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The effect of moringa leaves on pregnancy on growth and morbidity of 6–11 month☆

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KEYWORDS
Moringa leaves;
Growth;
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Abstract
Objective: This study was conducted to assess the effect of ML supplementation in women during pregnancy and lactation on growth and morbidity of 6–11 month-old infants.
Method: This study was an intervention study and followed with Cohort to the infants at 6–11 month-old. The subjects were pregnant women who were divided into three groups: a group who received ML powder (MLP, $n = 103$), a group receiving ML extract (MLE, $n = 94$), and a group consuming iron folic acid (IFA, $n = 111$). Growth and morbidity measurement were assessed each month. The data was analyzed using ANOVA test and Chi-squares.
Results: The study showed that prevalence of malnutrition at 6–11 month-old infants ranged from 7.8% to 14.9% for malnutrition and 2.6–7.1% of wasting and there were not significantly different among all age groups ($p > 0.05$). Moreover, prevalence of stunting was 26.3–40.9% and there were significant difference among groups in some age periods. The prevalence of stunting was significantly lower in IFA compared to MLP and MLE groups ($p < 0.05$). Diarrhea and upper respiratory infection were found but lower across the age periods (0.65–4.55%).
Conclusion: The study concluded that ML supplement in pregnant and lactating women could not protect infants from stunting.

Introduction

Growth of toddlers is closely related to nutritional status. The prevalence of nutritional status of toddlers in Indonesia from 2013 to 2018 had decreased, namely malnutrition and poor nutrition of 19.6%, 17.7%, very short and short of 37.2%, 30.8% and very thin and thin 12.1%, 10.2%.[1] Despite the decline in prevalence, this case is still a problem in the community.[2]

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Based on data from the WHO 5.9 million children under five years old passed away in 2015 and 45% of that number were caused by malnutrition.[3] Malnutrition in children has an impact on the decline of the immune system so that they are easily attacked by the disease. Illnesses and deaths in infants can be because of the nutritional status of the mother during pregnancy. The results of the study of hemoglobin levels of women in India in the reproductive age group showed a significant increase after intervention with moringa oleifera and jaggery.[4]

Exclusive breastfeeding in infants is still relatively low. Based on data from the Global Breastfeeding Scorecard that evaluated 194 countries, it found that only 40 percent of children under six months old were exclusively breastfed (only breastfed) and only 23 countries had exclusive breastfeeding rated above 60 percent.[3] The low prevalence of exclusive breastfeeding is partly due to low production. M. oleifera leaves were cooked and eaten like spinach or used to prepare soups and salads consumed by pregnant women to increase breast milk production.[5]

Many previous researchers with a small number of samples conducted the studies of Moringa so we tried to examine Moringa leaf extract in pregnant women with larger sample size. Previous studies analyzed the condition of Trimester II pregnant women by giving interventions and randomly dividing pregnant women into 3 groups. The first group received capsules of Moringa leaf extract (GEK), the second group consumed capsules of Moringa leaf flour (GTK) and the third group took capsules containing iron and folic acid (GBF) for 3 months. And the other research study was giving intervention after labor or to the breastfeeding mothers of 0–30 days to see the morbidity and growth of 0–6 months old infant. Our study assessed the effect of Moringa Oleifera leaf extract on pregnant and lactating mothers on dietary habit, morbidity, and growth in 6–12 month-old infants.

Methods

This study design was an experiment continued with a cohort study by taking samples of 6–11 months old infants. Research location in jeneponto district and carried out in 2018. Subjects were pregnant women (308) of grouped into 3; a group receiving Moringa leaf flour (TK, $n = 103$), a group getting Moringa leaf extract (EK, $n = 94$), a group consuming iron/folate (IF, $n = 111$). Inclusion criteria were 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. Variables were growth variables using anthropometric indicators WAZ, HAZ and WHZ and

Table 1 Distribution based on mother characteristic.

Variable	MLP ($n = 103$)	MLE ($n = 94$)	IFA ($n = 111$)	Total ($n = 308$)	p-Value
Mother's age					
<26 yo	36 (35.0)	33 (35.1)	39 (35.1)	108 (35.1)	1.000
≥26 yo	67 (65.0)	61 (64.9)	72 (64.9)	200 (64.9)	
Mother's education					
Low (<12 yo)	70 (68.0)	64 (68.1)	75 (67.6)	209 (67.9)	0.996
High (≥12 yo)	33 (32.0)	30 (31.9)	36 (32.4)	99 (32.1)	
Mother's occupation					
Not working	81 (78.6)	80 (85.1)	89 (85.1)	250 (81.2)	0.483
Working	2 (21.4)	14 (14.9)	22 (14.9)	58 (18.5)	
Father's education					
Low (<12 yo)	67 (65.0)	64 (68.1)	70 (63.1)	201 (65.3)	0.752
High (≥12 yo)	36 (35.0)	30 (31.9)	41 (36.9)	107 (34.7)	
Father's occupation farmer/fisherman	44 (42.7)	40 (42.6)	48 (43.2)	132 (42.9)	0.600
Civil Servant/private	11 (10.7)	16 (17.0)	19 (17.1)	46 (14.9)	
Driver/laborers	32 (31.1)	21 (22.3)	23 (20.7)	76 (24.7)	
Entrepreneur	12 (11.7)	14 (14.9)	19 (17.1)	45 (14.6)	
Others	4 (3.9)	3 (3.2)	2 (1.8)	9 (2.9)	
Income					
<2 million	79 (76.7)	64 (68.1)	78 (70.3)	22 (71.8)	0.370
≥2 million	24 (23.3)	30 (31.9)	33 (29.7)	87 (28.2)	
ANC					
<4 times	50 (48.5)	61 (64.9)	67 (60.4)	178 (57.8)	0.054
≥4 times	53 (51.5)	33 (35.1)	44 (39.6)	130 (42.2)	
Place of birth					
Home	11 (10.7)	8 (8.5)	5 (4.5)	24 (7.8)	0.231
Health insurance	92 (89.3)	86 (91.5)	106 (95.5)	284 (92.2)	

morbidity looking at diarrhea and ARI in infants. The characteristics of the mother and baby were found using a questionnaire. Anthropometric measurements using the Length Board use to check the length of the baby's body and the digital baby scales marked the baby's weight. Anthropometric measurements and capsule distribution were carried out by enumerators that previously went through the training and selection stages. The data were analyzed using Chi-square and ANOVA. The Chi-square test was to see the relationship between maternal and infant characteristic variables, while the ANOVA test was managed to know the differences between the three intervention groups. This research was conducted after obtaining approval from the Ethics Commission of the Faculty of Medicine, Universitas Hasanuddin with number 1071909130.

Results

There were three groups in the provision of interventions, including Moringa flour (MLP) group, Extract group (MLE) and Iron Folate Group (IFA). Table 1 shows the basic characteristics of the family. This study found that pregnant women in the sample were on average of ≥26 years old with a total of 64.9%. Mothers and fathers also on average did not complete 9 years of primary education with a total of 67.9% and 65.3%. The fathers mostly worked as farmers or fisherman (42.9%) and most mothers work as housewives. Family income averaged less than 2 million rupiahs (71.8%) per month.

Table 2 shows that most infants were born as a male of 54.2%. The most common birth process was normal (94.8%), as well as the birth weight. Most mothers who gave birth had a normal body weight of 95.8%, and most infants got exclusive breastfeeding of 54.5%.

Table 3 shows that diarrhea is highest in the IFA 15(15.93%) while lowest in the MLE 7(6.30) and ARI is highest in the IFA 11(10.67%) while lowest in the MLE 19(17.1%).

Fig. 1 indicates that the highest WHZ appears in the MLP and IFA groups; 11 months old infant of 4.9% and 10.8% and in the MLE group; 9-month-old infants of 7.4%. Distribution of infant growth based on the highest HAZ in the MLP group;

Table 2 Distribution based on characteristic of Infants.

Variable	MLP (n = 103)	MLE (n = 94)	IFA (n = 111)	TOTAL (n = 308)	p-Value
Sex					
Male	60 (58.3)	47 (50.0)	60 (54.1)	167 (54.2)	0.509
Female	43 (41.7)	47 (50.0)	51 (45.9)	141 (45.8)	
Birth process					
SC	1 (1.0)	7 (7.4)	8 (7.2)	16 (5.2)	0.060
Normal	102 (99.0)	87 (92.6)	103 (92.8)	292 (94.8)	
PNC					
Yes	19 (18.4)	22 (23.4)	32 (28.8)	73 (23.7)	0.203
No	84 (81.6)	72 (76.6)	79 (71.2)	235 (76.3)	
Infant weight					
BBLR	1 (1.0)	3 (3.2)	9 (8.1)	13 (4.2)	0.029
Normal	102 (99.0)	91 (96.8)	102 (91.9)	295 (95.8)	
Infant length					
≥48 cm	94 (91.3)	81 (86.2)	89 (80.2)	264 (85.7)	0.068
<48 cm	9 (8.7)	13 (13.8)	22 (19.8)	44 (14.3)	
Immunization					
Complete	48 (46.6)	45 (47.9)	46 (41.1)	139 (45.1)	0.611
Not-complete	55 (53.4)	49 (52.1)	65 (58.6)	169 (54.9)	
Breastfeeding					
Yes	82 (79.6)	77 (81.9)	91 (82.0)	250 (81.2)	0.884
No	21 (20.4)	17 (18.1)	20 (18.0)	58 (18.8)	
Breastmilk					
Exclusive breastmilk	58 (56.3)	50 (53.2)	60 (54.1)	168 (54.5)	0.900
Not-exclusive breastmilk	45 (43.7)	44 (46.8)	51 (45.9)	140 (45.5)	
Weaning food					
<6 month	25 (24.3)	27 (28.7)	24 (21.6)	76 (24.7)	0.498
≥6 month	78 (75.7)	67 (71.3)	87 (78.4)	232 (75.3)	
Parity					
1	28 (27.2)	28 (29.8)	40 (36.0)	96 (31.2)	0.355
>1	75 (72.8)	66 (70.2)	71 (64.0)	212 (68.8)	

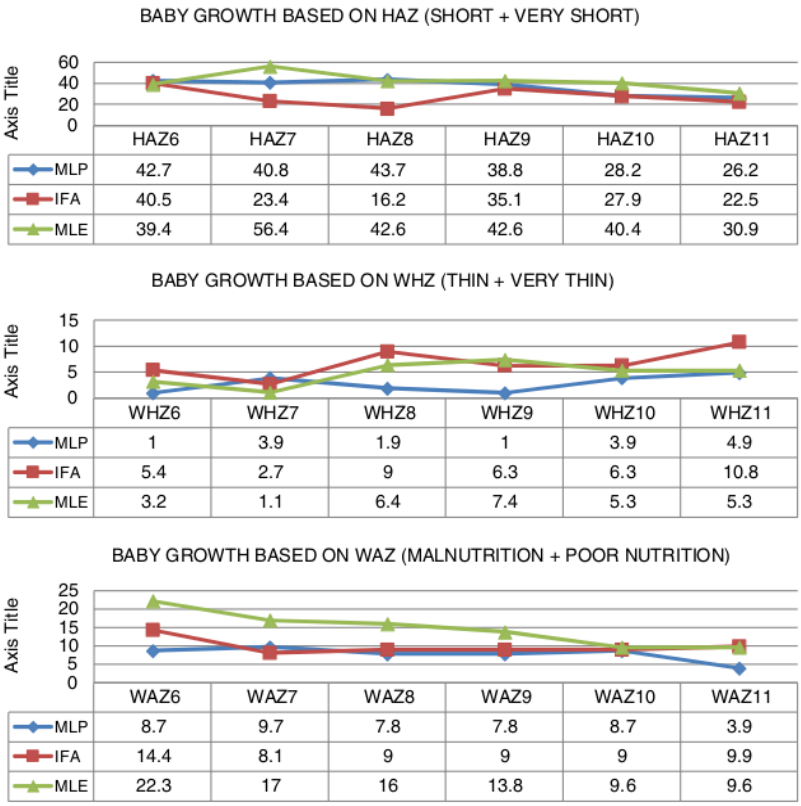

Figure 1 Distribution based on infant growth.

Table 3 Distribution of respondents based on infectious diseases.

Variable	MLP	MLE	IFA
Diarrhea			
Month 6	0	1 (0.90)	1 (1.06)
Month 7	2 (1.94)	3 (2.70)	1 (1.06)
Month 8	3 (2.91)	1 (0.90)	1 (1.06)
Month 9	5 (4.85)	1 (0.90)	4 (4.25)
Month 10	0	0	3 (3.19)
Month 11	0	1 (0.90)	4 (4.25)
Month 12	2 (1.94)	0	1 (1.06)
Total	12 (11.64)	7 (6.30)	15 (15.93)
ARI			
Month 6	3 (2.91)	5 (4.50)	2 (1.12)
Month 7	5 (4.85)	5 (4.50)	4 (4.25)
Month 8	3 (2.91)	0	1 (1.06)
Month 9	0	1 (0.90)	1 (1.06)
Month 10	1 (0.97)	4 (3.60)	1 (1.06)
Month 11	2 (1.94)	4 (3.60)	1 (1.06)
Month 12	1 (0.97)	0	1 (1.06)
Total	15 (14.55)	19 (17.1)	11 (10.67)

8 months old infants were 43.7%, IFA group based on HAZ with 6 months old infants of 40.5% and MLE group based on the highest HAZ with 7 months old infants were 56.4%. The highest distribution of infant growth based on WAZ was in the MLP group with 7 months old infants of 9.7%, the highest IFA group based on HAZ with 9 months old infants of 9.9% and the highest MLE group based on HAZ with 6 months old infants of 22.3%.

Discussion

This study found the intervention of Moringa leaves and iron folate given during pregnancy and lactation did not significantly affect infant growth. The highest growth of undernutrition infants based on WHZ appeared in the IFA group rather than the moringa intervention group. Besides, the growth of wasting infants based on WAZ in the IFA group was higher than in the Moringa intervention group. With the provision of moringa leaf intervention can increase the volume of breast milk so it is expected that the baby's mother can breastfeed exclusively[6] because Moringa leaves meet the needs of pregnant and lactating women. Previous research in Jeneponto conducted on pregnant women with Moringa intervention was able to prevent babies with low birth weight so that the child's growth could be optimal.[7]

Based on the results of this study still mothers who do not provide exclusive breastfeeding so that the baby's growth can be shaken like research in the Gambia village shows that the average age of termination of EBF is 5.2 months, and the growth of wobbling begins on; 3.5 months, a difference in WAZ and WHZ was found between exclusively breastfed infants until the age of 6 months (EBF-6) and those who were not (nEBF-6) at ages 6 and 12 months, with EBF-6 children having the average z score is higher.[8] Some babies suffering from diarrhea, most were those who got capsule of IFA when they were 9–11 months old. So, the moringa leaf intervention given to the baby's mother can protect the baby from diarrheal disease. For ARI disease generally attacked infants who got intervention in Moringa leaves. The main cause of the case was MP-ASI (weaning food) was due to poor management in terms of preparing time, quantity, quality, and hygiene of the food.[9]

Another study even mentioned that several factors caused disease, such as immature immune systems, lack of maternal antibodies and improper complementary feeding.[10] About 40% of the samples were contaminated with E. coli, mainly due to not optimal preparation for eating practices. Consumption of contaminated CF seemed to be related to the frequency of diarrhea and increased malnutrition in children.[11]

Conclusion

The results of this study showed the intervention of Moringa leaves during pregnancy to breastfeeding could not protect 6–11 months old infants from stunting and infectious diseases if the infant food intake was not optimally served. Subsequent research provided Moringa leaf intervention in complementary feeding infants 6–11 months.

Conflict of interest

The authors declare no conflict of interest.

Acknowledgements

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