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The integrated intervention of early childhood education and stunting prevention program in increasing pre-school age children's food intake

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ABSTRACT

Introduction: Indonesia's stunting rates are staggering, with more than 30% of stunted children. The government has conducted several stunting treatment programs, but the number of stunted children in Indonesia is still more than 20%. On the other hand, Indonesia has an education system for pre-school children. Stunting prevention can integrate with this system by providing nutrition education to pre-school children. The experiment aims to prevent stunting in children by integrating early childhood education and nutrition education to increase food intake.

Methods: The population is pre-school-age children in Bantul Regency Yogyakarta. The research sample was 20 pre-school children given the program and 19 pre-school children in the control group. The integration program was given to children for three months (February - April 2021). The activities are education to improve children's developmental abilities and provide nutrition-related education. The food intake measuring instrument used a food recall analyzed by the Nutri-survey software. Data analysis used central tendency and t-test.

Results: The average food intake was still below the Recommended Dietary Allowances (RDA), namely 1064 kcal in the intervention group and 1182 kcal in the control group. However, there was an increase in food intake in total daily food intake, breakfast intake, and dinner with a p-value of 0,001, 0,028, and 0,022, respectively, while at lunch intake, there was no difference with p-value 0,069.

Conclusion: The integrated early childhood education and nutrition education programs can increase food intake for pre-school children. Therefore, this program is critical to be continued in all early childhood education systems in Indonesia as one of the stunting prevention programs.

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INTRODUCTION

Stunting in children under five has reached 155 million globally.[1,2] The World Health Organization (WHO) showed that Indonesia is the third country with the highest prevalence among the Southeast Asia/South-East Asia Regional (SEAR) regions.[3,4] The prevalence of stunting in Indonesia has increased since 2016 from 27.5% in 2017 to 29.6%.[5] The prevalence of stunted toddlers in Yogyakarta Province in 2018 was 12.37% and decreased to 10.69% in 2019. The highest prevalence of stunting was Gunung Kidul Regency (17.94%), and the lowest was Bantul Regency (7.73%).[5,6]

Several factors can cause stunting in children. The main factors that directly affect stunting in toddlers are infectious diseases and food intake. Poor diet in pre-school age children is a risk factor for stunting.[7] Not all children are affected, and children with and without stunting are seen in the same communities. Therefore, this study aimed to identify nutritional and other factors that prevent stunting that may exist in local communities. STUDY DESIGN: This is a prospective cohort study. METHODS: Data were extracted from the Health and Demographic Surveillance System conducted in Kwale County, Kenya. The cohort consisted of all households with children less than five years old, within a radius of 2.2 km from a local health centre. A dietary pattern (DP Malnutrition in food intake can affect growth limitations, are susceptible to infection, and ultimately inhibit children's growth, contributing up to 45 percent of all child deaths. One of the groups of toddlers at risk of experiencing food intake problems is pre-school-age children.[5]

Preschool-age children are a golden period where at this time, their physical and psychological development is rapid. Therefore, they must have good and balanced nutrition[5] and require nutritional intake based on their needs.[8] In Indonesia, children aged 0-4 years old have reached 8.74% of the total population. The estimated number of pre-school-age children in Yogyakarta reached 113,231 children. One health problem that often occurs in pre-school-age children is

stunting, so integrated prevention efforts are needed between several existing programs in Indonesia.[9]

A previous study stated that the Early Childhood Development (ECD) program is recommended to provide nutrition improvement interventions to pre-school children.[10] large-scale nutrition-sensitive programmes that address key underlying determinants of nutrition and enhance the coverage and effectiveness of nutrition-specific interventions. We reviewed evidence of nutritional effects of programmes in four sectors agriculture, social safety nets, early child development, and schooling. The need for investments to boost agricultural production, keep prices low, and increase incomes is undisputable; targeted agricultural programmes can complement these investments by supporting livelihoods, enhancing access to diverse diets in poor populations, and fostering women's empowerment. However, evidence of the nutritional effect of agricultural programmes is inconclusive-except for vitamin A from biofortification of orange sweet potatoes--largely because of poor quality evaluations. Social safety nets currently provide cash or food transfers to a billion poor people and victims of shocks (eg, natural disasters It is considered effective in synergizing with nutrition intervention programs because currently, nutrition programs focus more on the period of conception to the first 1000 days of life so that pre-school age children receive less attention regarding nutrition programs. Although preschoolers do not benefit from nutritional interventions on linear growth, they still have dietary needs to maintain and improve their nutritional status. The Early Childhood Development (ECD) program in Indonesia is the Early Childhood Education Program.[1,11,12]

The Early Childhood Education Program (PAUD) is a level of education before the basic education level starting from newborn to six. Indonesia has 187.211 PAUD spread across all provinces. The Special Region of Yogyakarta has 4930 PAUD units.[13] The activities stimulate growth and development so that children are ready to enter further education. Based on the description, the researchers took the initiative to integrate the Early Childhood Education (PAUD) program with the stunting prevention program for pre-school children to increase food intake in children. This research initiates a program to prevent stunting, especially in pre-school-age children.

METHODS

The research design to see the PAUD program's effectiveness with stunting prevention in preschool-age children was quasi-experimental with a pre-post-test with a control group design approach. The population was pre-school children aged 3-6 years who joined the PAUD program in Bantul Regency. This research was a pilot project in handling stunting in pre-school age children. Only two PAUD in Bantul Regency were selected, where one PAUD was the intervention group and one PAUD was the control group. The sample was calculated by the sample size estimation formula to test the different hypotheses of 2 independent group means. The samples based on the formula calculation were 20 children for the intervention group and 19 children for the control group.

The program lasted for three months, from preparing materials, coordinating activities, and implementing the program. Stunting prevention education related to food intake was provided online and offline. The media used was audiovisual media, where the researchers developed two audiovisual media, namely materials related to stunting and nutrition for pre-school age children. Stunting prevention materials were given once a week on the sidelines of regular PAUD activities. The researchers also provided educational materials through the WhatsApp group for parents so that children could see them again at home. Students who participated in the PAUD program were only given posters on nutrition sent via WhatsApp in the control group.

The researchers measured the program's effectiveness using a 24-hour food recall instrument from WHO (2012) (14) via Google Form. Measurements were carried out for three days, where the researchers calculated the intake of breakfast, lunch, and dinner. The participants received food record forms before the intervention activity and one week after the program ended. The results of the food record were calculated using the Nutri-survey 2007 application to calculate the number of calories consumed by children (Erhardt, 2007) (15). Before testing the hypothesis, the researchers analyzed the normality and homogeneity of the data. The results showed regular and homogeneous data, so the analysis used was parametric, namely, t-test.

RESULTS

The study was conducted in two Early Childhood Development (ECD) programs in Bantul Regency, Yogyakarta. The characteristics of the respondents in this study showed differences between the intervention group and the control group in terms of gender characteristics and mother's education. In terms of gender, most intervention groups were male, while most were female in the control group. In terms of maternal education, most of the intervention group had a high school background, while in the control group, most of them were college graduates (see Table 1).

Table 1. Frequency distribution of respondents based on gender and mother's education (n=39).

Characteristics of Respondents	Intervention Group (n=20)		Control Group (n=19)	
	f	%	f	%
Sex				
– Male	11	55	7	36.8
– Female	9	45	12	63.2
Mother's educational background				
– Elementary-middle school	1	5	2	10.5
– High school	10	50	5	26.3
– University	9	45	12	63.2

According to both groups, there were several significant differences ($p<0.05$) in total food intake, breakfast intake, lunch intake, and dinner intake. Based on our assessment, we reported the increasement of total food intake, breakfast intake, lunch intake, and dinner intake if compared before and after the intervention. Meanwhile, total food intake had quite many differences compared to other variables in both groups (see Table 2). While in the control group (see Table 3), there is no increase in breakfast intake, lunch intake, dinner intake, and total food intake. Thus, we could not find any significant difference between the two groups ($p>0.05$).

The hypothesis test saw increased food intake after the PAUD integration program with stunting prevention using the independent t-test. However, the analysis results showed no increase in total food intake, morning and afternoon, but increased dinner intake (see Table 4). According to our analysis, only dinner intake had a significant difference between the two groups ($p=0.02.2$)

DISCUSSION

The results showed that before the intervention, the average food intake in the intervention group was 1064.85 kcal, with a minimum value of 450 kcal and a maximum of 1709 kcal. While in the control group, the average food intake was 1182.31 kcal with a minimum value of 688 kcal and a maximum of 1718 kcal. Based on the Regulation of the Minister of Health of the Republic of Indonesia No. 28 of 2019 concerning the recommended nutritional adequacy rate for the Indonesian people, the healthy adequacy rate for children aged 1-3 years is 1350 kcal and children aged 4-6 years is 1400 kcal. Therefore, the average nutritional adequacy rate in the intervention and control groups was still less than the established standard.[14]

Preschoolers are children aged 4-6 years. At this age, nutritional needs are in line with physical requirements. Preschoolers tend to see things from their point of view. They will ignore other people's points of view. Children with unstable and uncontrolled will continue to cry until their wishes are fulfilled. Characteristics of children at this age include those who tend to spend their time playing and neglect their eating hours. As a result, the nutritional adequacy of children cannot be fulfilled, which can cause nutritional problems.[15]

The results showed that the food intake of the intervention group in the intake of breakfast, dinner, and complete meals increased before and after the intervention. Meanwhile, there was no increase in food intake in the control group, breakfast, lunch, dinner, and total intake. Thus, the intervention of the PAUD integration program with stunting prevention is a community-based stunting prevention effort where several previous studies have stated that community-based stunting prevention interventions are more effective than clinical-based interventions. Gelli et al. integrated ECD and nutrition programs in the community. Their study showed an increase in food intake at home as measured using 24-hour food

Table 2. Description of respondents' food intake for pre-school age children in the intervention group (n=20).

Research Variable	Before Intervention (n=20)		After Intervention (n=20)		P*
	Min-Max	Mean±SD	Min-Max	Mean±SD	
– Total food intake	450-1709	1064.85±355.85	836.18-2233.10	1377.07±376.65	0.000
– Breakfast intake	131-638	354.95±143.57	206.60-673.55	442.99±142.28	0.028
– Lunch intake	131-637	386.55±164.69	164.56-858.41	481.52±192.22	0.069
– Dinner intake	130-502	324.05±125.30	215.67-1129.50	452.08±228.67	0.022

Description: *p<0.05 based on dependent t-test (one-tailed significance)

Table 3. Description of respondents' food intake for pre-school age children in the control group (n=19).

Research Variable	Before Intervention (n=19)		After Intervention (n=19)		P*
	Min-Max	Mean±SD	Min-Max	Mean±SD	
Total food intake	688-1718	1182.31±258.51	796.31-167.16	1231.58±264.12	0.453
Breakfast intake	143-659	420.47±150.38	286.61-659.20	451.30±126.60	0.113
Lunch intake	149-599	388.26±123.62	195.85-789.38	473.65±161.51	0.135
Dinner intake	112-709	373.52±144.97	129.21-646.79	306.62±135.90	0.517

Description: *p<0.05 based on dependent t-test (one-tailed significance)

Table 4. The effect of PAUD In casting on food intake in pre-school age children (n=39).

Research Variable	Before Intervention (n=20)		After Intervention (n=19)		95% CI	P*
	Min-Max	Mean±SD	Min-Max	Mean±SD		
Total food intake	836.18-2233.10	1377.07±376.65	796.31-167.16	1231.58±264.12	-66,63 – 357,61	0.173
Breakfast intake	206.60-673.55	442.99±142.28	286.61-659.20	451.30±126.60	-95,85 – 79,25	0.849
Lunch intake	164.56-858.41	481.52±192.22	195.85-789.38	473.65±161.51	-107.63 – 123.38	0.891
Dinner intake	215.67-1129.50	452.08±228.67	129.21-646.79	306.62±135.90	22.57 – 268.34	0.022

Description: *p<0.05 based on independent t-test (one-tailed significance)

recall. The measured food intake included macronutrients and micronutrients. The intervention could also increase the intake of diverse foods where vegetables and fish showed a significant increase. In addition, children and parents or caregivers received the intervention with an increase in caregiver knowledge.[1]

A mother's level of knowledge affects how a mother has information, especially proper food consumption, and decides to select food ingredients for the child. For example, mothers can know the types of food ingredients and the number of servings needed by children to meet their nutritional adequacy. Mothers can also determine rules and prohibitions related to children's food consumption to improve the quality of children's eating habits. Daily meals may reflect a mother's level of knowledge about good nutrition. In line with the results of this study, the mother's level of knowledge had a significant influence on children's food intake.[15]

Comparing the intervention and control groups showed no increase in food intake except for dinner because the two PAUDs previously had nutrition-related counseling from the public health center. Also, the increase in the food intake in the intervention group was not significant. Another factor that affected the food intake of pre-school age children was where parents became the most influencing factor for eating behavior in pre-school age children.[16]

The limitation of this study is that the sample involved in the research is still limited due to the pilot project stage, so further research is needed to see the effectiveness of the intervention in a larger population and the differences between urban and rural areas.

CONCLUSION

The results found that integrating PAUD intervention and stunting prevention programs could increase total food intake in the intervention group with a significant increase where the average before intervention was 1064.85 kcal and after the intervention increased to 1377.07 kcal.

CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose. All co-authors have seen and approved the manuscript's contents, and there are no conflicts of interest to disclose. We certify that the submission is original work and that it is not currently under consideration by another publication.

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ETHICAL APPROVAL

The research has gone through an ethical test at the Ethics Commission of the Faculty of Medicine and Health UMY with the ethical number 016/EC-KEPK FKIK UMY/I/2021.

AUTHOR CONTRIBUTION

TH and AR develop research concepts and designs. TH and YB develop ideas into research titles and look for appropriate literature. TH, AR, and YB put together research proposals and built experimental research. AR and AA collect data and analysis; meanwhile, TH does statistical data analysis. TH and YB compile manuscripts ranging from preparation, editing, and review. YB became the guarantor of the manuscript.

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