ASSESSING THE HEALTH AND NUTRITION OF CHILDREN FROM LOW-INCOME HOUSEHOLDS IN RURAL PANDEGELANG, BANTEN, INDONESIA

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Abstract. Undernutrition is linked to food insecurity, which is brought on by low income, restricted access to wholesome food, low educational attainment, and poor hygiene habits, all of which contribute to the development of disease. To address undernourishment among children under five, this study aimed to evaluate the prevalence of undernutrition in children from low-income households and provide appropriate handling. Pandeglang District was selected as the study area due to its high rate of province undernourished children. Information was gathered on the children's anthropometry, general characteristics, household socioeconomics, and 24-hour recall of food consumption. The results revealed that among the 105 children assessed, 40% were stunted, 23.8% were underweight, and 4.8% were experiencing wasting, indicating a notably high level of undernutrition. These figures place Pandeglang as the district with the highest undernutrition rates in the region, exceeding both the provincial and national averages reported in 2018. According to WHO standards, the area falls under the medium category for underweight and high category for both stunting and wasting. Dietary intake analysis using the Calculator of Inadequate Micronutrient Intake (CIMI) showed that only 55.2% of the children met energy requirements, while 50.5% and 53.3% met the needs for iron and zinc respectively. Alarmingly, nearly all (98.1%) had insufficient intake of vitamin A. This indicates that micronutrient deficiencies are a significant issue. It may have an impact on kids' development and health. To address this problem, better diets, supplementation, and nutrition education are required.

Keywords: undernutrition, food insecurity, CIMI, nutritional status, dietary intake

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INTRODUCTION

The prevalence of stunting in children under five is one of Indonesia's biggest nutritional issues. According to the Ministry of Health of Republic of Indonesia (MoHRI, 2019), nationally, the prevalence of stunted under five children, indicated by height-for-age Z-score (HAZ) less than minus two standard deviation (<-2 SD) (WHO, 2009), decreased from 37.2% in 2013 (MoHRI, 2013a) to approximately 30.8%. Despite this decline, the rate remained higher than the global average of 22.9% (UNICEF/WHO/World Bank Group, 2017), which represented about 155 million stunted children worldwide. By 2023, the three organizations jointly updated the global estimate to 148.1 million stunted children (UNICEF/WHO/World Bank Group, 2023).

Stunting is a chronic nutritional problem in children, which is characterized by a shorter height than children his age, indicated by HAZ <-2SD (WHO, 2006; WHO, 2009). Stunted children will be more vulnerable against disease and as an adult at risk for degenerative diseases. Impact stunting is not only in terms of health but also affects the level of cognitive of children. Children who were that small size at birth and 2 years of age (particularly height) were associated with reduced human capital: shorter adult height, less schooling, reduced economic productivity, and for women, lower offspring birth weight (Black *et al*, 2013).

An integrated program involving agencies and ministries was introduced in Indonesia to prevent stunting. In order to reduce stunting, 100 districts from all provinces were designated as priority areas in 2018, and 60 more districts were added the following year (National Development Planning Agency and the Ministry of Health, 2018). Cross-sectoral agencies' collaboration could lower Indonesia's stunting prevalence and help the country reach the Sustainable Development Goals (SDGs) target of 40% stunting reduction by 2025. According to the results of the national basic health research conducted every five years, among the five provinces on Java Island, Indonesia's most populous island, Banten Province has a notably high rate of malnutrition (33.0%), with Pandeglang District showing an even higher rate (38.6%) that exceeds the national average (37.2%) (MoHRI, 2013a).

The proportion of kids whose protein, energy, and vitamin A and C intakes fell short of the Indonesian Recommended Dietary Allowance (RDA) was high and varied by age group and urban/rural location (Beal *et al*, 2018). Having access to food is a component of food security. Furthermore, a joint report on food security monitoring led by the Indonesian Meteorology, Climatology, and Geophysical Agency, Ministry of Agriculture, National Agency for Disaster Countermeasure, National Institute of Aeronautics and Space, Central Bureau of Statistics, together with the United Nations World Food Programme and the Food and Agriculture Organization of the United Nations, found that the prevalence of stunted children in Indonesia is correlated with food availability (Indonesian Government Partners/WFP/FAO, 2017)

To provide the appropriate handling for undernutrition in Indonesia especially in Pandeglang District, Banten Province, the study about the prevalence of undernutrition is needed with the information about the socio-economic aspect of the household as well the dietary intake of children under five in the study area. The study's goals include

evaluating the dietary habits and nutritional status of Pandeglang's under-five children. Clear information regarding the nutritional status of children is essential for developing treatment measures that can be combined with local food in Indonesia (Fetriyuna *et al*, 2021; Fetriyuna *et al*, 2022; Fetriyuna *et al*, 2023; Fetriyuna *et al*, 2024).

MATERIALS AND METHODS

Pandeglang District, Banten Province, Indonesia, was selected as the study location based on the results of the national basic health research in 2013, ie having 38.6% of children below five years had HAZ less than -2 SD or stunted according to the World Health Organization's criteria (WHO, 2006; WHO, 2009). Pandeglang District was selected as the study site because of its high prevalence of stunted children which was above the national average of 37.2% (MoHRI, 2013a). This cross-sectional survey was carried out in Pandeglang in October 2017. From the lists of possible children gathered from cadre or midwives, simple random sampling was used to select the eligible children. The oldest children (ages 6 to 60 months) who were not exclusively breastfed were the focus of this study. Healthy children under the age of five who had lived in the area for at least six months before the study were eligible to participate.

Village selection, household survey, and anthropometric measurement

This study was carried out in collaboration with the Community Health Center, Pusat Kesehatan Masyarakat/Puskesmas, and the Local Integrated Health Post, Pos Pelayanan Terpadu/Posyandu. Between October and November 2017, a baseline household questionnaire was used to collect sociodemographic data retroactively. A structured and

quantitative questionnaire was used for data collection. The questionnaire was created at the Brawijaya University in Malang, Indonesia, and the Hohenheim University in Germany, then it was pre-tested in Banten prior to data collection.

Four trained enumerators conducted the interview to the mothers of the children. Data collection involved conducting in-home interviews with mothers or other caregivers of eligible children. They were questioned regarding the child's family, sociodemographic, and general attributes (such as the number of children living in the home, its size, and its ownership), in addition to the things that were bought with money. They were also asked about the child's eating and snacking patterns. Anthropometric measures for height, weight, and mid-upper arm circumference (MUAC) were also employed in addition to the observation of the external signs of undernutrition. Children older than or younger than two years old had their heights measured on a height/length board, and their weights were determined using a Seca (Seca GmbH, Hamburg, Germany).

Every measurement was taken twice, unless a third measurement was required for verification. The analysis was conducted using the mean of the measurements. The children's birth dates were taken from birth certificates and other documents. When not available, the Gregorian calendar was used to convert the estimated birth dates from a calendar of regional and national events.

A quick and simple tool that determines energy and nutrient intake as well as the percentage of nutrient fulfilment in comparison with the dietary recommendation, so called the Calculator of Inadequate Micronutrient Intake (CIMI) program (Jati *et al*, 2014), was used to analyze food consumption data from a 24-hour recall.

The study's main target group consisted of children between the ages of 6 and 60 months, identified from a list of eligible children in two

villages in the Pandeglang District. Children who were eating some solid foods, i.e. who were no longer solely breastfed, also met the inclusion requirements. Using the sample size formula for estimating a population proportion (Gross *et al*, 1998) with a 95% confidence interval and a 5% margin of error, and assuming a prevalence of moderate wasting in Baten province at approximately 7.3%, the minimum required sample size was calculated to be 101 children. A final sample size of 105 (including buffer) was determined from a calculated sample size of 101.

Outcome variables

Using a calibrated Seca-floor-scale 203 (Seca GmbH, Hamburg, Germany), each subject weighed 0.1 kg while wearing only a shirt and shorts for kids and no shoes. Children older than two years old had their height measured with a Seca-mobile stadiometer 206 (Seca GmbH, Hamburg, Germany), which had an accuracy of 0.1 cm. The Seca-mobile-mat 210 (Seca GmbH, Hamburg, Germany), with an accuracy of 0.5 cm, was used to measure the length of children under two years old. Using a non-stretchable tape, the midpoint of the left arm (in a relaxed position) was used to measure MUAC to the closest millimeter. The birth certificate provided the date of the child's birth. Stunting, underweight, wasting, HAZ, weight-for-age Z-score (WAZ), weight-for-length Z-score (WHZ) and MUAC scores were calculated in this study using the WHO Anthro software 2011 (available at URL: https://www.who.int/tools/child-growth-standards/software). Proportion of undernourished children was determined according to the WHO's classifications (WHO, 2006; WHO, 2015). Moderate or severe stunted children are indicated by HAZ <-2 SD or <-3 SD, respectively. Meanwhile, WAZ <-2 SD or <-3 SD is designated moderate or severe underweight children. Lastly, the moderate and severe wasted children is defined by WHZ <-2 SD or <-3 SD, respectively.

In the CIMI program, food intake data were recorded and entered based on amount of available food groups in the program, such as, rice, other grains, starchy staples, meat (including chicken), eggs, fish, and others, which were then converted into nutrients, ie protein, carbohydrate, fats, iron, and zinc. Furthermore, preformed vitamin A (carotenoids) was calculated based on retinol equivalents (RE) with a carotenoid conversion factor of 1:6 or 1:12. The percentage of the recommended intake of energy, protein, iron, zinc, and vitamin A was calculated using FAO/WHO (2001) age- and sex-specific recommended nutrient intake (RNI).

Statistical analysis

Statistical Package for the Social Sciences (SPSS), Version 22.0 (IBM Corp, Armonk, NY) was used to analyze the data. A p-value <0.05 was established as the general level of significance. The findings are presented as means ± standard deviation (SD), median or as percentages. The student's t-test/Mann-Whitney test, the univariate ANOVA/Kruskal-Wallis test, and the Kolmogorov-Smirnov test were the tests used. The Duncan postdoc test or, in the case of non-normally distributed data, the Mann-Whitney test with subsequent correction of the alpha inflation (cumulative Type I error) in accordance with Bonferroni were used to determine which groups a significant difference was found among. The Pearson/Spearman correlation was used to clarify relationships between two continuous variables. Fisher's exact test or chi-square test was used to evaluate sets of categorical data.

Ethics approval and consent to participate

The study complied with the 1995 Declaration of Helsinki's rules (as amended in Edinburgh 2000). Only with the caretakers' informed consent were eligible children included. On 28 July 2017, the Health

Research Ethics Committee Faculty of Medicine at Universitas Padjadjaran Bandung, Indonesia, registered the baseline study under study code No. 840/UN6.C.10/PN/2017. On 02 October 2017, the Badan Kesatuan Bangsa dan Politik (Board of National and Political Unity) approved it with code No. 070/160-kesbangpol/2017. A thorough explanation of the study's objectives was provided to the communities prior to enrollment, and informed consent was acquired by thumbprint or signature.

RESULTS

Prevalence of undernutrition

An anthropometric assessment of 105 children aged 6 to 60 months was carried out in the villages of Kadomas and Kalanganyar. Of these, 56 (53.3%) were boys and 49 (46.7%) were girls. One hundred and five caregivers took part in the baseline household survey. Mother 82 (78.2%), grandparents 19 (18.1%), uncle/aunty 1 (1.1%), and other relatives 3 (2.9%) were the primary caregivers. Because the mother was a migrant worker or the orphan, someone else was caring for the children and the majority of them (76.2%) were from nuclear families.

The findings showed that every fourth child was underweight (24.0%), every second child was stunted (40.0%), and only a small percentage had moderate or severe wasting (5.0%). There were no discernible anthropometric differences between boys and girls (apart from physiologically suggested variations in weight and MUAC. The children (n = 105) were 31.6 ± 16.0 months old on average at baseline, and there was no discernible difference in the age distribution of the sexes. Based on their HAZ, WAZ, and WHZ levels, girls tended to be slightly more affected by undernutrition in all its forms. On the other hand, Table 1 shows that boys were slightly more represented in the adequate z-score levels.

Table 1
Respondents' characteristics and nutritional status

Characteristics	Mean ± SD	Median	Range	Nutritional status, *n* (%)	
				Well-nourished	Under nourished
Overall results (N = 105)					
Average age (months)	31.6 ± 16.0	30.4	7.1 – 61.2		
Weight (kg)	11.5 ± 3.3	11.7	6.1 – 28.7		
Height (cm)	84.6 ± 11.0	86	63 – 109.5		
HAZ	-1.6 ±1.4	-1.7	-4.7 – 2.1	63 (60.0)	42 (40.0)
WAZ	-1.1 ±1.2	-1.3	3.4 – 4.9	80 (76.2)	25 (23.8)
WHZ	-0.3 ±1.3	-0.4	3.5 – 5.7	100 (95.2)	5 (4.8)
MUAC	0.09 ± 1.74	0.04	-5.44 – 5.07	96 (91.4)	9 (8.6)
By gender (N = 56 for boys and N = 49 for girls)					
Average age (months)					
Boys	31.3 ± 16.6	31.4	7.7 – 61.2		
Girls	31.9 ± 15.5	29.9	7.1 – 59.7		
Average Weight (kg)					
Boys	11.6 ± 3.3	11.8	6.8 – 28.7		
Girls	11.4 ± 3.3	11.3	6.1 – 21.7		

Table 1 (cont)

Characteristics	Mean ± SD	Median	Range	Nutritional status, *n* (%)	
				Well-nourished	Under nourished
By gender (N = 56 for boys and N = 49 for girls)					
Average Height (cm)					
Boys	84.5 ± 10.8	84.3	65 – 108.2		
Girls	84.9 ± 11.3	86.5	63 – 109.5		
Average HAZ					
Boys	-1.6 ± 1.4	-1.7	-4.7 – 1.8	32 (30.5)	24 (22.9)
Girls	-1.6 ± 1.4	-1.7	-3.8 –2.1	31 (29.5)	18 (17.1)
Average WAZ					
Boys	-1.2 ± 1.2	-1.3	-2.9 – 4.9	42 (40.0)	14 (13.3)
Girls	-1.2 ± 1.2	-1.3	-3.4 –1.9	38 (36.2)	11 (10.5)
Average WHZ					
Boys	-0.4 ± 1.3	-0.4	-3.5 – 5.7	54 (51.4)	2 (1.9)
Girls	-0.4 ±1.3	-0.4	-2.9 – 3.2	46 (43.8)	3 (2.9)
Average MUAC					
Boys	0.14 ± 1.78	-0.05	-5.1 – 5.07	52 (92.9)	4 (7.1)
Girls	0.05 ±1.70	0.2	-5.44 – 2.97	44 (89.8)	5 (10.2)

Table 1 (cont)

Characteristics	Mean ± SD	Median	Range	Nutritional status, *n* (%)	
				Well-nourished	Under nourished
By age (N = 42 for those aged ≤2 years and N = 63 for those aged >2 years)					
Average HAZ					
≤2 years	-1.3 ± 1.3	-1.2	-4.0 – 2.1	30 (28.6)	12 (11.4)
>2 years	-1.6 ± 1.4	-1.8	-4.7 – 1.4	33 (31.4)	30 (28.6)
Average WAZ					
≤2 years	-1.2 ± 1.2	-1.1	-3.4 – 0.8	31 (29.5)	11 (10.5)
>2 years	-1.0 ±1.3	-1.2	-3.3 – 4.9	49 (46.7)	14 (13.3)
Average WHZ					
≤2 years	-0.7 ± 1.2	-0.7	-2.9 – 1.74	38 (36.2)	4 (3.8)
>2 years	-0.1 ± 1.3	-0.2	-3.46 – 5.7	63 (60.0)	1 (0.0)
Average MUAC					
≤2 years	0.19 ± 2.29	0.04	-5.4 – 3.6	36 (34.3)	6 (5.7)
>2 years	0.12 ±1.71	0.06	-3.37 – 5.07	60 (57.1)	3 (2.9)

Note: Well-nourished (HAZ, WAZ and WHZ z-score ≥-2 SD); undernourished children (HAZ, WAZ and WHZ z-score ≤-2 SD) (WHO, 2006)

cm: centimeter; HAZ: Height-for-Age Z-score; kg: kilogram; MUAC: mid-upper arm circumference; SD: standard deviation; WAZ: Weight-for-Age Z-score; WHZ: Weight-for-Age Z-score

The percentage of children with moderate or severe stunting (HAZ <-2 SD or <-3 SD, respectively) significantly increased with age ($p = 0.009$), particularly between the youngest and older age groups. The prevalence of stunting rose sharply from 5.0% to 24.0%, especially between the third and fourth age groups. In contrast, the rates of moderate or severe underweight (WAZ <-2 SD or <-3 SD, respectively) and wasting (WHZ <-2 SD or <-3 SD, respectively) did not show significant changes across age groups, with only a slight increase in underweight prevalence from 10.3% among children ≤2 years to 13.3% among those >2 years.

MUAC measurements showed that 8.6% of children were undernourished. According to the MUAC z-score, girls are more likely than boys to be undernourished children. According to age, the prevalence of undernutrition decreases in the age group older than two years and increases in the age group younger than two years (Table 1).

According to the anthropometric failure composite index (Table 2) the concurrent of stunting and underweight affected 18% ($n = 19$), wasting and underweight 3% ($n = 3$), and all combinations of wasting, underweight, and stunting occurred only in one child.

Dietary intake based on CIMI Program

According to Table 3, nearly all children have inadequate consumption of vitamin A (98%) and energy (45%), as well as the micronutrients iron (50%) and zinc (53%). Except for iron ($p<0.001$), there were no gender-based differences in consumption. Energy consumption did not differ significantly by age group ($p = 0.19$), but micronutrients zinc and iron were significant ($p<0.001$). The percentage of children who did not consume enough iron rose as they age. From the age group of 1-2 years to the age group of 2-3 years, the percentage goes from 9% to 21%. Similarly, in children aged 2-3 years, inadequate zinc consumption increased from 10% to 22% in the same age group. Vitamin A deficiency

Table 2
Prevalence of undernutrition amongst children under five according to a composite index of anthropometric failure

Nutritional status of children	Overall frequency, *n* (%) (N =105)	Frequency by gender, *n* (%)		Frequency by age group, *n* (%)			
		Boys (N =56)	Girls (N = 49)	0-12 months (N = 13)	13-24 months (N = 29)	24-36 months (N =21)	>36 months (N = 42)
Well-nourished	57 (54.3)	28 (50.0)	29 (59.2)	8 (61.5)	18 (62.1)	15 (71.4)	16 (38.1)
Total children with all forms of undernutrition (Undernourished)	48 (45.7)	28 (50.0)	20 (40.8)	5 (38.5)	11 (37.9)	6 (28.6)	26 (61.9)
Moderate and severe wasted children	1 (1.0)	1 (1.8)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.4)
Moderate and severe underweight only	2 (1.9)	2 (3.6)	0 (0.0)	1 (7.7)	0 (0.0)	1 (4.8)	0 (0.0)
Moderate and severe stunted children only	22 (21.0)	13 (23.2)	9 (18.4)	0 (0.0)	5 (17.2)	3 (14.3)	14 (33.3)
Moderate and severe wasted and underweight children	3 (2.9)	1 (1.8)	2 (4.1)	2 (15.4)	1 (3.5)	0 (0.0)	0 (0.0)
Moderate and severe stunted and underweight children	19 (18.1)	11 (19.6)	8 (16.3)	2 (15.4)	4 (13.8)	2 (9.5)	11 (26.2.9)
Moderate and severe wasted, underweight, and stunted children	1 (1.0)	0 (0.0)	1 (2.0)	0 (0.0)	1 (3.5)	0 (0.0)	0 (0.0)

Table 3

Dietary consumption of the research area's children under five (N = 105)

Nutrients	RNI per day[a]	Mean ± SD	Median	Range	Frequency of fulfilment of dietary intake *n* (%)	
					Well-nourished children	Undernourished children[b]
Energy (kcal)	1,200	1,196.9 ± 505.9	1,076.6	160.8 - 2,585.5	58 (55.2)	47 (44.8)
Protein (g)	32	33.6 ± 13.6	33.8	4.0 - 68.2	102 (97.1)	3 (2.9)
Iron (mg)	8	4.85 ± 2.8	4.8	0.0 - 13.1	52 (49.5)	53 (50.5)
Zinc (mg)	4	4.9 ± 3.5	4.01	0.4 - 18.8	49 (46.7)	56 (53.3)
Vitamin A (mcg)	400	167.8 ± 86.9	164.3	0.0 - 448.1	2 (1.9)	103 (98.1)

[a]MoHRI, 2013b; [b]Total children with all forms of undernutrition

g: gram; kcal: kilocalorie; mcg: microgram; mg: miligram; RNI: recommendation nutrient intake; SD: standard deviation

is high across all age groups, with the highest percentage occurring in the 2-3-year age group (28%). For dietary intake and nutrition fulfillment, nearly all of the children (98.1%) consume insufficient amounts of vitamin A, while only half of them meet the requirements for energy, iron (50.5%), and zinc (53.3%).

DISCUSSION

Baseline data show that in Pandeglang, 40.0% of children under five are stunted, 4.8% are wasted, and 23.8% are underweight, making it the district with the highest undernutrition rates in the province. Nationally, in 2018, 30.8% of children were stunted, 10.2% wasted, and 17.7% underweight (MoHRI, 2019). It is confirmed that both Indonesia and Banten Province are classified as having high levels of stunting and wasting, and moderate levels of underweight.

The children's diary intake from a 24-hour recall questionnaire was examined using the Calculator of Inadequate Micronutrient Intake (CIMI) (Jati *et al*, 2014). In order to determine the percentages of RNI fulfillment, the CIMI computed the absolute intake of energy, macronutrients, retinol, ß-carotene, retinol equivalents, iron, and zinc), The result also supported the finding from Sandjaja *et al* (2013), who reported that the growth indicators of Indonesian preschool and school-aged children - such as weight-for-age, height-for-age, weight-for-height, and BMI-for-age - fall below WHO standards. The prevalence of stunting was 25.2% in urban areas and 39.2% in rural areas. Iron deficiency was found in 4.1-8.8% of children, and a large proportion had dietary intakes of energy, protein, and vitamins A and C below the Indonesian RNI (MoHRI, 2013b), with differences noted between urban and rural areas and across age groups. Similar findings were also observed in India, where a study by Meshram *et al* (2012) found that the health of tribal children was influenced by

factors such as personal hygiene, parental literacy, socioeconomic status, food security, and dietary intake.

Energy, carbohydrate, fat, protein, zinc, iron, vitamin A, retinol 6 and retinol 12, and beta carotene, are the ten predictors that make up the dietary intake component. Similar findings were reported by Appiah *et al* (2021) who discovered that factors related to mothers' infant and young child feeding practices were the main predictors of child undernutrition. In a low-resource environment where child undernutrition is known to be highly prevalent, this study offers evidence of maternal care practices as important potential causes of undernutrition.

Consuming meals primarily composed of carbohydrates (such as bread, rice, and cassava) with only a small number of vegetables and animal products led to poor nutrition. For the best growth and development, children need to eat various foods. Undernutrition is always the result of a poor diet.

According to a study on Indonesia's potential as a food carrier for micronutrients, undernutrition occurs in some remote areas of the country due to a low diversity of animal-source foods (ASF) (Melse-Boonstra *et al*, 2000), a lack of fruit and vegetables, and a lack of dietary diversity and household food security (Pipi *et al*, 2014; Meshram *et al*, 2012). In our study, almost all children (98.1%) had inadequacy in vitamin A intake. And only fulfillment of the recommended intake for energy, iron, and zinc that could achieve above 50% (Table 2).

Energy, carbohydrate, fat, protein, zinc, iron, vitamin A, retinol, and beta carotene are the nine predictors that make up the dietary intake component. Factors related to mothers' infant and young child feeding practices were the leading cause of child undernutrition. Appiah *et al* (2021) reported that in a low-resource environment where child undernutrition is known to be highly prevalent, maternal feeding practices are important potential causes of undernutrition.

In conclusion, high prevalence of stunting of 40.0%, wasting of 4.8%, and underweight of 23.8% among children under five was discovered in the research area of Pandegelang. The analysis using the Calculator of Inadequate Micronutrient Intake (CIMI) shows a significant gap in children's intake of essential nutrients in the study area. Only about half of the children meet the recommended intake for zinc (53.3%), iron (50.5%), and energy (55.2%). Alarmingly, almost all children (98.1%) lack sufficient vitamin A. These findings highlight widespread micronutrient deficiencies, which can seriously impact children's growth, development, and overall health. To improve child health, targeted interventions, such as promoting more diverse diets, providing supplements, and increasing nutrition education, are needed. Children under five need specific types and amounts of nutrients for healthy physical and mental development. In Banten Province, the high rates of undernutrition among young children call for urgent action to prevent further negative impacts on their development. To address these issues and support food security and sovereignty, it is important to develop specialized food products that target undernutrition, especially by using locally available food resources.

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