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<sup>1</sup>Poltekkes Kemenkes Bengkulu

<sup>2</sup>Poltekkes Kemenkes Kupang

<sup>3</sup>Poltekkes Kemenkes Denpasar

\*Correspondence to: [demsa\\_ui03@yahoo.com](mailto:demsa_ui03@yahoo.com)

## Nutrition assistance of breastfeeding and complementary feeding associated with the linier growth of stunted children aged 6-24 months

Demsa Simbolon<sup>1\*</sup>, Ina Deborah Ludji<sup>2</sup>,  
Yuni Rahyani<sup>3</sup>

### ABSTRACT

**Background and purpose:** Age 6-24 months is a critical period for experiencing nutrition and health problems, especially among children who are stunted. Stunting children need to recover their nutritional status through appropriate interventions to be able to pursue their growth. The purpose of this study was to determine the effect of nutrition assistance on breastfeeding and complementary feeding on the length growth of children aged 6-24 with stunting.

**Methods:** This was a quasi-experimental study. A sample of 60 intervention and 60 control groups were divided into North Bengkulu District and Timor Tengah Selatan (TTS) District. Nutrition assistance for 6 months (July-November 2019) was carried out by 10 trained cadres. Each cadre is responsible for 6 stunted children aged 6-24 months (3 children received assistance and 3 children with standard services from the public health center). Data analysis uses independent t-test and dependent t-test after passing the homogeneity test phase of the proportion of sample characteristics and normality of the data.

**Results:** We found that assistance for breastfeeding and complementary feeding for mothers with stunting children aged 6-24 months was effective in increasing the growth of the child's body length. As many as 53.3% of stunted children in North Bengkulu District and 36.7% in TTS District showed growth after nutrition assistance.

**Conclusion:** It is recommended that the implementation of a nutrition assistance model be accompanied by continuous family and community empowerment in the recovery of nutritional status, especially in families with stunted children aged 6-24 months.

**Keywords:** nutrition assistance, breastfeeding, complementary feeding, stunting

## INTRODUCTION

Stunting is a global problem, especially in some poor and developing countries. It is estimated that the incidence of stunting around the world was 1 in 4 toddlers.<sup>1</sup> In Indonesia, based on the prevalence of stunting, 14 provinces fell into heavy stunting category, and 15 provinces in the category of serious problems. Nationally, the highest prevalence of stunting was in East Nusa Tenggara Province. For Sumatra, the prevalence of stunting in Bengkulu Province is also still high.<sup>2</sup> Various attempts have been made, but the prevalence of stunting remains high, which has become a priority for intervention.

Specific nutrition interventions are stunting prevention activities that focus on the First 1000 Days of Life group. The targets and types of cost-effective specific nutritional interventions are varied. For pregnant women, the interventions are including iron folate supplementation, supplementary feeding for mothers with stunting children aged 6-24 months, prevention of intestinal worms in pregnant women, administration of insecticide-treated bed nets and treatment for pregnant women who are malaria positive; for infants aged 0-6 months are the promotion of breastfeeding, individual, and group counseling, while for children aged 7-23 months are the promotion of breastfeeding, Education Information Communication (EIC) behavior change for complementary feeding improvement, zinc supplementation for diarrhea management, administration of worming, iron fortification, and administration of insecticide-treated mosquito nets for malaria prevention.<sup>3</sup>

Children who suffer from malnutrition will have reduced physical growth, cognitive development, and show less productive work capacity. Globally, stunting contributed to the cause of infant mortality as high as 35% of deaths.<sup>4</sup> Stunting in infancy also increases the risk of obesity and has economic consequences at the individual, household, and community level.<sup>5,6</sup>

The risk factor for stunting can start from the nutritional condition of the pregnant woman, even before pregnancy, which will determine the growth of the fetus.<sup>1</sup> The WHO conceptual framework on the causes and consequences of stunting explains that the incidence of stunting is related to the poor quality of complementary food in children aged 6 to 24 months.<sup>7,8</sup> A study in West Nusa Tenggara Province found that toddlers who received improper complementary feeding have the risk of getting stunted 7.4 times higher compared to toddlers who received the appropriate complementary feeding.<sup>9</sup> Some research results showed that the time of complementary feeding is also related to the incidence of stunting of children aged 6-23 months. The right time to start complementary feeding has a positive effect on children's growth and development. Inappropriate timing of complementary feeding results in children having higher risk of stunting compared to children who receive complementary feeding on time.<sup>4,10-12</sup> Exclusive breastfeeding that is sufficient will meet the nutritional needs of children during the first six months of life. The duration of exclusive breastfeeding more than the recommended times can result in chronic malnutrition due to less energy intake from complementary feeding,<sup>13</sup> while the timing of complementary feeding and the type of complementary feeding influences the incidence of stunting.<sup>14</sup>

In Indonesia, practice to provide complementary feeding at inappropriate times and types is common, for example giving bananas and rice flour mixed with breastfeeding.<sup>14,15</sup> The practice of complementary feeding is influenced by various factors including maternal education and knowledge,<sup>16,17</sup> family income, and advice from health workers.<sup>18</sup> The results of those studies prove that the mother's knowledge, attitudes and actions about complementary feeding are related to the growth of children age 6-24 months.<sup>19,20</sup>

Studies suggested the need for increased knowledge, attitudes, and actions of mothers in complementary feeding after being given nutrition counseling. Nutrition counseling affects the increase in knowledge, attitudes,

and behavior of mothers in the provision of complementary feeding for infants aged 6-24 months.<sup>21</sup> However, the effect of nutrition assistance on the growth of stunted children aged 6-24, has not yet been well established. The aim of this study was to determine the effect of assistance in complementary feeding on the growth of the body length of stunted children aged 6-24 months. The results of this study are expected to be useful in restoring the nutritional status of stunted children.

## METHODS

This study used a quasi-experimental design with a pre-post with control group design. The study population was all stunted children aged 6-24 months in Timor Tengah Selatan (TTS) District, East Nusa Tenggara Province, and North Bengkulu District, Bengkulu Province. Selection of samples was using purposive sampling. Samples are stunted children aged 6-24 months who meet the inclusion criteria, namely biological children, single birth, not disabled, and did not experience concomitant diseases. The number of samples for the intervention groups were 60 children, 30 children in each district, similarly 60 children for the control group, 30 children in each district. The intervention group is a group of mothers who have stunted children aged 6-24 months who received specific nutrition assistance. The control group received standard services from the public health center in the integrated service post. Intervention package was in the form of assistance for breastfeeding and complementary feeding infants to mothers with stunted children aged 6-24 months. Assistance for breastfeeding and complementary was conducted for 6 months (June-November 2019). Breastfeeding and complementary feeding assistance was provided by 10 cadres who had attended the training. Each cadre is responsible for screening 6 stunted children aged 6-24 months (3 children received assistance and 3 children with standard services from the public health center).

The activities included nutrition assistance (nutrition counseling) for mothers and infants, nutrition assistance of nutritional intake (breastfeeding and complementary feeding), nutrition assistance for monitoring children's nutritional status, child health care (immunization, use of insecticide-treated mosquito nets to prevent malaria) and hygiene sanitation (personal hygiene). The study divided into three stages: pre-intervention, intervention, and post intervention stages. During the pre-intervention, baseline data was collected including anthropometric data of body weight and body length of the child, which then converted into the Height Age Z-score (HAZ). The intervention stage was the implementation of assistance of breastfeeding and complementary feeding with counseling. Assistance is given for 6 months in total which includes three phases, 1) intensive phase, the child's mother visited every week for 1 month from Week 1 to 4, 2) the reinforcement phase, the child's mother visited every month for 3 months, and 3) the phase of self, for 1 month since 5 to 6 months to measure the nutritional status of children and changes in maternal behavior. Then, post intervention anthropometric data collection of body weight and length of the child was conducted. Data analysis uses independent t-test and dependent t-test after passing the data normality test stage.

This research has received ethical approval from the Health Research Ethics Commission of the Health Polytechnic of the Tanjung Karang Ministry of Health on March 28, 2019, number 94/EA/KEPK-TJK/III/2019.

## RESULT

Breastfeeding mothers were in the productive age between 21 to 35 years old, seven were primipara. The lowest education level was junior high school, and mostly work outside the home (Table 2). For other

informants, the age's range was from 24 to 54 years with education level from junior high school to 3-year diploma (Table 3).

Table 1 shows the characteristics of mothers with stunted children in both districts. We can see that the intervention and control groups were comparable across both districts, except the proportion of mid upper arm circumference (MUAC) size between the intervention group and the control group is not homogeneous, both in North Bengkulu District ( $p=0.0001$ ) and in the TTS District ( $p=0.005$ ).

**Table 1. Characteristics of the parent of stunted children aged 6-24 months**

Parents Characteristics	North Bengkulu District			TTS District		
	Intervention	Control	p	Intervention	Control	p
Maternal Nutrition Status (kg/m <sup>2</sup> )						
Thin (<18.5)	13.1	10.0	0.055	20.0	18.3	0.164
Normal (18.5-22.9)	26.7	60.0		36.7	55.0	
Overweight (23-24.9)	30.0	10.0		18.3	8.3	
Obese (>24.9)	30.0	10.0		25.0	18.3	
Father Nutrition Status (kg/m <sup>2</sup> )						
Thin (<18.5)	10.0	13.3	0.862	53.3	60.0	0.602
Normal (18.5-22.9)	60.0	50.0		46.7	40.0	
Overweight (23-24.9)	30.0	36.7		0	0	
Mother's age (years)						
<20	16.7	23.2	0.713	11.7	18.3	0.537
20-35	70.0	60.1		73.3	65.0	
>35	13.3	16.7		15.0	16.7	
Parity						
Primipara	30.0	30.0	0.199	31.7	35.0	0.825
Multipara	70.0	60.0		55.0	55.0	
Grande multipara	0	10.0		13.3	10.0	
Interval of Pregnancy (months)						
<24	36.7	40.0	0.791	41.7	55.0	0.144
≥24	63.3	60.0		58.3	45.0	
Chronic energy deficiency (cm)						
CED (MUAC <23.5)	6.7	53.3	0.0001	46.7	71.7	0.005
Normal (MUAC ≥23,5)	93.3	46.7		53.3	28.3	

\*CED=chronic energy deficiency; MUAC=mid-upper arm circumference

Table 2 shows the characteristics of stunted children from both districts and intervention groups. Stunted children in both districts have homogeneous proportions between the intervention group and the control group, so that the child characteristic factors are the same, except the proportion of birth length between the intervention group and control group in TTS District ( $p=0.02$ ).

**Table 2. Characteristics of stunted children aged 6-24 months.**

Characteristics of Children	North Bengkulu District			TTS District		
	Intervention	Control	p	Intervention	Control	p <sup>a</sup>
Gender						
Male	33.3	50.0	0.19	70.0	50.0	0.114
Female	66.7	50.0		30.0	50.0	
Birth Weight						
LBW (<2500 gr)	23.3	13.3	0.317	26.7	23.3	0.766
Normal (≥2500gr)	76.7	86.7		73.3	76.7	
Length Birth						
Short (48 cm)	53.3	36.7	0.194	30.0	60.0	0.02
Normal (≥ 48 cm)	46.7	63.3		70.0	40.0	
Early initiation of breastfeeding						

Not implementing	36.7	43.3	0.999	60.0	70.0	0.417
Implementing	63.3	56.7		40.0	30.0	
History of Breastfeeding						
Non-exclusive	43.3	53.3	0.438	53.3	63.3	0.432
Exclusive	56.7	46.7		46.7	36.7	

<sup>a</sup>Chi Square test; LBW= low birth weight

Table 3 shows that the family characteristics of stunted children in both districts have a homogeneous proportion between the intervention group and the control group, so the family characteristics factor is the same.

**Table 3. Characteristics of families with stunted children aged 6-24 months**

Family Characteristics	North Bengkulu District			TTS District		
	Intervention	Control	p	Intervention	Control	p
Socio-economic Status						
Pre-prosperous	26.7	33.3	0.291	63.3	66.7	0.309
Prosperous I	10.0	23.3		5.0	11.7	
Prosperous II	6.7	13.3		3.3	6.7	
Prosperous III	26.7	13.3		13.3	6.7	
Prosperous III Plus	30.0	16.7		15.0	8.3	
BPJS' participant						
No	11.0	11.0	1.00	65.0	66.7	0.847
Yes	99.0	90.0		35.0	33.3	
Home ownership						
Not ownership	40.0	36.7	0.791	30.0	23.3	0.409
Ownership	60.0	63.3		70.0	76.7	
Mother's Education						
Elementary	20.0	40.0	0.236	20.0	40.0	0.236
Secondary	33.3	23.3		33.3	23.3	
Higher	46.7	36.7		46.7	36.3	
Father's Education						
Elementary	16.7	46.6	0.03	26.7	40.0	0.301
Secondary	53.3	26.7		36.7	30.0	
Higher	30.0	26.7		36.6	30.0	
Family Size						
Large families	36.7	46.7	0.432	36.7	46.7	0.432
Small families	63.3	53.3		63.3	53.3	
Mother's Employment						
Housewife	93.3	93.3	0.513	95.0	93.3	0.677
Employed	6.7	6.7		5.0	6.7	
Father's Employment						
Farmer/Laborer	66.7	73.3	0.573	78.3	76.7	0.827
Employed	33.3	26.7		21.7	23.31	

**Table 4. Effect of nutrition assistance on linear growth of stunted children aged 6-24 months**

North Bengkulu District	HAZ Pre-test		HAZ Post-test 6 months		p <sup>a</sup>
	Min-Max	Mean±SD	Min-Max	Mean±SD	
Intervention	-5.31 to -2.08	-2.91 ± 0.74	-4.25 to 1.51	-2.56 ± 1.71	0.0001
Control	-5.76 to -2.00	-3.45 ± 1.00	-5.83 to 0.22	-3.44 ± 1.17	0.008
p <sup>b</sup>	0.056		0.024		
TTS District	HAZ Pre-test		HAZ Post-test		p <sup>a</sup>
	Min-Max	Mean±SD	Min-Max	Mean±SD	
Intervention	-5.81 to -2.00	-3.46 ± 1.27	-5.53 to 1.27	-1.66 ± 1.22	0.0001
Control	-5.57 to -2.00	-3.35 ± 1.10	-5.78 to -2.62	-2.93 ± 1.74	0.317
p <sup>b</sup>	0.717		0.002		

<sup>a</sup>Paired t-test; <sup>b</sup>Independent t-test, HAZ=height age Z score

Table 4 shows the baseline HAZ index of stunted children in the North Bengkulu District spread from -5.31 to -2.08 in the intervention group and -5.76 to -2.00 in the control group. At baseline screening, there was no difference in the mean HAZ index between the intervention group and the control group ( $p=0.056$ ). After nutrition assistance for breastfeeding and complementary feeding for 6 months, there was a difference in the average HAZ index between the intervention group and the control group ( $p=0.0024$ ). Statistical test results also showed that nutritional assistance was effective in increasing the average HAZ index both in the intervention group ( $p=0.0001$ ) and in the control group ( $p=0.008$ ). Meanwhile, in Timor Tengah Selatan District, the baseline HAZ index spreads from -5.81 to 2.00 in the intervention group and -5.57 to -2.00 in the control group. At the initial screening, there was no difference in the average HAZ index between the intervention group and the control group ( $p=0.717$ ), after 6 months of nutrition assistance there was a significant difference in the average HAZ index between the intervention group and the group control ( $p=0.002$ ). Statistical test results show that assistance for breastfeeding and complementary feeding is effective in increasing the Z-score of the HAZ index only in the intervention group ( $p=0.0001$ ), while the control group has no difference in the HAZ index before and after 6 months of research ( $p=0.317$ ).

Table 5 shows a significant change in the HAZ index between the intervention group and the control group, both in North Bengkulu District ( $p=0.011$ ) and in Timor Tengah Selatan District ( $p=0.012$ ). The increase of the HAZ index in the North Bengkulu District in the intervention group was between -0.24 to 2.23 and the control group was -0.86 to 2.62. The increase of the HAZ index in North Bengkulu District in the intervention group was between -0.72 to 2.39 and the control group -0.92 to 0.94. The change in HAZ index was higher in the intervention group than in the control group.

After 6 months of breastfeeding and complementary feeding assistance, as much as 53.3% of the stunted children showed normal nutrition status, whereas in the control group only 30% showed changes to normal nutrition status (OR=1.78; 95%CI: 0.94-3.37,  $p=0.067$ ). This result showed nutrition assistance program may be effective, but it was not statistically significant. Meanwhile, in the TTS District the difference is higher, in the intervention group, of the 30 stunting children who received assistance for 6 months, 36.7% became normal, while in the control group, only 3.3% of the children showed normal nutritional status (OR=11; 95%CI: 1.51-79.95,  $p=0.004$ ). These results indicate that mothers with stunted children, when given assistance in breastfeeding and complementary feeding, have the opportunity to improve children's nutritional status 11 times to normal body length.

**Table 5. Effectiveness of nutrition assistance to changes in HAZ index and nutrition status.**

North Bengkulu	Changes in HAZ index		OR (95%CI)	$p^a$
	Min-Max	Mean± SD		
Intervention	-0.24 to 2.23	0.902±1.11		0.011
Control	-0.86 to 2.62	-0.09±0.51		
<b>Timor Tengah Selatan</b>				<b>0.012</b>
Intervention	-0.72 to 2.39	1.25±1.14		
Control	-0.92 to 0.94	0.5±1.01		
North Bengkulu	Nutrition Status (HAZ index)		OR (95%CI)	$p^b$
	Normal (%)	Stunting (%)		
Intervention	53.3	46.7	1.78 (0.94-3.37)	0.067
Control	30.0	70.0		
<b>Timor Tengah Selatan</b>				
Intervention	36.7	63.3	11.00 (1.51-79.95)	0.004

Control	3.3	96.7
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<sup>a</sup> Independent t-test, <sup>b</sup> Chi Square test

## DISCUSSION

The findings of this study showed that maternal assistance in breastfeeding and complementary feeding in stunted children is effective for improving the HAZ index of children's length or height. A well-planned and sustainable nutrition assistance program enables mothers to get optimal nutrition and health education. Nutrition assistance interventions include providing knowledge and providing motivation towards changing attitudes and feeding behaviors to children. Increased knowledge, attitudes, and feeding practices in children can influence the growth of stunted children. Nutrition assistance for mothers and caregivers of toddlers is one of UNICEF Indonesia's recommendations for alleviating the problem of stunting in Indonesia.<sup>22</sup> Likewise, nutrition assistance about breastfeeding and complementary feeding will change the practice of feeding children. Nutrition assistance is a formal process to train the ability of clients or increase client's knowledge in choosing food, and behavior related to health maintenance or improvement. Through assistance in breastfeeding and complementary feeding, mothers will understand the time of breastfeeding, also the time and type of complementary feeding.

Complementary feeding means giving other food as a complement to breast milk given to infants and children from the age of 6-24 months. Exclusive breastfeeding during the first six months, followed by the appropriate complementary feeding is an effort that can reduce stunting and improve children's survival. Whilst exclusive breastfeeding that is given too long will delay the provision of complementary feeding which can cause the child to receive an inadequate intake of nutrients to support the process of growth and development.<sup>23</sup> The timing of complementary feeding administration is related to the stunting event. Children who get complementary feeding that is not in accordance with the time they started complementary feeding (less than or more than 6 months) have a 2.8 times risk of stunting.

Children under five who are given exclusive breastfeeding and complementary feeding according to their needs can reduce the risk of stunting.<sup>11</sup> This is because at the age of 0-6 months toddlers who were given exclusive breastfeeding can form immunity to prevent infectious diseases. Then at the age of 6 months, a toddler should be given complementary feeding in sufficient number and frequency so that children under five are fulfilling their nutritional needs which can reduce the risk of stunting.<sup>24</sup> Providing complementary feeding that is timely, fully nutritious, sufficient, balanced, safe and given in the right way is a requirement that will meet the needs of children to grow and develop. If the baby gets early complementary feeding, it will increase the risk of diarrhea and other infections. It will also cause the amount of breast milk received by the baby to decrease, since the nutritional composition of the milk in the first 6 months is very suitable for the baby's needs, consequently, the baby's growth will be disrupted.<sup>15</sup>

The influence of nutrition assistance toward mothers is indirectly associated with the growth of a child's length or height through increased knowledge and feeding practices. A systematic review found behavioral change interventions with appropriate strategies and approaches would be effective in increasing the knowledge and practice of complementary feeding to children 6-24 months in developing countries.<sup>25</sup> Nutrition assistance for mothers and caregivers of toddlers is one of UNICEF Indonesia's recommendations for alleviating the stunting problem in Indonesia.<sup>22</sup>

Mother's knowledge will influence decision making and affect behavior. Mothers of stunted children with good nutritional knowledge will likely provide adequate nutrition for their babies. Nutrition assistance can increase knowledge and feeding practice which is marked by an increase in children's nutrient intake as well as the frequency and form of suitable food. Nutrition assistance can be done individually or in groups.<sup>26</sup> The results of research in the Cibeureum Sub-District, Cimahi City found that nutrition assistance interventions three times each week at the integrated service post (*posyandu*) can improve the knowledge scores and feeding practice of mothers of stunted toddlers. The group that received the intervention using the media food sample had a higher score increase in knowledge and feeding practice. The practice of feeding is one of the factors related to the nutritional status of toddlers. There are significant mean differences in scores of feeding practice after nutrition assistance.<sup>27</sup>

Our study found there is an increase in the average HAZ index for 6 months of assistance to mothers with stunted children aged 6-24 months. Statistical test results showed that there were differences in the average HAZ index both in the intervention and control groups in North Bengkulu District and TTS District. This is because the assistance for 6 months will increase knowledge, improve attitudes, and improve the ability of mothers in parenting. The catch-up after the age of 24 months reflects the availability of food, consumption patterns, the composition of adequate nutrients and avoid infection. Nutrition assistance must also be emphasized on preventing infection.<sup>28,29</sup>

## CONCLUSION

Assistance for breastfeeding and complementary feeding for mothers who have stunted children aged 6-24 months is effective in increasing the growth of the child's body length. It is recommended that a nutritional program be developed by implementing a sustainable nutrition assistance alongside family empowerment and community empowerment model to improve children's nutritional status, especially in families with stunted children aged 6-24 months.

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## AUTHOR CONTRIBUTION

DS contributed in conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, software, supervision, validation, writing original draft and writing, review and editing. IDL contributed in data curation, funding acquisition, methodology, project administration, resources, supervision, and validation. YR contributed in validation and visualization.

## CONFLICT OF INTEREST

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



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