

RESEARCH STUDY

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Effect of Education on Complementary Feeding Using a Modification Method on the Growth of Infants Aged 6-7 Months: An Experimental Study at Integrated Health Centers (Posyandu) in Karangtengah, Demak Regency

Pengaruh Edukasi MPASI Metode Modifikasi terhadap Pertumbuhan Bayi 6-7 Bulan: Studi Eksperimental di Posyandu Wilayah Karangtengah, Kabupaten Demak

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ABSTRACT**Background:** Infant growth is defined as increased physical size or organ development. Such growth is usually monitored through anthropometric measurements. One of the factors that can affect infant growth is complementary feeding given by mothers.**Objectives:** This study aimed to determine the effect of education on complementary feeding using a modification method on the growth of infants aged 6-7 months at Integrated Health Centers (*Posyandu*) in Karangtengah, Demak Regency.**Methods:** This experimental study used a Pre- and Post-test control group design with samples of mothers and their infants aged 6-7 months. The intervention was given for three months as education on complementary feeding using a modification method, namely a combination of lectures, demonstrations, interactive discussions, practical sessions, and video presentations, as well as dissemination of information and consultation through a WhatsApp group. In addition, a group of mothers with awareness of complementary feeding was created, supervised by local volunteers and midwives during the healthcare services at *posyandu*.**Results:** The mean length increment for the intervention group (4.29 cm) was higher than that for the control group (2.63 cm) with $p=0.000$. Similarly, the mean weight increment for the intervention group (668.75 g) was also higher than that for the control group (344.00 g) with $p=0.001$.**Conclusions:** Education on complementary feeding using the modification method affected the growth of infants aged 6-7 months at *Posyandu* in Karangtengah, Demak Regency.**INTRODUCTION**

Nutritional problems that affect child growth emerge due to a mismatch of nutritional requirements and intake¹. Malnutrition among Indonesian toddlers includes stunting, low body weight, and wasting². Mothers' understanding of the role of nutritional intake during the first 1000 days of life is crucial when it comes to preventing various nutritional problems in Indonesia, particularly in regions where the prevalence of stunting is high³.

Based on data from the 2018 Basic Health Research, the prevalence of short stature in Demak Regency was 19.93% and ranked the 12th highest in

Central Java, whose average was 19.4%. The prevalence of undernutrition in Demak Regency was 16.04%, making it among the top 10 in Central Java, whose average was 11.5%. Based on the data on short stature and undernutrition, it can be concluded that the prevalence was higher than the average for Central Java^{4,5}. Further investigation is needed to determine the factors associated with the stunting cases in Demak Regency. A diet with adequate protein intake, especially animal protein, is crucial for rapid growth during the first year of life. A cohort study in Vietnam proved that weight and length at six months of age are the best predictors for stunting at three years of age⁶. The first 1000 days of life

is a critical phase in which any growth lag is irreversible, as it is closely linked to the crucial phase of rapid brain development; by the age of 2, brain growth starts to slow down⁷. According to WHO, inadequate quality, quantity, and diversity of complementary foods given to children from 6 months old contribute to stunting. Stunting is often linked to reduced intelligence and cognitive function in school-aged children. Providing complementary foods that contain animal protein can boost length increment⁸.

Research conducted at a Public Health Center in East Pontianak showed a significant increase in mothers' knowledge scores after a stunting-related intervention was given through video and brochure materials. Video was shown to be effective in enhancing mothers' knowledge about stunting⁹. Another study also showed a significant weight increment in toddlers before and after nutrition-related interventions, namely nutrition education, using lectures and leaflets. The results showed an average weight increment of 0.60 kg in infants¹⁰.

Because Demak Regency had a high prevalence of malnutrition (among the top 10 in Central Java) and a high stunting rate, research on the effect of education on nutritional intake using a modification method on the growth of infants aged 6-7 months is needed as a stunting preventive measure. Education using a modification method may utilize various techniques such as lectures, videos, support groups for mothers at Integrated Health Centers (*Posyandu*), and dissemination of information through social media platforms such as WhatsApp groups for mothers in Dukun Village.

METHODS

This was an experimental study that used a Pre-posttest Control Group Design. This was part of a research and community service program conducted by Sri Priyantini et al. under the theme "Effect of Education on Complementary Feeding on Attitudes-Knowledge-Practices, Calorie and Zinc Intake, and Growth of Infants under 1 Year at Integrated Health Centers in Karangtengah Subdistrict, Demak Regency." The research was conducted at Integrated Health Centers in Karangtengah Subdistrict, Demak Regency, from August to November 2022. The study involved a total of 39 mothers, 29 mothers and their infants from Dukun Village as the intervention group, and 15 mothers and their infants as the control group. The first group received a 3-month intervention, namely education on complementary feeding using a modification method, which consisted of several techniques to disseminate information. First, experts' direct sessions were

conducted monthly, including lectures, interactive discussions, demonstrations or practice of proper complementary feeding techniques, and video presentations. Second, a group of mothers with awareness of complementary feeding was created, with local volunteers and midwives supporting proper complementary feeding practices during activities at *posyandu*. Third, information was disseminated through a WhatsApp group, including videos, PowerPoint presentations, and brochures about complementary feeding. On the other hand, the control group received only one educational session about child growth and the importance of nutrition intake for infants under two years of age.

The inclusion criteria were infants aged 6-7 months, born full-term, healthy without congenital or physical disorders. The intervention group from Dukun Village comprised 5 Integrated Health Centers, with 400 children under five years old and 24 infants aged 6-7 months to be involved in the intervention. The control group comprised ten infants aged 6-7 months out of 400 toddlers at 5 Integrated Health Centers from Karangtengah Village and five infants aged 6-7 months out of 265 at 4 Integrated Health Centers from Karangtengah Village. Therefore, there was a total of 15 infants aged 6-7 months in the control group. The education topics consisted of current methods of introducing solid foods, namely responsive feeding and baby-led weaning, and the appropriate proportions of complementary feeding, including FDA-approved milk porridge for infants aged 6-7 months and homemade rice porridge with proper proportions (rice, animal protein, vegetables, and oil/butter) to be given daily. Additional information was also provided, including information on how to detect stunting by assessing weight and length growth curves in the Maternal and Child Health book, allowing mothers to understand growth patterns better.

Infants' weight and length were measured in both groups before and after the educational interventions were given. The weight measurements were conducted according to the standards issued by the Indonesian Ministry of Health, with the infants weighed while lying down and not wearing clothes, using a digital baby scale with an accuracy of 0.001 kg. Similarly, the length measurements were taken with the infants lying down using a measuring slide up to 150 cm, with an accuracy of 0.01 cm¹¹. The nutritional intake design taught to the mothers at *posyandu* was based on the recommendations of the Indonesian Pediatric Society (IDAI), as depicted in Table 1 below¹²:

Table 1. Recommended daily intake of babies

Age (months)	Daily frequency	Energy needs from complimentary feeding (kcal/day)	Consistency	Amount per serving
6-8	2-3	200	Puree	2-3 spoonfuls, increased gradually to 125 ml
9-11	3-4	300	Shreds/slices, finger foods	125 ml
12-23	3-4	550	Same food as the family	150-250 ml

kcal: kilocalories

Hypothesis testing was performed using the independent samples t-test to compare the mean weight and height increments between the two groups after the interventions. The data were analyzed using the SPSS (Statistical Product and Service Solutions) application, with a significance threshold of $p < 0.05^{13}$. This research was approved by the Bioethics Commission of the Medical/Health Research of the Faculty of Medicine, Sultan Agung Islamic University Semarang, with Approval Letter No. 302/VIII/2022/Komisi Bioetik. The study was conducted after the Ethical Clearance was obtained. Each of the mothers who participated was provided with an explanation of the research objectives, and all had signed a consent form.

RESULTS AND DISCUSSION

There were 24 infants in the intervention group from four *posyandu* and 15 infants in the control group from three *posyandu*. This research was conducted at *Posyandu* in Karangtengah Subdistrict, Demak Regency,

from August to November 2022. The study involved 39 mothers, comprising (1) 24 mothers from Dukun Village as the intervention group who were given intensive education on complementary feeding and (2) 15 mothers from Karangsari Village as the control group who were given one health counseling session.

Health counseling is an activity that aims to help the community understand how to maintain their health and prevent things that could harm their health. Through nutritional counseling, mothers of babies can gain important information and practical methods for preparing and scheduling complementary feeding. The counseling was conducted using various methods, including lectures, demonstrations, and videos, so these mothers could actively engage in the activities, ask questions, and share experiences and knowledge¹⁴. Mother's knowledge and attitudes are crucial determinants for children's health in general and infant feeding practices in particular¹⁵. Table 2 below presents the characteristics of the respondents from both groups:

Table 2. Characteristics of mothers and babies

Variables	Group		Total	p-value
	Intervention	Control		
Mothers' Age				
<30 years	19 (79.2%)	10 (66.7%)	29 (74.4%)	0.463
>30 years	5 (20.8%)	5 (33.3%)	10 (25.6%)	
Mothers' Education				
Low	7 (29.2%)	0 (0.0%)	7 (17.9%)	0.031*
High	17 (70.8%)	15 (100.0%)	5 (82.1%)	
Mothers' Occupation				
Employed	2 (8.3%)	4 (26.7%)	6 (15.4%)	0.180
Unemployed	22 (91.7%)	11 (73.3%)	33 (84.6%)	
Family Income				
>MMW of Demak	16 (66.7%)	0 (0.0%)	16 (41.0%)	0.000*
<MMW of Demak	8 (33.3%)	15 (100%)	23 (59.0%)	
Exclusive Breastfeeding History				
Yes	20 (83.3%)	15 (100.0%)	35 (89.7%)	0.146
No	4 (16.7%)	0 (0.0%)	4 (10.3%)	
Formula Milk History				
Yes	5 (20.8%)	5 (33.3%)	10 (25.6%)	0.463
No	19 (79.2%)	10 (66.7%)	29 (74.4%)	
History of Full Vaccination				
Yes	24 (100%)	1 (6.7%)	9 (23.1%)	0.000*
No	0 (0%)	14 (93.3%)	30 (66.7%)	
Birth Weight				
Normal	22 (91.7%)	15 (100.0%)	37 (94.9%)	0.514
Low	2 (8.3%)	0 (0.0%)	2 (5.1%)	
Birth Length				
Normal	24 (100%)	15 (100%)	39 (100%)	1.000
Low	0 (0.0%)	0 (0.0%)	0 (0.0%)	

*Chi-square/Fisher's exact test, MMW: Monthly Minimum Wage

Table 2 shows that there was a higher number of mothers aged 22-25 years (45.8% and 40.0%, respectively) compared to the other age groups in both the intervention and control groups. In both groups, most mothers graduated from high school (62.5% and 73.3%, respectively). Regarding occupation, most mothers in both groups were housewives (91.7% in the intervention group and 73.3% in the control group). In the control group, the family income was predominantly in the range of IDR 2.5-3.0 million (50.0%), while in the intervention

group, mostly in the range of IDR 3.5-4.0 million (66.7%). Regarding exclusive breastfeeding, both groups were dominated by mothers who exclusively breastfed their babies (83.3% in the intervention group and 100.0% in the control group). Regarding formula milk history, most babies (79.2% in the intervention group and 74.4% in the control group) were not given formula milk. This means that there were a smaller number of babies who received formula milk (16.7% and 33.3%). Regarding the full vaccination history, all babies in the intervention group

were fully vaccinated, and 93.3% of babies in the control group were not fully vaccinated. Regarding birth weight, 91.7% of the babies in the intervention group and all babies (100.0%) in the control group had a normal birth weight. All the babies (100%) in both groups had normal birth length.

Family income can affect the behavior or preference for affordable food items. Despite having a higher education level, the control group had lower family incomes, potentially causing difficulties in buying nutritious food items, especially animal-based foods. Animal-based foods offer the benefits of containing essential proteins, fatty acids, minerals (zinc, calcium),

and vitamins (A, D) that are necessary during the accelerated growth phase¹⁶. The results of a previous study have shown that mothers' education and socio-economic status are not directly linked to stunting. Still, babies' daily nutritional intake is associated with stunting at the age of three¹⁷. Based on the Chi-Square test results, the data on mothers' education, family income, and full vaccination history using Fisher's exact test had p-values of 0.031, 0.000, and 0.000, respectively, with $p < 0.05$ indicating significant differences in terms of mothers' education, family income, and full vaccination history between the intervention and control groups.

Table 3. Mean difference in height and length increments between the intervention and control groups

Variable	Mean ± SD		p-value
	Intervention group	Control group	
Mean length increment	4.29 ± 1.33 cm	2.63 ± 1.22 cm	0.000*
Mean weight increment	668.75 ± 344.15 g	344.00 ± 89.83 g	0.001*

*Independent t-test

Based on the results of the t-test for independent samples (unpaired t-test), the mean weight increment showed $p < 0.001$ ($p < 0.005$), indicating a significant difference in the mean weight increment between the intervention and control groups. Similarly, the difference in length increment between the intervention and control groups resulted in $p = 0.000$, indicating a significant difference in height increment between the two groups. Therefore, based on this analysis, nutrition education using a modification method affected the growth of infants aged 6-7 months, as evidenced by the difference in mean weight and length increments between both groups.

This results align with research by Jardí, demonstrating that implementing nutrition education programs for mothers with infants in Africa contributed to improved child growth and reduced malnutrition. The education program encouraged caregivers to learn and apply high-calorie recipes, hygiene practices, feeding skills, and improvement of nutritional quality through group activities¹⁸.

Research by Rahayu has shown a significant relationship between maternal nutrition education and weight changes in malnourished toddlers in the Mardani playgroup in Kendal Regency. Nutrition education aims to inform mothers about good parenting practices related to appropriate feeding methods and food types and variations that are appropriate and appealing for toddlers. Increased maternal knowledge can lead to better feeding practices and behaviors, thus positively affecting toddler nutrition¹⁹.

The nutrition intake education program aims to inform and enhance the knowledge of mothers or caregivers about proper nutrition for infants. Improved knowledge about complementary feeding improves attitudes and behaviors in providing appropriate complementary feeding for infants. This aligns with research by Kustiani et al., who indicated a significant improvement in attitudes and feeding practices after nutrition education. This means that there was an improvement in mothers' attitudes towards complementary feeding after nutrition counselling²⁰.

As mothers' knowledge about complementary feeding improves, their behavior and attitude towards providing optimal complementary feeding to infants aged 6-24 months also improve. In other words, mothers' knowledge affects their attitude and behavior in selecting food for their babies; good nutritional knowledge potentially leads to better food consumption for babies²⁰. An increase and change in mothers' knowledge, attitudes, and behavior after counseling can then positively affect the provision of nutritious food for their children, so children could have better food consumption, which expectedly leads to weight and length increments¹⁷.

Various factors affect weight and length increments, including genetic or familial factors with a history of obesity, the nutritional intake provided to the baby, parenting style when caring for sick babies, and mothers' knowledge. Mothers' knowledge about complementary feeding is crucial for babies' healthy growth and development to prevent malnutrition. Apart from the interventions in the form of education on complementary feeding, nutrition is a primary determinant of a child's future health²¹. Child nutrition standards should be observed when a child begins to be given complimentary foods and since pregnancy. Mothers should monitor the growth during the prenatal and postnatal periods²². Scientific works in early childhood nutrition have recognized that during the first 1000 days of life, starting from fetal life and beyond, nutrition has a significant effect on health from childhood to adulthood.

Children with poor nutrition are at risk of poor development, such as stunting and wasting. There are many potential causes of stunting in Indonesia, including proximal factors such as maternal nutritional status, breastfeeding practices, complementary feeding practices, and exposure to infections, as well as distal factors such as education, economic status, food systems, healthcare, water, and sanitation²³. The late introduction of complementary foods is still common in Bangladesh. However, a positive change in mothers' knowledge or attitudes toward complementary feeding is not

associated with the timely introduction of complementary foods²⁴. However, the improvement in complementary feeding practices through the use of Communication for Development approaches, of which the follow-up was done after one year, showed an increase in mothers' awareness of complementary feeding after the interventions were given. This study also showed increased meal frequency, iron-rich food intake, accuracy, and appropriate introduction of complementary foods as measured through in-depth interviews. In addition, the interventions resulted in reduced obesity and wasting rates²⁵.

The mothers' psychological state can affect children's nutritional status during complementary feeding practices. Mothers with traditional practices tend to have a higher anxiety level compared to those practicing Baby-Led Weaning (BLW). This means that mothers using traditional practices are more cautious in determining what foods to give than mothers using BLW²⁶. Parents who practice the traditional methods seem to be concerned about information from health practitioners. The main reason for not practicing BLW (as reported by 56% of the samples of a study in New Zealand, n=199) was fear that their baby might choke (55.3%), concerns about the baby's ability to have adequate nutritional intake (44.2%), concerns about the baby's ability to feed themselves (27.6%)²⁷.

It is estimated that one in five children aged <5 years will experience stunting by 2022²⁸. Based on a systematic review that compares interventions for child growth and development, nutrition education significantly improves weight and length increments among infants aged 12 months compared to those aged 18 months or above²⁹. After age two, a child's growth rate slows down compared to the standard growth reference. Therefore, it is necessary to conduct cross-sectoral activities and interprofessional collaboration, including regular nutrition education, which could involve nutritionists at health centers, pediatric specialists, and local volunteers at *posyandu* to prevent stunting. A previous study has shown that education on early detection of stunting can significantly increase mothers' knowledge about stunting prevention for babies aged 0-24 months^{30,31}. It is also important for local volunteers to be active and interact with the communities to create awareness of stunting and nutrition by providing counseling through focus group discussions (FGDs). In addition, their active involvement serves not only as a measure of the success of these efforts but also as an indicator of their readiness and capability to educate the community^{32,33}. However, this study has limitations, including unequal sample sizes between the two groups, less homogenous characteristics, and numerous confounding variables such as ease of access to smartphone information, recurring infections, and parenting patterns.

CONCLUSIONS

Based on the results of this study, the mean weight increment in the intervention group (668.75 g) was significantly higher compared to the control group (344.00 g). The mean length increment in the intervention group (4.29 cm) was also considerably

higher than the control group (2.63 cm). It can be concluded that education on complementary feeding affected the weight and length increments in infants under one year old. Therefore, continuous and regular educational efforts are still needed for mother groups through *posyandu* through various techniques, including supervision from trained local volunteers, video presentations, dissemination of informative materials, and leaflets shared through social media groups facilitated by healthcare professionals, local volunteers, or other trained personnel which also involve collaboration with Primary Health Centers (*Puskesmas*) and nearby hospitals. The success of education on complementary feeding contributes to preventing stunting and malnutrition.

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Conflict of Interest and Funding Disclosure

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