



# Effects of healthy eating patterns based nutrition education and providing structured supplementary feeding on improving the nutritional status of stunted children

*Pengaruh program edukasi gizi berbasis pola makan sehat dan pemberian makanan tambahan terstruktur terhadap peningkatan status gizi balita stunting*

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## Abstract

Nutrition education can improve mothers' knowledge in fulfilling nutritional needs among children under five years through provision of supplementary feeding. Local ingredients based supplementary feeding which had high nutritional value can contribute to improving the nutritional status of children. The aim of this study was to analyze the effect of healthy eating patterns nutritional education and provision of supplementary feeding on improving the nutritional status of stunted children under five years. This study used a quasi-experimental design with a pre-posttest with control group design carried out in Sidawangi Village in August-October 2023. The subjects were children under five years and their mothers (10 intervention group: 10 control group). The interventions were nutritional education and supplementary feeding for a month. Nutritional knowledge data was obtained from interviews using a questionnaire, and nutritional status data (Height-for-Age) was obtained based on z-score calculations. Data was analyzed using Wilcoxon, Mann-Whitney, and independent t-test. The average difference in HAZ index in the intervention group (z-score: 0,81 SD) compared to the control group (z-score: -0,50 SD). There was a significant difference between the average difference in the HAZ index in the intervention group and the control group ( $p=0,001$ ). Nutrition education improved nutritional knowledge of mothers in understanding nutrition education and supplementary feeding ( $p=0,042$ ). In conclusion, nutritional education intervention can improve the nutritional knowledge of mothers and supplementary feeding can improve the nutritional status of children.

**Keywords:** Local food, stunted, toddlers

## Abstrak

Edukasi gizi dapat membantu meningkatkan pengetahuan ibu dalam memenuhi kebutuhan gizi balita melalui pemberian makanan tambahan (PMT). PMT berbasis bahan pangan lokal yang bernilai gizi tinggi dapat berkontribusi terhadap peningkatan status gizi balita. Tujuan penelitian ini untuk menganalisis pengaruh edukasi gizi berbasis pola makan sehat dan PMT terhadap peningkatan status gizi balita stunting. Penelitian ini menggunakan *quasi experimental design* dengan rancangan *pre-posttest with control group* dilakukan di Desa Sidawangi bulan Agustus-Oktober 2023. Subjek penelitian adalah balita dan ibu balita (10 intervensi: 10 kelompok kontrol). Intervensi berupa edukasi gizi dan pemberian PMT selama sebulan. Data pengetahuan gizi diperoleh dari wawancara menggunakan kuesioner, dan data status gizi (TB/U) berdasarkan perhitungan z-score. Analisis data menggunakan wilcoxon, mann-whitney, independent t-test. Rata-rata selisih indeks TB/U pada kelompok intervensi (z-score: 0,81 SD) dibandingkan kelompok kontrol

(z-score: -0,50 SD). Terdapat perbedaan yang signifikan antara rata-rata selisih indeks TB/U pada kelompok intervensi dan kelompok kontrol ( $p=0,001$ ). Edukasi gizi juga telah meningkatkan pengetahuan ibu balita dalam memahami edukasi gizi dan PMT ( $p=0,042$ ). Kesimpulan, intervensi edukasi gizi dapat meningkatkan pengetahuan gizi ibu balita dan PMT dapat meningkatkan status gizi pada balita.

**Kata Kunci:** Balita, pangan lokal, stunting

## Introduction

Stunting or shortness of breath is a big problem in Indonesia as a result of chronic lack of nutritional intake, recurrent infections, especially in the first 1000 days of life of children. Malnutrition that occurs during this period results in irreversible growth and development of children, so that they cannot reach their maximum growth potential. A child is said to be stunted if the z-score value for length or height according to age is  $<-2$  SD (Demilew et al., 2017; National Team for the Acceleration of Poverty Reduction, 2018).

Around 35% of deaths in the world are related to nutritional problems, including stunting (Workie et al., 2020). Stunting causes death in up to 14,5% and impaired functional abilities in 12,6% of children (The Lancet, 2013). According to the World Health Organization (WHO), Indonesia ranks third in the Southeast Asia region or South-East Asia Regional (SEAR) region which has an average stunting rate in children of 36,4% from 2005 to 2017 (WHO, 2020). The prevalence of stunting in Indonesia in 2022 is 21,6%, based on the results of the 2023 Indonesian Health Survey (SKI), the stunting rate is 21,5%, compared to the previous year, it decreased by 0,1%. The reduction in stunting has not yet reached the national target of 18%. The stunting rate in West Java Province will increase by 1,5% in 2023 (Kemenkes RI, 2022; Kemenkes RI, 2020). The prevalence of stunting above 20% is considered high. Cirebon Regency is one of the districts with a stunting rate of 19,4%. The prevalence of stunting is considered to be still higher than the national target, the government has formulated an accelerated reduction in stunting in the 2024 National Medium Term Development Plan (NMDP) to 14% (Badan Perencanaan Pembangunan Nasional, 2020; Kemenkes RI, 2022).

The increase in the prevalence of stunting shows that efforts to reduce stunting in children have not yet been achieved even though various

efforts have been made. Stunting increases the risk of mortality and morbidity as well as poor cognitive and physical development of children. Malnutrition in children is caused by the interaction of various factors such as inadequate food intake, recurrent infections, and disturbed prenatal conditions (Jukes et al., 2020). Based on UNICEF's conceptual framework, poor mother-child feeding practices are the main cause of child malnutrition (United Nations Children's Fund, 2021). Based on UNICEF's conceptual framework, poor mother-child feeding practices are the main cause of child malnutrition (Muluye et al., 2020).

Recommendations from various experts show that nutrition education is needed to increase maternal knowledge and awareness about appropriate child feeding for mothers or caregivers (Fantay et al., 2019; Neme & Olike, 2017). Mothers who have good knowledge are able to change the nutritional attitudes and practices of mothers of toddlers regarding nutritional intake in a better direction, as well as increasing the mother's self-efficacy in improving child feeding behaviors (Mahmudiono et al., 2018; Rahmad et al., 2022). According to Saleem et al., the group of mothers who received nutrition education was able to reduce stunting rates in children by around 10% compared to the group of mothers who did not receive nutrition education (Saleem et al., 2014).

The results of a systematic review by Vaivada et al. (2017) show that various nutrition-based approaches are designed to improve child growth and developmental outcomes through providing supplementary food to malnourished children. This has been proven to be able to increase growth significantly (Vaivada et al., 2017). Providing additional food in the form of eggs to stunted toddlers for one month shows an improvement in nutritional status as measured by the z-score Height (Suksesty et al., 2020). Another study with one egg a day for six to nine months had a significant effect on increasing linear growth and

reducing stunting in the Andean population in Ecuador (Iannotti et al., 2017). Providing Additional Food (PAF) in the form of milk for toddlers shows a positive relationship, Height scores in children who are not used to drinking milk are significantly lower compared to children who usually drink milk (Stuijvenberg et al., 2015).

Sidawangi Village is one of the villages in Sumber District, Cirebon Regency which is included as a stunting locus. Based on a literature search, research on nutritional education and providing structured additional food to improve the nutritional status of stunted toddlers has never been carried out, thus encouraging researchers to carry out this intervention. On the other hand, there is still a lack of use of local food ingredients as PAF for toddlers. One food that is easy for toddlers to like and consume is eggs and milk. By processing local food into a varied PAF menu, toddlers will be increasingly interested in consuming it, which is beneficial for their growth and development and improves the nutritional status of stunted toddlers.

## Methods

The research used a quacy experimental design with a pre-post intervention with control group design. The research location is Sidawangi Village, Cirebon Regency from August to October 2023. The location for Sidawangi Village was determined because it is a special location (locus) for stunting in Cirebon Regency, apart from that, the handling of stunting in this village is still low.

The population in this study were mothers who had stunted toddlers. Determining the sample size purposively for toddlers and mothers of toddlers. The inclusion criteria include 1) toddlers who have a Height score  $< -2SD$ ; 2) toddlers aged 12-59 months and living with their mother; 3) mothers of toddlers aged 15-49 years; 4) parents of toddlers are willing to sign informed consent and participate in nutrition education and PAF programs. Meanwhile, the sample inclusion criteria are 1) the toddlers being observed are twins; 2) toddlers have congenital defects; 3) toddlers suffer from chronic diseases; and 4) toddlers have allergies to eggs or lactose intolerance.

Determining the sample size was calculated using the Lameshow (1990) formula using the mean approach, the power used was 80% and the degree of significance ( $\alpha$ ) was 0.05. The mean and SD used in calculating sample size refer to previous research (Jeniawaty et al., 2022; Lemeshow, 1990). Researchers added 10% of the sample size to each group to anticipate respondents who were lost to follow up. The sample size was 11 toddlers for each group, both intervention and control. There were 2 toddlers who were excluded as subjects because the subjects were not followed up so the sample size used was 10 toddlers for each group.

The stages of this research were that the intervention group was given nutritional education using counseling techniques and leaflets to mothers of toddlers and added PAF with a menu of local food preparations made from eggs and *Moringa oleifera* leaves, as well as milk. The control group was a group that was only given nutrition education in the form of leaflets without counseling. The protein content in purebred chicken eggs is 12.4 g and instant cow's milk sachets are 5 g. Chicken eggs and milk are given as PAF considering that apart from their benefits, the results of preliminary research show that chicken eggs and milk are the most widely consumed animal protein foods so it is hoped that acceptance of this PAF will also be high. The contribution of nutrients from one egg to the RDA of toddlers based on the following groups: aged 1-3 years, namely 11% for energy, 62% protein, 13% calcium, 33% zinc, 43% iron and 15% vitamin A. Age 4 -6 years, namely 11% for energy, 50% protein, 9% calcium, 20% zinc, 30% iron and 14% vitamin A. Meanwhile, the contribution of nutrients from one milk to the RDA of toddlers based on the following groups: ages 1-3 years, namely 9% for energy, 25% protein, 42% calcium, 65% zinc, 47% iron and 30% vitamin A. Age 4-6 years, namely 9% for energy, 20% protein, 28% calcium, 39% zinc, 33% iron and 27% vitamin A (Farisita et al., 2021).

A number of research instruments were used, including: 1) a general questionnaire aimed at obtaining general information on the subject including maternal characteristics (age, height, education and occupation, parenting patterns); characteristics of toddlers (gender, age, birth weight, history of exclusive breastfeeding and history of infectious diseases).

This information was taken at pre-intervention (baseline); 2) nutritional knowledge questionnaire consisting of 11 true or false statement items. The questionnaire has passed validity and reliability tests (Cronbach's Alpha = 0,678). The scoring for a correct answer is 1, while for an incorrect answer the score is 0. The level of knowledge is calculated by adding up the scores and classified into three categories. Information on nutritional knowledge was obtained twice, namely at baseline and post-intervention (endline); 3) leaflets; 4) the instrument for measuring the length or height of toddlers uses a portable stadiometer to measure the nutritional status of toddlers. Nutritional status was seen based on the Height z-score obtained using WHO Anthro software and then categorized into stunting and not stunting. length or height of toddlers is measured twice, namely at baseline and endline.

The form of intervention carried out for mothers of toddlers is nutritional education, while the intervention for toddlers is PAF. Nutrition education is provided in 4 meetings over 1 month, each meeting session is  $\pm 30$  minutes. The educational topics include: 1) Basic nutrition, 2) Stunting, 3) exclusive breastfeeding and PAF/Complementary Food, 4) Daily health sanitation and hygiene. The determination of these four topics is based on the results of previous references regarding factors that influence stunting in toddlers. Basic nutrition discusses nutrients, food, food ingredients and nutritional status. Material regarding toddler stunting includes the definition, characteristics, impact and treatment of stunting. The material on breast milk and PAF/Complementary Food includes the meaning of breast milk and PAF/Complementary Food, the advantages of breast milk, and the practice of making PAF/Complementary Food in accordance with the recommendations for balanced nutrition. Sanitation and hygiene and examples in everyday life. Meanwhile, the intervention for toddlers is providing additional food based on B2SA using local food, namely eggs and Moringa leaves, as well as 125 ml UHT milk for 1 month. Eggs and Moringa leaves are processed into various kinds of menus which are used as side dishes. The PAF given follows the recommendation "fill my plate with rich animal protein" which consists of rice as a source of carbohydrates, eggs as a source of animal protein, Moringa leaves and milk, to meet the needs for

fiber, vitamins and minerals, fruit is given. Chicken eggs, Moringa oleifera leaves and milk are given as PAF considering that apart from their benefits, the results of preliminary research show that chicken eggs and milk are the most widely consumed animal protein foods so it is hoped that acceptance of this PAF will also be high. Meanwhile, many Moringa leaves grow in gardens in the area.

Data analysis was carried out in stages starting from proving the normality of the distribution (using the Shapiro Wilks test) and continued with bivariate analysis, namely using the paired sample t-test and Wilcoxon test for paired data and the Mann Whitney test was used for unpaired data at a significance level of 95%.

The research has received ethical permission from the Research Ethics Committee of the Mahardika Institute of Technology and Health with ethical approval number 103/KEPK.ITEKESMA/VII/2023.

## Result and Discussion

Toddlers are children under five years old or over one year old. The child's characteristics will influence the child's growth and development, including gender, age, birth weight, history of exclusive breastfeeding, parenting patterns and history of infectious diseases. The number of toddlers in this study was 20 toddlers, each group consisting of 10 toddlers.

Based on Table 1, the majority of toddlers in the intervention and control groups were male, the average age of toddlers in the intervention group was younger, namely 16,8 months compared to the control group, 18 months. Research in Ethiopia shows similar results, namely that the proportion of stunting incidents is 54,0%, the majority in boys compared to girls. Boys have a higher risk of infection and malnutrition. According to Bork (2017) boys are the sex that is biologically weaker and more sensitive to environmental or nutritional deficiencies during early life, potentially leading to stunting. Boys face greater nutritional disruption during periods of rapid cell division and tissue deposition than girls (Bork & Diallo, 2017). The results of the different tests showed that there were no significant differences in the distribution of gender and age of toddlers in the intervention and control groups ( $p > 0,05$ ).

**Tabel 1.** Characteristics of toddlers and mothers of toddlers

Characteristics	Intervention		Control		p-value
	n	%	n	%	
<b>Toddlers</b>					
<b>Gender</b>					
Man	8	80,0	7	70,0	0,615 <sup>a</sup>
Woman	2	20,0	3	30,0	
<b>Age (month)</b>					
$\bar{x} \pm SD$	16,8 $\pm$ 4,0		18,0 $\pm$ 4,2		0,655 <sup>b</sup>
<b>Birth Weight</b>					
Low Birth Weight (<2,5 kg)	1	10,0	0	0,0	0,119 <sup>b</sup>
Normal ( $\geq$ 2,5 kg)	9	90,0	10	100,0	
$\bar{x} \pm SD$	3,1 $\pm$ 0,4		3,2 $\pm$ 0,2		
<b>History of exclusive breastfeeding</b>					
Yes	5	50,0	2	20,0	0,170 <sup>a</sup>
No	5	50,0	8	80,0	
<b>History of infectious disease</b>					
Yes	6	60,0	5	50,0	0,661 <sup>a</sup>
No	4	40,0	5	50,0	
<b>Mother of Toddlers</b>					
<b>Mother age</b>					
Early adulthood(20 – 30 years)	4	40,0	4	40,0	0,331 <sup>b</sup>
Middle adulthood (31 – 50 years)	6	60,0	6	60,0	
$\bar{x} \pm SD$	33,3 $\pm$ 7,6		32,6 $\pm$ 6,2		
<b>Height</b>					
< 150 cm	6	60,0	4	40,0	0,761 <sup>b</sup>
$\geq$ 150 cm	4	40,0	6	60,0	
$\bar{x} \pm SD$	148,2 $\pm$ 5,1		151,4 $\pm$ 4,6		
<b>Education</b>					
No/ Never been to school	0	0,0	0	0,0	0,384 <sup>a</sup>
Finished SD/ Equal	6	60,0	3	30,0	
Finished SMP/ Equal	3	30,0	2	20,0	
Finished SMA/ Equal	1	10,0	5	50,0	
Finished D1/ D2/ D3/ S1	0	0,0	0	0,0	
<b>Income per month</b>					
<Rp 550,458,00	2	20,0	0	0,0	0,146 <sup>a</sup>
$\geq$ Rp 550,458,00	8	80,0	10	100	
<b>Eating patterns</b>					
Good (> 80%)	3	30,0	2	20,0	0,611 <sup>b</sup>
Pretty Good (60-80%)	7	70,0	8	80,0	
Not Good (<60%)	0	0,0	0	0,0	
$\bar{x} \pm SD$	76,1 $\pm$ 6,5		74,1 $\pm$ 5,7		

<sup>a</sup>Mann-Whitney; <sup>b</sup>Independent sample t-test

Birth weight (BW) is categorized into two, namely normal ( $\geq$  2,5 kg) and LBW (< 2,5 kg). Most stunted toddlers have a history of normal BBL, the average BW in both groups, intervention and control is 3,1 kg, there was no significant difference between the intervention and control groups. In line with the results of Winowatan's (2017) research conducted in the Sonder Community Health Center working area,

generally stunted children have normal BW, namely 86,6% and the rest have low BW. The relationship between BW and the incidence of stunting is not significant, this could be because the effect of birth weight on stunting is greatest at the age of 6 months at birth and then decreases until the age of 2 years. If in the first 6 months of age, toddlers can catch up with their growth then there is a possibility that toddlers

can grow to normal height (Winowatan et al., 2017). The results of the independent sample t-test stated that there was no significant difference in the BW of toddlers in the two groups ( $p>0,05$ ).

According to WHO (2014), exclusive breastfeeding is the mother's practice of giving breast milk to babies for the first six months after birth without providing any additional food or fluids. Based on statistical tests in Table 1, it shows that there is no significant difference in the history of exclusive breastfeeding in the two groups ( $p>0,05$ ), however the proportion of toddlers who received exclusive breastfeeding in the intervention group was greater (50,0%) than the control group (20,0%). Mothers who do not exclusively breastfeed their children admit that they feel sorry if they only give them breast milk, so they give prelacteal food and complementary feeding earlier when the baby is less than 6 months old. Apart from that, because the mother's breast milk production is low, she is forced to be given formula milk. Another reason mothers say is that babies are fussy so they are fed prematurely.

The results of the Mann-Whitney test showed that there was no significant difference in the BW of toddlers in the intervention and control groups ( $p>0,05$ ). Several studies stated that the practice of exclusive breastfeeding had an effect on the incidence of stunting in toddlers. (Cruz et al., 2017; Muldiasman et al., 2018; Taufiqoh et al., 2017). Toddlers who are not exclusively breastfed have a 16,5 times greater risk of experiencing stunting. Breast milk is the most complete food source for babies, providing all the nutrients and fluids needed for optimal growth and development during the first six months (Damayanti & Muniroh, 2016).

In this study, the infectious diseases studied included diarrhea, ARI, and fever experienced by toddlers in the last 3 months. The proportion of toddlers who experienced infectious diseases in the last 3 months in the intervention group was greater (60,0%) than the control group (50,0 %). Based on the Mann Whitney test, there was no significant difference between the intervention and control groups ( $p>0,05$ ). The incidence of infectious diseases influences the incidence of stunting. This is caused by crowded and unhealthy living conditions which can increase the risk of infectious diseases. In addition, maternal

hygiene practices have a big influence on the risk of infectious diseases. Children under five who have a history of infectious diseases such as diarrhea have a four times greater risk of experiencing stunting (Audiena & Siagian, 2021).

The maternal characteristics examined in this study include maternal age, height, education, income and parenting style. Table 1 shows that there is no difference in maternal age in the intervention and control groups. This can be seen from the results of the Independent Sample T-test ( $p>0,05$ ). The average age of mothers in the intervention group is  $33,3 \pm 7,6$  years. while the control group was younger, namely  $32,6 \pm 6,2$  years. The age of the mothers in both groups was middle adulthood. A person's age is used as an indicator for determining productivity. According to Khomsan (2009), as a person's age increases, there is a tendency to increase in knowledge. Maternal age is significantly related to the incidence of toddler stunting (Khomsan et al., 2009). The results of Habima and Biracyaza's research (2019) show that mothers aged 25-34 years are at risk of having stunted toddlers compared to mothers aged under 25 years (Habimana & Biracyaza, 2019).

The maternal height in the intervention group was lower than the control group,  $148,2 \pm 5,1$  cm and  $151,4 \pm 4,6$  cm, respectively. There was no significant difference between the two groups ( $p<0,05$ ). The relationship between maternal height and stunted children, such as an intergenerational relationship, may reflect genetic mechanisms passed on to children. In women with short stature, physical mechanisms such as the development of the anatomical system of pregnancy and metabolic mechanisms are not optimal, they also have low maternal glucose levels and reduced protein and energy storage. These factors lead to impaired intrauterine development and delayed linear growth of the baby. This suggests that mothers with short stature exhibit cumulative nutritional deficiencies during growth. Mothers who during pregnancy have poor nutritional status are at risk of placental growth and resulting in insufficient transfer of nutrients to the fetus (Khatun et al., 2019; Sinha et al., 2018; Susyani et al., 2022).

The results of statistical tests using Mann Whitney showed that there was no significant difference in the level of maternal education in

the two groups. The educational level of mothers in the control group was better than the intervention group. A total of 60,0% of mothers had completed high school in the control group and 60,0% of mothers had completed elementary school in the intervention group.

The incidence of stunting is related to the level of parental education, where it is more likely to occur in parents with low education. This is related to limited family income and results in inadequate care and lack of attention to children's health. Mothers who are highly educated are better able to make decisions in improving children's health and nutrition (Susyani et al., 2022).

The quantity and quality of food at the household level is determined by family income factors. Low income or poverty is the cause of low food consumption which can affect the nutritional status of family members (Susyani et al., 2022). It is known that in the intervention and control groups the monthly income was above IDR 550,458, meaning it was above the national poverty line. There was no significant difference in income between the intervention and control groups ( $p > 0,05$ ).

The average eating pattern for toddlers in the intervention group was greater than the control group, and was included in the quite good category. These results are in line with research by Farisita et al. (2021) stated that 77,5% of toddler eating patterns were in the good category with an average score of  $87,9 \pm 6,9$ . The growth and development of toddlers is influenced by the parenting patterns implemented by their mothers (Farisita et al., 2021).

**Table 2.** Nutritional status based on z-score

Indeks	Intervention	Control	p-value
Length	$\bar{x} \pm SD$	$\bar{x} \pm SD$	
Baseline	$-2,79 \pm 0,64$	$-2,38 \pm 0,39$	0,070 <sup>c</sup>
Endline	$-1,97 \pm 1,20$	$-2,98 \pm 0,86$	0,046 <sup>d</sup>
$\Delta^a$	$0,81 \pm 0,98$	$-0,50 \pm 0,90$	0,001 <sup>c</sup>
p-value	0,005 <sup>b</sup>	0,019 <sup>b</sup>	

<sup>a</sup>Endline–baseline; <sup>b</sup>Wilcoxon test; <sup>c</sup>Mann-Whitney;

<sup>d</sup>Independent sample t test

The effect of PAF on the nutritional status of toddlers is presented in Table 2. The results of statistical analysis using the Wilcoxon test show that there is a significant difference in average height according to age at baseline and endline in the intervention group ( $p = 0,005$ ). The average

Height at baseline was  $-2,79$  SD and increased to  $-1,97$  SD. There was an increase in the Height score of  $0,81$  SD in the group that received the intervention of processed eggs, Moringa leaves and milk (Table 3), this shows that the PAF intervention had a significant effect on increasing the height of stunted children ( $p = 0,005$ ). The difference in Length between the intervention and control groups showed significant results ( $p = 0,001$ ), meaning that the group that was given PAF had a better increase in body length compared to the control group that was not given PAF. The results of this study are in line with previous research, stunting toddlers given PAF in the form of eggs and milk showed that the Height score of toddlers at post-intervention was  $-2,6 \pm 0,8$ , experiencing a slight improvement compared to pre-intervention  $-2,9 \pm 0,7$ . There is a significant difference in the nutritional status of Height toddlers ( $p = 0,002$ ) (Farisita et al., 2021). Other research conducted by Mahfuz et al. (2019) showed that there was an increase in HFA scores of  $0,23$  in children who received egg and milk intervention for 90 days. Postnatal growth is characterized by a linear increase in growth velocity that decreases gradually after birth. The linear growth rate of a healthy child is approximately 25 cm per year in the first year and 12 cm at 12 to 24 months of age. Giving PAF in the form of boiled chicken eggs to stunted toddlers for 30 days shows a change in nutritional status from stunting to non-stunting based on Height category (Suksesty et al., 2020).

Providing one egg a day for six months has a significant effect on increasing linear growth and reducing stunting in the Andean population in Ecuador (Iannotti et al., 2017). Research by Veterini et al. (2023) data results show that the weight and height of children who consumed biscuits made from Moringa leaves for two months increased, in the male group the average increase in height was 0.22 cm, in the female group the average increase in height is 0.43 cm (Veterini et al., 2023).

Other research shows that giving Moringa leaves to toddlers has an impact on the nutritional status of toddlers as measured by body mass index (BMI) according to age. Giving Moringa leaves to toddlers can increase BMI. In other words, there is an average tendency for an increase in BMI of  $0,13$  before and after treatment (Rahayu et al., 2018). Moringa oleifera is one of the local foods in Indonesia which has

high nutritional content. Nutritional content in 100 g of fresh Moringa leaves, there are 6,7 g of protein and 0,7 g of iron (Olson et al., 2016). According Joshi & Mehta (2016) Increasing the weight and height of toddlers can be influenced by the role of vitamin A, calcium, protein and zinc. Moringa is highly recommended because the raw material is widely grown in Indonesia. So it can be used to support reducing stunting cases.

Nutritional knowledge is information stored in a person's memory, so that it can become the main reference for a person's behavior. The average nutritional knowledge score in the intervention group was  $74,20 \pm 7,10$  higher than the average nutritional knowledge score in the control group, namely  $63,10 \pm 6,64$ . This is also shown in the greater mean difference in the intervention group  $26,10 \pm 6,64$  compared to the control group  $17,10 \pm 11,58$ .

**Table 3.** Nutritional Knowledge of Mothers of Toddlers

Nutritional Knowledge	Intervention $\bar{x} \pm SD$	Control $\bar{x} \pm SD$	p-value
Before	$48,2 \pm 10,0$	$45,3 \pm 8,8$	0,552 <sup>d</sup>
After	$74,2 \pm 7,1$	$63,1 \pm 6,6$	0,009 <sup>d</sup>
$\Delta^a$	$26,1 \pm 6,6$	$17,1 \pm 11,6$	0,042 <sup>d</sup>
p-value	0,021 <sup>b</sup>	0,008 <sup>c</sup>	

<sup>a</sup>Endline–baseline; <sup>b</sup> Paired sample t-test; <sup>c</sup>Wilcoxon test; <sup>d</sup>Mann-Whitney

Based on the results of the Mann-Whitney difference test, a significance value of 0,042 was obtained ( $p < 0,05$ ). This shows that there is a significant difference in the increase in maternal knowledge scores at baseline-endline in the intervention group and the control group. In line with the research results of Farisita et al. (2021), the nutrition education intervention given to mothers showed an increase in nutritional knowledge from 59,9 ( $\pm 16,2$ ) (pre-intervention) to 69,4 ( $\pm 16,9$ ) (post-intervention) ( $p = 0,001$ ). Research in Uganda also showed the same results that nutrition education interventions increased maternal nutritional knowledge, and provided significantly different results ( $p < 0,05$ ) between the intervention group and the control group (Kajjura & Veldman, 2019). Other research shows that nutrition education can improve behavior feeding (Mahmudiono et al., 2018), and when maternal knowledge increases through nutrition

education, this knowledge will be internalized into behavior change (French et al., 2012). The limitation of this research is that the sample used was relatively small and mostly homogeneous. Sample characteristics like this should have a larger and more heterogeneous sample so that the expected results will be more diverse.

## Conclusion

Nutrition education intervention increases nutritional knowledge of mothers of toddlers. This will have a positive impact on their child's diet. The intervention of providing additional food (PAF) in the form of eggs, Moringa leaves and milk for one month was able to improve body length scores according to age in toddlers.

Suggestion, it is necessary to carry out similar research with an additional time of more than one month so that the Height score experiences more improvement. The government and other partners who are trying to reduce stunting in a sustainable manner must focus on nutrition education to increase knowledge and provide advanced PAF interventions to stunted toddlers because stunting is not a nutritional problem that can be resolved in a short time.

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