Effect of TIJEK Nuggets as a Local Supplementary Food on Weight Gain among Stunted Toddlers: A Pre-Experimental Study

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Abstract

Stunting remains a critical public health challenge in Indonesia, particularly in regions like Deli Serdang Regency, North Sumatra, where prevalence rates remain elevated despite ongoing interventions. This pre-experimental one-group pretest-posttest study evaluated the effect of TIJEK Nuggets a locally developed supplementary food made from tempeh (fermented soybeans), anchovies, chicken eggs, and spices as a nutrition intervention to improve the nutritional status of stunted toddlers aged 2-5 years in Pantai Labu Pekan Village. From a population of 45 eligible toddlers, 30 participants meeting the inclusion criteria (willingness to participate and measurable anthropometrics) were consecutively sampled. Baseline height and weight measurements served as pretest values, followed by daily administration of 100 grams of TIJEK Nuggets (divided into two servings) for 14 days, with posttest anthropometrics recorded thereafter. Nutritional analysis confirmed that 100 grams (4 pieces) of TIJEK Nuggets provided 150.61 kcal of energy, 26.83 g of carbohydrates, 7.92 g of protein, 11.61 g of fat, 62.56 g of water, and 1.40 g of ash, leveraging high-protein local ingredients to address macronutrient deficiencies common in stunting. Results showed no significant change in mean height (pretest-posttest: 92.72 cm ± 7.69 cm), but averages were identical due to minimal linear growth over the short term. However, mean weight increased significantly from 12.77 kg ± 2.03 kg to 13.39 kg ± 2.04 kg (p=0.001), indicating TIJEK Nuggets effectively promoted short-term weight gain. This aligns with biological expectations: height reflects chronic malnutrition, which responds to prolonged interventions, while weight responds more rapidly to energy-dense supplements. In conclusion, TIJEK Nuggets demonstrate promise as an accessible, effective supplementary food for short-term weight improvement in stunted toddlers, warranting broader, controlled applications within multifaceted anti-stunting strategies

Keywords: Stunting, Toddlers, Nutritional Status, TIJEK Nuggets, Local Food

INTRODUCTION

Stunting is a nutritional issue often found in low-income and developing countries. It is a condition in which toddlers experience growth failure due to chronic malnutrition, resulting in the child being shorter than expected for their age (Rahmadhita, 2020; Soliman et al., 2021; Vaivada et al., 2020). Stunting interventions in Indonesia generally rely on providing plant-based flour/protein supplementary foods (PMT) distributed through integrated health posts (Posyandu) and government programs. However, several evaluations indicate that parental compliance with PMT consumption varies, and the unappealing taste and flavor of PMT for children can reduce the effectiveness of increasing energy and protein intake (Apriliani et al.,

2024; Mertens et al., 2023; Rahmadhita, 2020). Furthermore, the physical and organoleptic properties of PMT are usually inferior to those of commercial foods preferred by toddlers, resulting in a high risk of rejection or incomplete consumption. This situation highlights the need for local supplementary products that are practical, child-friendly, and rich in protein and calcium as alternatives or complements to existing PMT.

According to the latest UNICEF, WHO, and World Bank Joint Child Malnutrition Estimates, stunting remains a major global nutrition problem among children under five, affecting approximately 150.2 million children worldwide in 2024, or 23.2% of this age group. Although global stunting prevalence decreased from 26.4% in 2012 to 23.2% in 2024, progress has stagnated since 2021, showing that current efforts are still insufficient to achieve the 2030 nutrition targets. Asia and Africa bear the brunt of the burden, with 51% and 43% of stunted children residing in these regions, respectively (World Health Organization, 2025). In Southeast Asia, stunting prevalence reached around 22.7% in 2024, affecting about 11.6 million children. In Indonesia, based on the Indonesian Nutrition Study Report (SSGI), the prevalence of stunting among children under five reached 47.7% in 2021. In North Sumatra, stunting prevalence was reported at 12.5% in Deli Serdang Regency, 15% in Pematang Siantar City, and 17.3% in Tebing Tinggi City. In Hutabargot, stunting prevalence decreased to 21.6% in 2022, down by 2.8 points from the previous year. Meanwhile, stunting measurement data in Deli Serdang Regency showed a decline to 13.9% in 2022, and another report stated a decrease from 1.52% in 2021 to 0.63% in 2022. Deli Serdang has also been one of the focus areas for stunting management since 2019.

Socioeconomic conditions and sanitation are the main factors causing stunting. This aspect relates to the family's ability to meet nutritional needs, access safe food, and receive adequate health services for pregnant women (Ademas et al., 2021; Noor et al., 2022; Permatasari et al., 2023; Woldesenbet et al., 2023). Malnutrition in early life can lead to growth failure, which in turn affects cognitive development, disease rates, and mortality. To achieve optimal growth and development, adequate nutritional intake, positive parenting, and stimulation appropriate to the child's developmental stage are required (Benjamin-Chung et al., 2023; Soliman et al., 2021; Handryastuti et al., 2022).

Toddlerhood is a highly sensitive period for the environment, particularly regarding adequate nutritional intake (Draper et al., 2024). Stunting in toddlers can hinder physical and cognitive development, increase the risk of non-communicable diseases, reduce productivity, and increase the risk of having a low birth weight (Akbar et al., 2023; Firdaus & Maulana, 2025; Wells, 2018). The causes of stunting are generally multifactorial, including inadequate

intake of macronutrients (carbohydrates, fats, and proteins) and micronutrients (vitamins and minerals), as well as a history of infections that directly affect growth (Firdaus & Maulana, 2025; Raiten & Bremer, 2020; Soliman et al., 2021).

Tempeh is fermented soybeans using specific microbes and has a distinctive shape and aroma (Górska et al., 2025; Ahnan-Winarno et al., 2021). The development and variation of tempeh, through processing it into tempeh flour, aim to introduce new food varieties and improve their nutritional quality. Some processed tempeh products that have become the focus of research are tempeh chips, tempeh chocolate, tempeh cereal, and tempeh nuggets (Ernawati et al., 2021; Permatasari et al., 2022; Soliman et al., 2021). Tempeh is a high-protein food with a Protein Efficiency Ratio (PER) almost equivalent to cow's milk casein and is low in fat. It is also rich in minerals, including calcium, phosphorus, and iron, as well as various vitamins. Studies indicate that unblanched tempeh flour has high digestibility, biological value, and Net Protein Utilization (NPU). In every 100 grams of soybean tempeh, there are approximately 20.8 grams of protein, 8.8 grams of fat, 13.5 grams of carbohydrates, 347 mg of calcium, and 1.4 grams of fiber. Tempeh flour is produced by steaming tempeh, drying it under the sun, and grinding it into flour. Its use can help increase the protein content of food products. (Ajmera, 2025).

In previous research, a 10% substitution of tempeh flour in cinnamon cookies contributed approximately 3.17% to the RDA for protein. In addition to protein, calcium is also important for optimal bone growth. Anchovies are a beneficial source of calcium, with approximately 68.7 grams of protein and 2381 mg of calcium per 100 grams of dried, unsalted anchovies (Permatasari et al., 2022; Safitri et al., 2023). Anchovies are a popular side dish that Indonesians have long favored. Nationally, anchovies play an important role in the fisheries industry, with approximately 65% of fishery products processed and preserved using salting methods (Ane et al., 2016).

Although anchovies have a higher protein content, namely 68.7 grams per 100 grams, compared to tempeh, which is only 46.5 grams per 100 grams, in terms of quality, tempeh contains more essential amino acids, methionine-cysteine 171mg, compared to anchovies, which only contain around 32.60 mg. Therefore, the use of tempeh and anchovies as substitute ingredients in making cookies aims to increase the protein and calcium content of the cookies. The study was conducted to analyze the levels of protein and calcium and the organoleptic characteristics of cookies with the substitution of tempeh flour and anchovy flour (Rahmawati & Rustanti, 2013).

Nuggets made with anchovies as the main ingredient are high in protein and rich in omega-3 fatty acids, with 1.5 grams per 100 grams. Omega-3 fatty acids help neutralize excess cholesterol in the body. In addition to being high in protein, anchovies are readily available in the market. Nuggets are a product available in various brands, including fish-based nuggets. This study shows that nuggets, whether made from meat or fish, are a practical and popular consumption choice among the public.

In this context, TIJEK nuggets offer a more innovative and adaptive approach: made from tempeh and anchovies, both relatively inexpensive local foods readily available in coastal areas like Deli Serdang. This combination provides high-quality protein from both plant and animal sources, as well as high levels of calcium, which is essential for bone formation and increased bone mineral density in stunted toddlers (Ajmera, 2025; Safitri et al., 2023; Soliman et al., 2021). Furthermore, the nugget format already known as a practical and popular snack among children has the potential to increase children's acceptance and compliance compared to conventional porridge- or flour-based PMT (Cliffer et al., 2022; Ow et al., 2024).

Although several studies have demonstrated the benefits of tempeh and fish products in increasing the protein and calcium content of processed foods, research specifically evaluating the effects of TIJEK nuggets, a local food supplement, on the nutritional status and weight gain of stunted toddlers in the Deli Serdang context remains limited. This limitation presents a research gap that needs to be addressed, particularly to determine whether local nugget-based supplements with a high nutritional profile (energy, protein, and calcium) can improve short-term weight gain and potentially support stunting recovery when integrated into long-term intervention programs.

Therefore, this study aimed to evaluate the effects of TIJEK nuggets for 14 days on changes in weight and height of stunted toddlers aged 2–5 years in Pantai Labu Pekan Village, Deli Serdang Regency, and to provide preliminary evidence regarding the potential of TIJEK nuggets as a local food supplement rich in protein and calcium in stunting reduction strategies in the region.

METHODS

This study used a one-group pretest–posttest design, which is a pre-experimental design in which a single group of toddlers was measured before and after the TIJEK Nuggets intervention, without a separate control group. At the beginning of the study, toddlers' height and weight were measured as pretest values. Subjects then received an intervention consisting of TIJEK Nuggets for 14 days, and posttest measurements were repeated to assess changes in

nutritional status. This design allows researchers to analyze the effect of TIJEK Nuggets on the height and weight of stunted toddlers by comparing pre- and post-intervention values within the same group.

The study population consisted of all toddlers aged 2–5 years living in Pantai Labu Pekan Village, Deli Serdang Regency. From a population of 45, a sample of 30 toddlers was selected based on the following inclusion criteria: Toddlers aged 2–5 years; willingness of parents or guardians to participate in the TIJEK Nuggets intervention; availability for both pretest and posttest measurements of height and weight. The exclusion criteria were the following: Toddlers with acute illness or severe comorbidities that could interfere with growth or food intake during the study period; Any known allergy or intolerance to anchovy- or egg-based products. The sampling technique used was consecutive sampling, whereby all toddlers who met the inclusion criteria and provided written consent were enrolled sequentially until the sample size of 30 was reached. The sample size of 30 was determined based on the feasibility of the local setting and practical implementation constraints, considering that this was a short-term, community-based intervention. All participants received the same treatment: TIJEK Nuggets for 14 days.

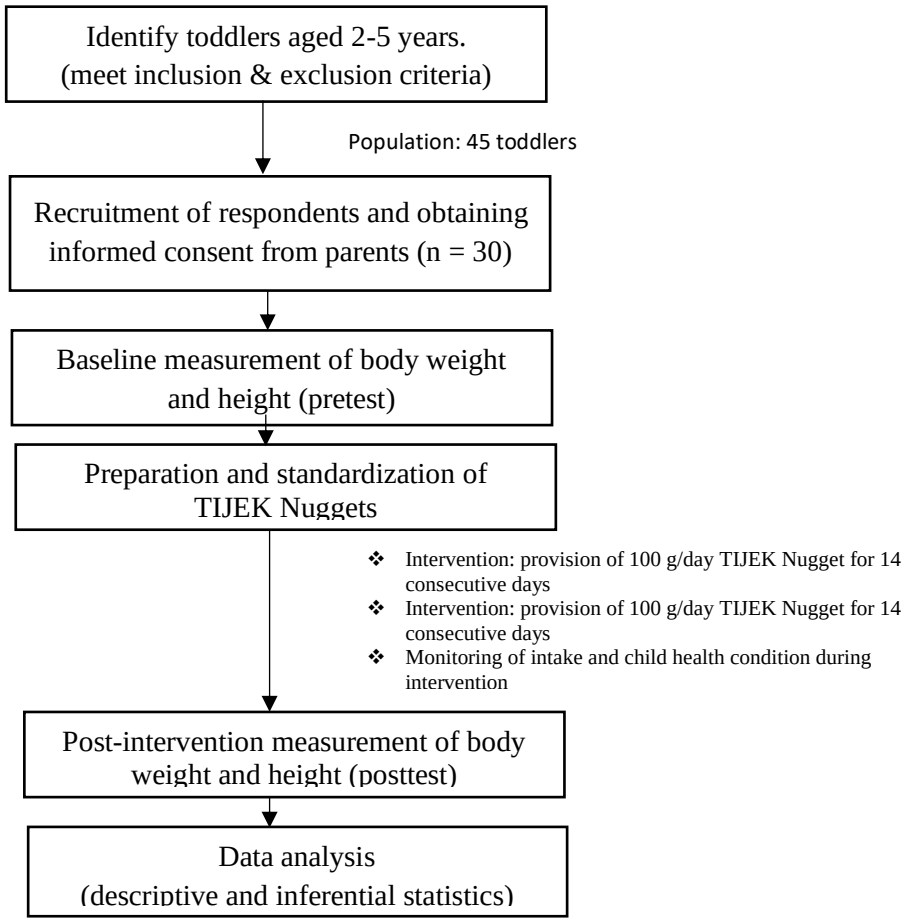

Figure 1. Research Flow

Data collection in this study was conducted in several structured stages, starting with the selection of the toddler sample and the anthropometric measurements taken before and after the intervention. After the sample was determined, the researchers provided an explanation to the toddler's parents or guardians regarding the purpose and procedures of the study, then requested written consent through an informed consent form before the child was included. The main data collected were the toddler's weight and height, measured using a digital scale and a stadiometer according to standards, to obtain pretest (before administering TIJEK Nuggets) and posttest (14 days after administering TIJEK Nuggets) values in the intervention group. During the intervention period, the researchers and team also monitored the administration of 100 grams of TIJEK Nuggets per day, divided into two servings. They ensured compliance with consumption to ensure that the data on changes in nutritional status accurately reflected the intervention's effects.

Nuggets are a snack liked by all age groups that temporarily relieves hunger. TIJEK nuggets, made from anchovies, chicken eggs, and other spices, are typically consumed for approximately 2 to 3 hours between main meals, between 10 a.m. and 4 p.m., according to the results of a chemical laboratory examination by PT Saraswanti Indo Genetech Bogor in 2025. In 4 pieces of nuggets, there are 100 grams, which contain 150.61 kcal of energy, 26.83 grams of carbohydrates, 7.92 grams of protein, 62.56 grams of water, 1.40 grams of ash, and 11.61 grams of fat. This additional food is provided as TIJEK nuggets, which can improve children's nutritional status and weight in Pekan Pantai Labu Village.

Figure 2. TIJEK Nuggets

The data collected from the results of weight and height measurements before and after the intervention were then processed and analyzed statistically to assess the effectiveness of providing TIJEK Nuggets. The analysis was carried out by calculating the average, standard deviation, and difference between pretest and post-test values for both weight and height in the intervention. The statistical test used was a difference test (descriptive test with significance testing), with a significance limit of $p < 0.05$; if the p value is less than 0.05, it is stated that there is a significant difference. The analysis showed that providing TIJEK Nuggets for 14

days did not significantly affect toddler height but did significantly increase body weight, suggesting that TIJEK Nuggets have the potential to serve as an additional food source to improve the nutritional status of stunted toddlers in the short term.

This research was conducted by observing the principles of the code of ethics for health research, starting from the submission and approval of ethics to the Health Research Ethics Committee of the Medan Ministry of Health Polytechnic, before field activities were carried out, with the ethical feasibility statement number No.01.26.1380/KEPK/POLTEKKES KEMENKES MEDAN 2025. Before data collection, researchers provided clear and complete information to the parents or guardians of toddlers regarding the purpose, benefits, research procedures, types of interventions to be provided, and possible risks or discomforts that may arise, and then obtained voluntary informed consent.

The confidentiality of respondents' identities was maintained by not including the full names of children and parents in the report; instead, codes or initials were used so that the reported data were anonymous and the privacy of the subjects remained protected in accordance with the ethical guidelines' confidentiality and privacy standards. Throughout the research process, researchers ensured that the TIJEK Nugget intervention provided was safe for toddlers to consume, made with appropriate local food ingredients and processed according to hygienic procedures, and committed to stopping or adjusting the intervention if conditions arose that could endanger the respondents' health.

Researchers also ensured that participation in the research was voluntary, without coercion or excessive persuasion. Parents were entitled to withdraw their children from the research at any time without consequences to their access to routine health services, in line with the principles of benefit, fairness, protection against risks, and informed consent as stated in the 2011 WHO Standards and 2016 CIOMS Guidelines.

RESULT

Respondent characteristics in this study included the child's age, maternal occupation, and the mother's education level as a parent of a toddler. Based on age distribution, the majority of toddlers were 3-year-olds, followed by 4- and 5-year-olds, while the smallest proportion were 2-year-olds. In terms of occupation, the majority of respondents' mothers worked as housewives, while a small proportion worked as traders and teachers. In terms of education, more than half of the respondents' mothers had a high school/vocational high school education, followed by junior high school and diploma 3 education. In contrast, only a few had an

elementary school education. Table 1 provides a comprehensive overview of the respondents' characteristics.

Table 1. Frequency of respondent characteristics

Characteristics	N	%
Age (years)		
2	5	16.6
3	10	33.3
4	8	26.7
5	7	23.4
Work		
Housewife	26	86.7
Teacher	1	3.3
Trader	3	10.0
Education		
Elementary School	1	3.3
Junior High School	9	30.0
High School/ Vocational School	17	56.7
D3	3	10.0
Total	**30**	**100**

The characteristics of respondents in Table 1 show that the largest number of toddlers were 3 years old (33.3%), followed by 4 years old (26.7%), 5 years old (23.4%), and the least were 2 years old (16.6%). In terms of occupation, the majority of respondents were housewives (86.7%), while a small number worked as traders (10.0%) and teachers (3.3%). In terms of education level, the majority of mothers had a high school/vocational high school education (56.7%), followed by junior high school (30.0%), diploma (3) (10.0%), and only a few had an elementary school education (3.3%). Overall, the study included 30 respondents (100%).

Average Increase in Children's Height

After an intervention was carried out in the form of providing TIJEK nuggets to increase the height of children in Pantai Labu Pekan village, the results of the average score for increasing the height of children were as follows:

Table 2. Distribution of Height Before and After Treatment

	N	Min	Max	Mean	SD
BB Before	30	79.50	105.00	92.7200	7.688803
BB After	30	79.50	105.00	92.7200	7.688803

Table 2 shows that the mean height of elementary school children before and after the TIJEK nuggets intervention was the same, at 92.72 cm, with a minimum value of 79.50 cm and a maximum of 105.00 cm, and a standard deviation of 7.69 cm. Because there was no change in the mean height before and after treatment, the 14-day intervention did not lead to an increase in children’s height. This finding suggests that, within this relatively short intervention period, the provision of TIJEK nuggets did not produce a measurable change in children’s linear growth based on the observed means and variation.

Average Child Weight Gain

After an intervention was carried out in the form of providing TIJEK nuggets for weight gain in children in Pantai Labu Pekan village, the results of the average score for weight gain in children were as follows:

Table 3. Body weight distribution before and after treatment

	N	Min	Max	Mean	SD	P Value
BB Before	30	9.25	16.80	12.7667	2.02673	0.001
BB After	30	9.40	17.30	13.3867	2.03922	

Table 3 shows that the average weight of children before the TIJEK nuggets intervention was 12.77 kg, with a minimum of 9.25 kg and a maximum of 16.80 kg, and a standard deviation of 2.03 kg. After 14 days of intervention, the average weight increased to 13.39 kg, with a range of 9.40 kg to 17.30 kg and a standard deviation of 2.04 kg. A p-value of 0.001 indicates a statistically significant difference in weight before and after TIJEK nugget administration, suggesting that this intervention significantly increases toddlers' weight in Pantai Labu Pekan Village.

DISCUSSION

The results of the study indicate that the toddlers who became subjects were mostly aged 3–5 years, with the largest proportion at age 3, while the 2-year-olds were the smallest group. The age range of 2–5 years is a very active growth period, so the need for nutrients, especially energy and protein, is relatively high to support children's physical growth and cognitive development. Between the ages of 2 and 5 years, it is said that toddler growth is more effective when additional food is provided, aiming to increase the child's physical development (Komalasari et al., 2021). The dominance of homemakers as primary caregivers and the majority of high school/vocational high school graduates provide a fairly good opportunity for acceptance and understanding of nutritional interventions, including the introduction of locally produced, food-based supplementary foods such as TIJEK Nuggets. Higher education is generally associated with greater nutritional knowledge, which can contribute to more informed decision-making when choosing food for children, including a willingness to try innovative, nutritious products.

The results of this study show that providing TIJEK Nuggets for 14 days significantly increased toddlers' weight but did not produce a measurable change in height, which is consistent with the biological understanding that linear growth responds more slowly than weight to short-term nutritional interventions. This finding is directly linked to the pretest–posttest data: the mean height remained at 92.72 cm throughout the 14-day intervention, while

body weight increased from 12.77 kg to 13.39 kg with a statistically significant difference (p = 0.001).

The lack of change in height within 2 weeks is biologically plausible, as stunting reflects chronic malnutrition and linear growth is influenced by long-term nutritional status, health conditions, and environmental factors. Short-term provision of supplementary foods such as TIJEK Nuggets is therefore more likely to improve acute nutritional status and body weight before impacting height, which aligns with previous studies reporting measurable weight improvements in malnourished or stunted children within weeks, while height changes usually become apparent only after 3–6 months of continuous intervention (Mamun et al., 2023; Martinez et al., 2018). In this context, the observed weight gain in our study suggests that TIJEK Nuggets can effectively increase energy and protein intake over a short period, but do not, by themselves, reverse linear growth impairment in such a brief timeframe.

In contrast to height, toddlers' weight increased significantly after the TIJEK Nugget intervention. The average pre-intervention weight of 12.77 kg increased to 13.39 kg after 14 days of TIJEK Nugget administration, with a p-value of 0.001 indicating a statistically significant difference. This weight gain can be explained by the high energy and protein content of TIJEK Nuggets, as 100 grams (4 pieces) of TIJEK Nuggets contain approximately 150.61 kcal of energy, 26.83 grams of carbohydrates, 7.92 grams of protein, and fat, which contribute to the total energy. The basic ingredients of tempeh and anchovies provide a combination of high-quality vegetable and animal proteins, with tempeh rich in protein and essential amino acids. In contrast, anchovies contain high amounts of protein and calcium, which are important for bone growth. Previous research also shows that processed tempeh and anchovy flour products can increase the protein and calcium content in snacks, thus potentially improving children's nutritional status when consumed regularly.

From a supplementary food concept perspective, TIJEK Nuggets meet the principle of using local, safe, nutritious, and preferred foods for children, thereby increasing the likelihood of full consumption by toddlers. Nuggets, as a processed form, also offer sensory advantages (taste, texture, and appearance) that are generally preferred by children, thereby addressing the problem of low appetite for certain nutritious foods when presented in less appealing forms. In the context of stunted toddlers, significant short-term weight gain is an important achievement because it indicates improvement in acute nutritional status, which, if maintained in the longer term, has the potential to support linear growth and overall child development. However, without extending the intervention duration and continuing monitoring, the impact on height and structural stunting status cannot be optimally assessed.

The findings of this study are consistent with previous studies reporting that providing supplementary foods based on locally available, high-protein, energy-rich foods can increase the weight of malnourished toddlers over several weeks to several months, while changes in height are usually only apparent after a longer intervention period (Zhang et al., 2021)(Ow et al., 2024)(Cliffer et al., 2022). The study (Ulya et al., 2025) results showed that local food-based PMT can help improve the nutritional intake and weight of undernourished toddlers. The toddlers' weight increased from 7.75 kg to 8 kg in 14 days, but the increase was not significant due to the short intervention period. The research results of (Husniati et al., 2025) show that there is a relationship between compliance with supplementary feeding (PMT) and an increase in the weight of malnourished toddlers. The results of statistical tests show a p value = 0.033, so that compliance with PMT is significantly related to weight gain in malnourished toddlers. This confirms that TIJEK Nuggets have the potential to serve as an alternative local supplementary food to increase toddlers' energy and protein intake, especially in areas with high stunting rates, such as Deli Serdang Regency. However, the use of TIJEK Nuggets should be viewed as part of a comprehensive intervention package that includes improving daily diets, nutrition education for parents, improving sanitation and environmental health, and regular growth monitoring. Furthermore, the limitations of the one-group pretest–posttest design without a control group and the relatively short intervention duration need to be considered when interpreting the results. Therefore, further research with a more robust design, a larger sample size, and a longer intervention period is highly recommended to assess the long-term impact of TIJEK Nuggets on linear growth and stunting status in toddlers.

The results of this study indicate that providing TIJEK Nuggets for 14 days can significantly increase toddlers' weight. However, it has not yet provided a measurable impact on height in the short term. This finding implies that TIJEK Nuggets have the potential to be used as a locally sourced, supplementary food to help improve nutritional status, especially weight, in toddlers at risk of or already experiencing stunting. For health workers at community health centers, integrated health posts (Posyandu), and nutrition cadres, this product can be used as a practical, nutritious, and more readily accepted PMT (supplementary food) menu option for children, given its familiar and preferred form.

For policymakers at the regional level, the results of this study can serve as an initial basis for developing more systematic local food-based nutrition intervention programs, for example, including TIJEK Nuggets or similar products into toddler nutrition intervention packages in areas with a high prevalence of stunting. On the other hand, for academics and researchers, this study offers opportunities to develop further the formulation, fortification, and

long-term effectiveness testing of TIJEK Nuggets for other nutritional indicators, such as micronutrient status and cognitive development. Another important implication is the need to integrate supplementary food interventions with nutrition education for parents, so that improvements in toddler nutritional intake do not only depend on one type of product but are also reflected in overall daily eating patterns.

This study has several limitations that should be considered when interpreting the results. First, the design used was a one-group pretest–post-test without a control group, making it difficult to completely rule out the influence of factors beyond the intervention (e.g., changes in home diet, physical activity, or other health conditions) on weight change. Furthermore, the intervention lasted only 14 days, which is understandable given that linear growth takes longer and is influenced by chronic nutritional status.

CONCLUSION

This study shows that providing TIJEK Nuggets, a supplementary food based on local foods, for 14 days to toddlers aged 2–5 years in Pantai Labu Pekan Village significantly increased short-term weight gain but did not result in significant changes in height during that period. TIJEK Nuggets, formulated from tempeh and anchovies, appear to be an effective option for short-term weight recovery, but their impact on linear growth requires further evaluation through longer-term studies. Suggestion: For health workers and integrated health post (Posyandu) cadres, TIJEK Nuggets can be considered a locally sourced, food-based PMT menu regularly provided to toddlers at risk of stunting, accompanied by nutritional education for parents on the importance of a balanced diet. For future researchers, it is recommended to conduct studies with a control group, a larger sample size, and a longer intervention duration to assess the impact of TIJEK Nuggets on body weight, height, and other nutritional indicators.

From a policy viewpoint, these data show that TIJEK Nuggets can be used as a locally manufactured, high energy, high protein supplementary food for stunted toddlers within the existing Posyandu framework. The product can be integrated into routine Posyandu activities through: (1) the inclusion of TIJEK Nuggets in the menu of supplementary food (PMT) provided at Posyandu sessions together with or instead of conventional flour-based PMT for stunted or at-risk toddlers; (2) training of nutrition cadres and midwives to monitor toddler weight and height before and after 14–30 days of TIJEK Nuggets consumption, using simple growth-monitoring charts; and (3) basic nutrition counselling for parents on how to combine TIJEK Nuggets with home meals to ensure adequate daily intake. In the long term, local health offices might consider partnering with community-based food producers to standardize and

scale up TIJEK Nuggets production to ensure consistent nutrient content, safety, and affordability and to promote its use as part of a comprehensive stunting-reduction strategy in high-prevalence areas such as Deli Serdang Regency.

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