5 (38.5)
Bulan 3	5 (71.4)	1 (14.3)	1 (14.3)
Bulan 4	6 (42.9)	3 (21.4)	5 (35.7)
Bulan 5	5 (38.4)	4 (30.8)	4 (30.8)
Total	22 (39.29)	14 (25.0)	20 (35.71)

Source: primary data.

antioxidant activity against free radicals, prevents oxidative breakdown in major biomolecules and provides significant protection against oxidative damage. Antioxidants play an important role in inhibiting and counteracting free radicals, thus providing protection against infectious diseases and degenerative diseases.⁶ Based in a study of the under nourished community in Senegal Africa reported that the treatment of Moringa leaf flour can significantly improve individual nutritional status.⁵ The use of Moringa as a source of additional food is one of the efforts to overcome malnutrition.⁴

Several previous studies conducted in South Sulawesi related to *Moringa* showed that administration of *Moringa oleifera* extract to pregnant informal workers can reduce stress and improve nutritional status but cannot reduce DNA damage.⁷ In line with the research conducted in Makassar shows that the administration of *Moringa oleifera* extract can prevent anemia and DNA damage due to oxidative stress in pregnant women,⁸ and prevent LBW while research conducted by Iskandar shows that *Moringa oleifera* extract can maintain a decrease in ferritin serum by 50%⁵ In addition, in their study concluded that administration of Moringa extract and Moringa flour can increase the volume of breast milk⁹

and also shows that *Moringa oleifera* can prevent anemia in pregnant women.¹⁰

Conclusion

MLP tended to show protection against underweight but not for stunting. For morbidity, MLP and MLE can reduce the incidence of morbidity in infants 0–5 months in the district of Jeneponto. Future studies should be considered duration of intervention at least 6 months.

Conflict of interests

The authors declare no conflict of interest.

Acknowledgements

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