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Linear growth of infants aged 0-6 months in breastfeeding mothers who consume *Moringa oleifera* leaf extract capsules: randomized controlled double-blind design

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Abstract

The prevalence of stunting in children in Indonesia is still high. However, linear growth and infant growth rates are relatively rarely published. This study aimed to analyse the effect of linear growth and growth rate of infants aged 0-6 months exclusively breastfed on mothers who consumed *Moringa* leaf extract and *Moringa* leaf powder supplements. The design of this study was a randomized controlled Double-Blind Design. Subjects were divided into 35 intervention groups and 35 control groups. The intervention group was given *Moringa* extract capsules (3.2 g/day) and breastfeeding education, while the control group was given *Moringa* leaf powder capsules (3.2 g/day) and breastfeeding education for about 3 months. Infant growth was followed until the age of 6 months, the variables of infant growth were expressed in weight for age, body length for age and growth based on the nutritional status of the infant expressed in the Z score of weight for age (W/A), Z score of body length for age (BL/A), Z score of body weight for body length (BW/BL) and Z score of body mass index for age (BMI/A). Statistical analysis with paired T-test, Kolmogorov-Smirnov, and Exat Fisher Test. The results showed that the growth of body weight, body length, and BL/A were not different between the intervention group and the control group ($p>0.05$). Especially for the Z score of BW/A, BW/BL, BMI/A found a difference between the intervention and control groups with a p-value <0.05. The conclusion of the research is the growth rate of weight and length of infants aged 0-6 months were influenced by birth weight, infant morbidity, and exclusive breastfeeding status. The difference in the average deviation of the Z score value from the four anthropometric indices (BW/A, BW/BL, and BMI/A) roled in the administration of *Moringa* extract.

1. Introduction

The period of the first thousand days of life is sensitive because the effects on the infant at this time will be permanent and cannot be corrected. Moreover, the impact is on physical growth and mental development and intelligence, which in adulthood can be seen from the physical size that is not optimal and the quality of work that is not competitive, which results in low economic productivity (Kemenkes RI, 2013).

Riskesdas (2018) reported that the prevalence of children under five who were short and very short (stunting) in Indonesia was 30.8% (Kemenkes RI, 2018). Theoretically, children's growth and development are influenced by many internal and external factors. Idriansari (2014) shows that factors that affect growth in children under five are nutritional status, family economic status, parental education, and parental stimulation. Besides, it is also influenced by exclusive breastfeeding status, mother's knowledge, and mother's occupation (Herlina, 2018a).

Many intervention efforts have been carried out on stunting through government programs and intervention studies by research institutes and universities. One of the systematic reviews concluded that interventions in infants to overcome stunting problems by providing a

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single nutrient or a combination of 2-3 substances Nutrition (multi-micronutrients) had been widely carried out, and the impact is not conclusive, it can prevent toddlers from becoming stunted (Yuniar *et al.,* 2018).

The nutritional needs of mothers increase during breastfeeding conditions because they are closely related to milk production. Therefore, the fulfillment of good nutrition for breastfeeding mothers will affect the nutritional status of breastfeeding mothers and also the growth and development of their babies. (World Bank, 2006). The low level of micronutrients consumed by breastfeeding mothers will affect the ability to provide breast milk with sufficient micronutrient content for the infant's growth. Nutrients contained in *Moringa* leaf extract include iron, calcium, zinc, vitamin A, vitamin C, and E, which are given to nursing mothers aimed to improve the health and nutritional status of nursing mothers in order to produce optimal breast milk to meet the nutritional needs of babies who are breastfed for the baby's growth and development. The results of the analysis of the nutritional composition of the South Sulawesi variety *Moringa* leaf extract in 100 g of protein 12.31%, fat 18.62%, provitamin A (β-carotene) 313.47 mg, vitamin E 1549.4 mg, vitamin C 1514 .96 mg, iron (Fe) 9.72 mg, zinc (Zn) 3.7 mg and selenium 47.45 mg. It was also concluded that breastfeeding mothers who consumed *Moringa* leaf extract and *Moringa* leaf powder experienced a significant increase in breast milk volume (Zakaria *et al.*, 2016). The intervention of *Moringa* leaves in extract or powder could improve nutritional status, haemoglobin levels, prevent oxidation stress in pregnant women, prevent low birth weight, increase milk production and quality, and improve the nutritional status of pregnant women. In addition, *Moringa* leaves can be used to prevent stunting in the First 1000 Days of Life (Nadimin, 2021).

The aim was to know the effect of giving *Moringa* leaf extract capsules to breastfeeding mothers on the linear growth and growth rate of infants aged 0-6 months.

2. Methodology

It is experimental research with a randomized controlled Double-Blind Design (Figure 1). The research was conducted in the Marusu District, Maros Regency. Research subjects were divided into 2 groups, breastfeeding mothers who received *Moringa* leaf extract and breastfeeding mothers who received *Moringa* leaf powder. Both groups had received education on the correct way of breastfeeding so that there are no differences in the practice of exclusive breastfeeding. *Moringa* leaf extract was given in capsules of the same colour, 2 times 2 capsules a day for 3 months. Each capsule contained 800 mg of *Moringa* leaf extract and *Moringa* leaf powder so that the amount of

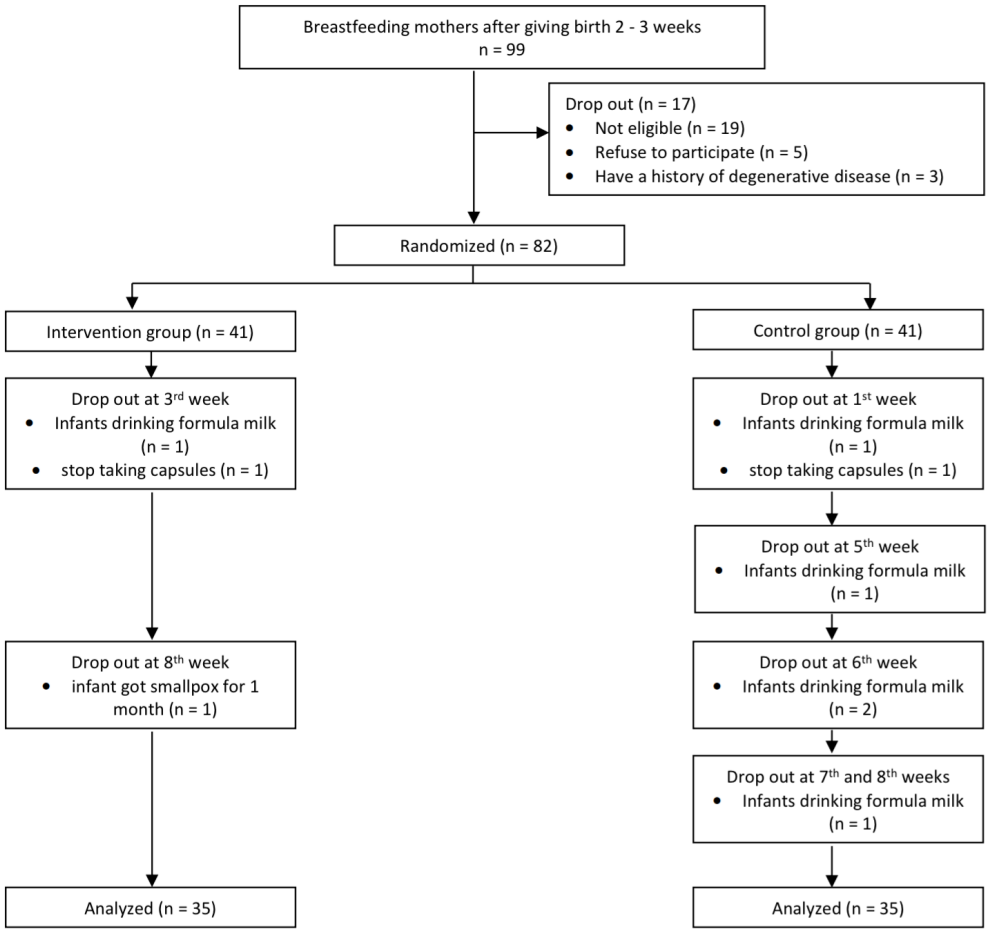

Figure 1. Research design and flow

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administration per day was 3.2 g. The determination of giving 3.2 g per day is based on Iskandar *et al*. (2015). The number of research samples that can be analyzed until the end of the study was 71 samples from 83 participating samples.

Several data were collected, including family characteristics, infant's age, infant's weight, and body length. The family characteristics were collected using a questionnaire, the infant's age was calculated based on the birth certificate, the infant's weight was measured every month for 6 months using an infant scale with an accuracy of 1 g (Zigma brand), body length was measured every month for 6 months using body length scale of 0.1 cm (Pixation board). All tools used were standardized first. Then, infant growth was expressed in body weight (BW), body length (BL), Z score of body length for age (BL/A), Z score of body weight for body length (BW/BL), and Z score of Body Mass Index for Age (BMI/A). Enumerators were trained to identify cases, measure anthropometry, distribute *Moringa* capsules, and breast milk education. Quality control consisted of enumerator training, anthropometric techniques, supervision, and data management with double entry and double-blind *Moringa* capsules. The Ethics Committee of the Faculty of Medicine, Hasanuddin University, approved this research, accompanied by informed consent if agreed. Statistical analysis with paired T-test, Kolmogorov-Smirnov, and Exat Fisher Test.

3. Results

3.1 Subject characteristics

The characteristics of the subjects in this study were the place of the mother giving birth, birth attendant, maternal health during the intervention, maternal health before the intervention, early breastfeeding, and breastfeeding status (Table 1).

3.2 Mother's nutritional intake from Moringa leaf extract supplements

The results of monitoring the consumption of supplements for breastfeeding mothers using a compliance form for taking supplements every weekend showed that breastfeeding mothers were obedient in taking supplements, an average of 96.3±5.3% in the intervention group and 96.6±3.7% in the control group. Table 2 shows the average contribution of daily nutritional intake derived from extract supplements and *Moringa* leaf powder.

3.3 Infant growth

3.3.1 Growth based on body weight

Based on the mother's information and evidenced by information from the place of the mother giving birth, the average male birth weight was 3.15±0.31 kg in the intervention group and 2.98±0.30 kg in the control group. At the beginning of the study, the weight of the male infant in both groups was not significantly different

Table 1. Characteristics of subjects

	Intervention (n = 35)	Control (n = 35)	Total (70)	P-Value
Place of delivery				
• Hospital	12(34.3)	14(40.0)	26(37.1)	0.973*
• Pos Kesehatan Desa (Village Health Post)	3(8.6)	5(14.3)	8(11.4)	
• Puskesmas Pembantu (Auxiliary Health Center)	5 (14.3)	5(14.3)	10(14.3)	
• Practice Midwife	9(25.7)	7(20.0)	16(22.9)	
• Home	9(17.1)	4(11.4)	10(14.3)	
Childbirth Helper				
• Doctor	2(5.7)	2(5.7)	4(5.7)	1.000*
• Midwife	30(85.7)	29(82.9)	59(84.3)	
• Shaman	3(8.6)	4(11.4)	7(10.0)	
Maternal Health Before Intervention				
• Sick	2(5.7)	2 (5.7)	4 (5.6)	
• Healthy	33(94.3)	33(94.3)	67 (94.4)	
Maternal Health After Intervention				
• Sick	1 (2.9)	1(2.9)	2 (2.8)	1.000**
• Healthy	34(97.1)	34(97.1)	68(97.8)	
Early Initiation of Breastfeeding				
• Yes	11(31.4)	12(34.3)	24(33.3)	0.799**
• No	24(68.6)	23(65.7)	48(66.7)	
Breastfeeding Status				
• 4 months	5(14.3)	3(8.6)	8(11.4)	0.710**
• 5-6 months	30(85.7%)	32(91.4)	62(88.6)	

* Kolmogorov Smirnov

** fisher exact test

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Table 2. Consumption of nutrients from *Moringa* extract supplements per day

Nutrition	Intervention (n = 35) Mean±SD	% Nutritional Adequacy	Control (n = 35) Mean±SD	% Nutritional Adequacy
Protein (g)	0.40±0.09	0.52	0.85±0.03	1.1
Vitamin C (mg)	40.00±7.93	39.48	2.17±0.08	2.17
Vitamin E (mg)	42.88±7.91	237.61	3.48±0.13	18.3
Fe (mg)	0.32±0.10	0.96	0.85±0.03	2.65

(p>0.05). After the intervention for 3 months, the weight of infant boys in the intervention group became 6.48±0.38 kg, the average increased by 3.33±0.07 kg, and the control group became 6.42±0.64 kg, an average increase of 3.44±0.4 kg. The weight of male infants after the intervention and control groups' intervention was not significant (p > 0.05).

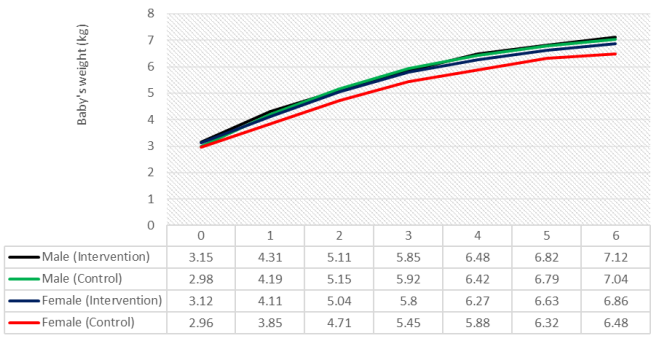
The female infants showed an average birth weight of 3.12±0.30 kg in the intervention group and 2.96±0.43 kg in the control group. The two groups were not significantly different at the beginning of the study (p > 0.05). After the intervention for 3 months, the infant's weight became 6.27±0.45 kg in the intervention group, the average increased by 3.15±0.15 and the weight in the control group became 5.88±0.69 kg, the average increase was 2.92±0.26 kg. The weight gain of female infants in the intervention group was higher than the control group, but statistical tests did not significantly differ (p > 0.05).

Figure 2 shows a growth curve based on the weight of male infants in the intervention group and the control group, according to the growth pattern compared to the anthropometric standard recommended by the Ministry of Health of the Republic of Indonesia in 2011. The average weight growth pattern of female infants was the same as the median standard. After the age of 4 months, the intervention group slightly decreased until the age of 6 months. However, the weight growth pattern of female infants in the control group was lower than the intervention group; from the age of 1 month, it was below the median, standard growth pattern until the age of 6 months. The growth curves of baby boys and girls based on weight gain are presented in Figure 2.

3.3.2 Growth based on body length

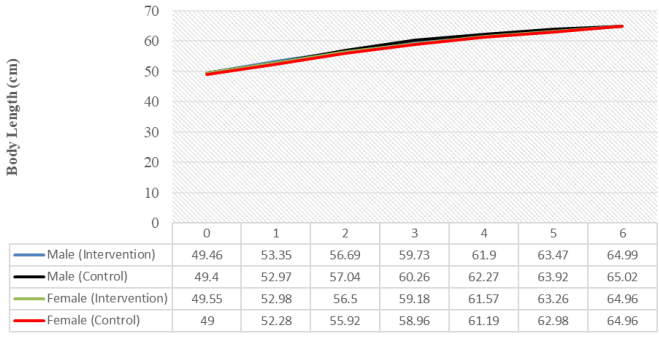
In some cases, the infant born body length (BL) is not recorded in the birth certificate and in general, the mother does not know or forget. Thus, the infant's birth length measurement was carried out at the time of initial data collection (14 days after birth). The average birth length of male infants was between 49.40±1.10 to 49.46±1.39 cm, and for female infants was 49.00±1.21 to 49.55±0.80 cm. At the beginning of the study, there was no significant difference in both male and female infants' body length in both groups. After the intervention, the body length of male infants in the intervention group increased by 12.44±0.09 cm and in the control group increased by 12.87±0.43 cm. The increase in body length for males in the intervention group was slightly lower than in the control group. The same for the body length of the female infants showed that the increase in the body length in the intervention group was slightly lower than in the control group. The statistical test results of infant body length growth at the end of the intervention did not show a significant difference between the two groups (p > 0.05), both male and female infants.

Figure 3 shows that compared to the standard median recommended by the Ministry of Health in 2010, the growth curve of body length for male infants in both the intervention and control groups was below the standard curve. Meanwhile, the intervention group's female body length growth curve appeared to coincide with the standard median, while in the control group, it was below the standard median curve. The growth curves of baby boys and girls based on the increase in body length are presented in Figure 3.



	0	1	2	3	4	5	6
Male (Intervention)	3.15	4.31	5.11	5.85	6.48	6.82	7.12
Male (Control)	2.98	4.19	5.15	5.92	6.42	6.79	7.04
Female (Intervention)	3.12	4.11	5.04	5.8	6.27	6.63	6.86
Female (Control)	2.96	3.85	4.71	5.45	5.88	6.32	6.48

Figure 2. Weight growth curve of 0-6 months baby compared to standard anthropometric assessment of nutritional status



	0	1	2	3	4	5	6
Male (Intervention)	49.46	53.35	56.69	59.73	61.9	63.47	64.99
Male (Control)	49.4	52.97	57.04	60.26	62.27	63.92	65.02
Female (Intervention)	49.55	52.98	56.5	59.18	61.57	63.26	64.96
Female (Control)	49	52.28	55.92	58.96	61.19	62.98	64.96

Figure 3. Baby's body length growth curve 0-6 compared to anthropometric standards

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3.3.3 Infant growth based on Z-score of BW/A and Z-score of BL/A

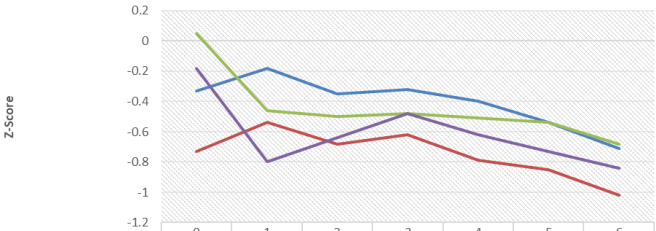
Infant growth based on the average Z-score BW/A of infants aged 1 month increased, both in the intervention and control groups. However, at the age of 2 months, it decreased, at the age of 3 months it rose, then at the age of 4 months, it decreased up to 6 months of age. Infant growth was based on the average value of the infant's Z of BL/A score measured every month showed that the infant's Z score of BL/A began to deviate at 1 month of age. Unfortunately, it improved at 2-3 months of age and decreased at 4 months to 6 months. Infant growth based on the average Z of BL/A of infants in the control group was greater than that in the intervention group. The mean value of the infant Z score of BL/A in the intervention group was not significantly different ($p>0.05$) from the control each month of measurement.

3.3.4 Infant growth based on the infant's Z-score of BW/A and Z-score of BMI/A

The nutritional status of infants in the intervention group tended to improve until the age of 3 months when the average Z score of BW/BL was getting closer to 0, but at the age of 4 months to 6 months, it tended to decrease. While in the control group, it can be seen that the average Z score of BW/BL infants at the age of 1 month improved with a Z score of BW/BL infants of 0.20±1.41 kg. However, from the age of 2 months to 6 months, they decreased every month for the Z score of BW/BL. Thus, the decrease in the infant's Z-score of BW/BL in the control group tended to be higher than in the intervention group. This showed that the growth based on the infant's weight/BL index in the intervention group was better than in the control group.

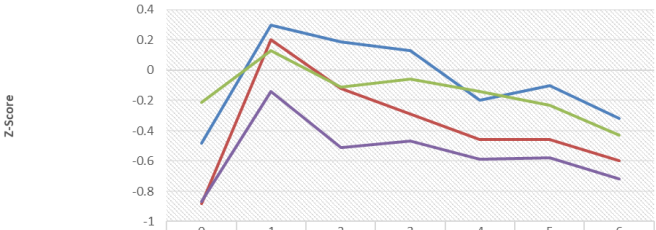
Infant growth based on the average BMI/A Z score at the beginning of the study in the intervention group was better than the control group and was statistically significantly different ($p < 0.05$). After the intervention, the infant's BMI/A Z score improved in both groups. Although the BMI/A scores of infants in the intervention group were still higher than the control group, the difference in deviations did not show a significant difference before and after the intervention ($p>0.05$). Meanwhile, in the control group, the difference in the mean deviation of the infant's BMI/A Z score was significantly different ($p<0.05$) before and after the intervention. Infant growth based on Z score of BW/BL and BMI/A was presented in Figure 4. The growth curve based on the average Z score of BW/A and BL/A infants 0-6 months can be seen in Figure 4.

Figure 5 shows that the infant's growth based on the BW/BL index was better than the BMI/A index. However, both indicated the infant's growth continued to decline, and the deviation was getting higher by the age of the infants.



	0	1	2	3	4	5	6
BW/A (Intervention)	-0.33	-0.18	-0.35	-0.32	-0.4	-0.54	-0.71
BW/A (Control)	-0.73	-0.54	-0.68	-0.62	-0.79	-0.85	-1.02
BL/A (Intervention)	0.05	-0.46	-0.5	-0.48	-0.51	-0.54	-0.68
BL/A (Control)	-0.18	-0.8	-0.64	-0.48	-0.62	-0.73	-0.84

Figure 4. Graph of growth based on Z scores BW/A and BL/A



	0	1	2	3	4	5	6
BW/BL (Intervention)	-0.48	0.3	0.19	0.13	-0.2	-0.1	-0.32
BW/BL (Control)	-0.88	0.2	-0.12	-0.29	-0.46	-0.46	-0.6
BMI/A (Intervention)	-0.21	0.13	-0.11	-0.06	-0.14	-0.23	-0.43
BMI/A (Control)	-0.87	-0.14	-0.51	-0.47	-0.59	-0.58	-0.72

Figure 5. Growth chart based on the baby's Z-score of BW/BL and BMI/A

4. Discussion

The findings of this study were that the growth of infants based on weight gain after the intervention was 3.33±0.07 kg, and control increased by 3.44±0.4 kg but did not differ between the two groups. The body length of male infants in the intervention group increased by 12.44±0.09 cm, and in the control group increased by 12.87±0.43 cm, both were also not different. The increase in a Z score of BW/A, and Z score of BW/BL did not differ between the two, except the Z score of BMI/A was better in the intervention group. Based on these results, it was known that the mother who was given *Moringa* leaf extract capsules gave a better effect on length growth than the *Moringa* leaf capsules without extract.

This study is similar to the study by Basri *et al*. (2021), giving *Moringa* leaf extract capsules to pregnant women can prevent stunting even until the child is 36-42 months old (Basri *et al*., 2021). Another study tested the acceptance of *Moringa* leaves in children for alternative stunting prevention in Indonesia. The result is known that not only for mothers but also direct giving to children is relatively accepted in Indonesia (Katmawanti *et al*., 2021).

Growth based on the body weight of the two research groups did not show any significant difference

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(P > 0.05). No difference in growth between infants who were exclusively breastfed and those who were not exclusively breastfed (p = 0.235) (Sajiman *et al*., 2016). Comparing the weight of male infants with the weight of female infants, it shows that males have a higher weight than females. This difference is due to differences in mass body formation where men are heavier and have large bones, so they are relatively heavier. The infant's weight gain in this study was still higher than the results of Aritonang (2010), in infants 0-4 months in Bogor an average of 2.32±0.82 kg after the intervention (Aritonang, 2010), but slightly lower when compared to the weight gain of infants 0-4 months who were exclusively breastfed, which was 3.79±0.46 kg (Widodo, 2003).

Both males and females were slightly below the standard median limit. In this study, several infants who suffered from infectious diseases during intervention cause low average weight, both in the intervention group of 34.3% and the control group of 33.8%. However, in the intervention group, there was a tendency of giving *Moringa* leaf extract to the infant's weight gain. This can be seen in the growth curve of female infants' body weight which was higher in the intervention group than in the control group. Furthermore, according to the deviations in the Z score of BW/A of infants 0-6 months where the average Z score of BW/A was higher in the intervention group than in the control group and iron levels, vitamin C in the intervention group tended to be higher than the control group. This means that giving *Moringa* leaf extract to nursing mothers plays a role in preventing deviations in the Z BW/A score further from zero points (Zakaria *et al.*, 2018).

The average body length of the infants at the beginning of the study was relatively the same (Figure 2). The body length growth in the two intervention groups did not show a statistically significant difference (p>0.05). It appears that the body length of male infants was higher than that of female infants. In this study, the growth curve of infants was still lower than the standard median body length growth in both the intervention group and the control group. Similar research results Sugeng *et al*. (2019) concluded that there were still under -fives with poor nutritional status and children with dubious and deviant developmental status (Sugeng *et al*., 2019).

The growth of the infant's body length is influenced by the content of calcium, iron, zinc, and vitamin A contained in foodstuffs consumed daily in addition to offspring. Calcium is the main component of bone formation, so it plays an important role in linear growth. Vitamin A also plays a role in forming osteoclasts as part of the bone formation process to affect linear growth (Pritasari and Didit, 2017). This shows that *Moringa* leaf extract containing nutrients such as protein, calcium, iron, zinc and vitamin C, vitamin A and vitamin E, and other nutrients in *Moringa* leaves is expected to enrich the quantity and quality of the mother's breast milk. This can then affect the infant's growth, but it does not seem to have a real effect on the growth of the body length. The growth of the body length in this study was more influenced by genetics.

Body length describes the nutritional status of the past. The improvement in the intervention group and control group is caused by adequate nutritional intake from food and adequate nutritional intake during pregnancy or genetic factors. The statistical test results for the Z score of BL/A did not show a significant difference between the two groups at the end of the intervention (P>0.05). This was because our samples, both the intervention and control groups, were exclusive breastfeeding until the age of 6 months. Exclusive breastfeeding is a significant factor in infant growth and development, and there are other related factors, namely the mother's knowledge, mother’s occupation, food consumption and parenting environment (Herlina, 2018b).

The provision of a standardized education program compared with an enhanced education program with diet and physical activity components was ineffective in improving infant growth outcomes (Thomson *et al*., 2018). The average Z score of BL/A score in the two groups tends to decrease every month. However, it can be seen that the decrease in the Z score of BL/A score in the control group was more significant than in the intervention group. The deviation of the Z score, which was further away from the zero points, was more significant in the control group than in the intervention group. This deviation must be considered since the growth spurt is not corrected, which demands many nutritional needs at an infant's age. It will result in more significant deviations making it challenging to catch up with the growth spurt.

World Bank (2006) stated that efforts to improve nutrition that was carried out after two years could not repair the damage or impact of malnutrition at the age of under two years. Nutritional improvements carried out at the age of under two years impact children's growth and brain development, intelligence, and productivity. Besides that, improving nutrition is also related to the economy, where the intervention in nutrition provides a high return of economic benefits, encourages economic growth, and reduces poverty. However, giving *Moringa* leaf extract to breastfeeding mothers to increase the

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quantity and quality of breast milk, which prevents the rate of deviation of infant growth based on BL/A, has not been seen significantly.

The average value of the infant's Z score for BW/BL was higher than the average Z score for BW/A, BL/A, and BMI/A. This was understandable because the BW/BL index describes the current state of nutrition and is not influenced by age. The average BW/BL of Z score tended to improve in the intervention group; the average BW/BL of Z score at the age of 1-3 months was above 0 and decreased at 4 months. Meanwhile, in the control group, only at the age of 1 month the average Z score was above 0, and it decreased at the age of 2 months. This study found similar study results (Minarto, 2014), which show that growth based on the Z score of BW/BL infants aged 6-12 months is better than the two indices of BW/A and body BL/A. Infants 6-12 months experienced 2 forms of severe growth disorders, a rapid decrease in body length between the ages of 6-12 months and severe weight loss disorders, more significant than the decrease in body length (Minarto, 2014). Thus, food supplementation is a variable with risks that affect the growth and development of infants (Ara *et al*., 2018).

A new standard, namely body mass index according to age (BMI/A) (Kemenkes RI, 2011). This index is almost the same as the BW/BL index, but BMI/A is useful for measuring the increase in the incidence of being very obese. This study showed that the deviation of the BMI/A Z score was slightly larger than the deviation of the Z score of BW/BL score in the two treatment groups and slightly lower than the BW/A and BL/A of BW/A Z score. This means that the average nutritional status of infants 0-6 months in this study with very obese status is relatively low. The results of the non -parametric regression confirmed that most of the stagnation and futile linear growth occurred before 23 months of age. Estimates of the magnitude of the association with the associations of wealth, education, and increased toilet use, from regression of Z score of BL/A scores, were systematically more significant for children 24-59 months of age than samples of 0-23 months or 0-59 months; The opposite applies to the regression of the Z score of BW/BL conducted ecological research in Mozambique to find the relationship between various anthropometric variables and birth weight. Studies have shown that birth weight correlates with the growth of the infant's weight ($r = 0.805$, $p<0.01$), and is related to the infant's length ($r = 0.837$, $p < 0.01$) (Alderman and Headey, 2018).

Similar to the average Z score of BW/BL, the average Z score of BMI/A initially was significantly different between the intervention and control groups and occurred again at the end of the intervention, which was significantly different between the two intervention and control groups. However, the change in growth based on the average BMI/A Z score in the intervention group deviated lower than the control group. This means that giving *Moringa* leaf extract to breastfeeding mothers positively affects breast milk volume, which impacts growth based on the BW/BL index and BMI/A infants 0-6 months. Working parents are not an inhibiting factor in children's growth and development (Handayani *et al.*, 2017).

This study can conclude that the difference in the average deviation of the Z score value of the four anthropometric indices (BW/A, BL/A, BW/A, and BMI/A) tends to the administration's role of *Moringa* extract. Furthermore, the average Z score of the reference standard in both groups cannot be separated from the influence of birth weight and length, infectious, and genetic diseases. In general, the results of this study revealed one way to prevent stunting by improving the quality of nutritional intake of pregnant women. It can be conducted by supplementation with *Moringa* leaf extract capsules for breastfeeding mothers for 3 months.

The limitations of this study are that this study did not use a placebo comparison; the comparison used in this study was *Moringa* leaf powder. Then, it was not easy to distinguish between the effects of *Moringa* leaf extract and *Moringa* leaf powder, while the pattern of parenting is not controlled.

5. Conclusion

According to age, the linear growth of infants 0-6 months based on body weight and body length did not differ significantly ($p > 0.05$) in the group receiving *Moringa* leaf extract, both male and female, with the group receiving *Moringa* leaf powder. The growth rate of weight and length of infants aged 0-6 months was influenced by birth weight, infant morbidity and exclusive breastfeeding status. The difference in the average deviation of the Z score value from the four anthropometric indices (BW/A, BL/A, BW/A, and BMI/A) roled in the administration of *Moringa* extract. However, the deviation of the average growth value of the Z score from the reference standard in both groups cannot be separated from the influence of weight and length of the infant born, infectious and genetic diseases. Efforts need to be made to develop complementary feeding products with *Moringa leaf* enrichment to prevent growth inhibition in infants after 6 months of age. Recommendations for further research are needed to increase the dose given to breastfeeding mothers. The policy recommendation is that it is hoped that the

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Government can take advantage of the results of this study so that *Moringa* capsules can be given to breastfeeding mothers to improve the quality and quantity of breast milk to support exclusive breastfeeding and have an impact on the anthropometric nutritional status of infants.

Conflict of interest

The authors state that there is no conflict of interest in this study.

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