

## The Effect of Taburia Supplementation on Weight Gain and Nutrient Intake among Underweight Children Aged 6–24 Months in the Working Area of Karang Jati Health Center

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### ARTICLES

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### ABSTRACT

Underweight in toddlers remains both a global and national health issue. In Balikpapan, the prevalence of underweight increased from 14.1% (2023) to 16.2% (2024). One of the government's efforts to address this problem is through Taburia, a multivitamin powder formulated to increase nutritional intake and support growth. However, its effectiveness has never been evaluated locally at the Karang Jati Health Center, Balikpapan City. This study is a quasi-experiment with a one-group pre-test and post-test design involving 30 underweight toddlers aged 6–24 months. The intervention consisted of Taburia administration for 30 days at a dose of 1 sachet every two days. Weight data were measured weekly, while nutrient intake was assessed using a 2x24-hour food recall. Analysis was performed using the Wilcoxon test. The results showed that Taburia administration had a significant effect on increasing the toddlers' body weight ( $p=0.005$ ). The average weight gain for the 6–11 month age group was  $400.0 \pm 141.4$  grams, and for the 12–24 month group, it was  $376.9 \pm 127.4$  grams. Taburia also significantly increased protein intake ( $p=0.021$ ) and fat intake ( $p=0.002$ ), while increases in energy and carbohydrates were not significant ( $p>0.05$ ). Taburia administration has a positive effect on weight gain and the improvement of protein and fat intake in underweight toddlers aged 6–24 months. This intervention has potential as a public nutrition strategy, especially in areas with a high prevalence of underweight. As a follow-up, the Taburia program needs to be expanded with family nutrition education and long-term monitoring, as well as further research with an RCT design and longer duration to strengthen the evidence of its effectiveness

### Key Messages:

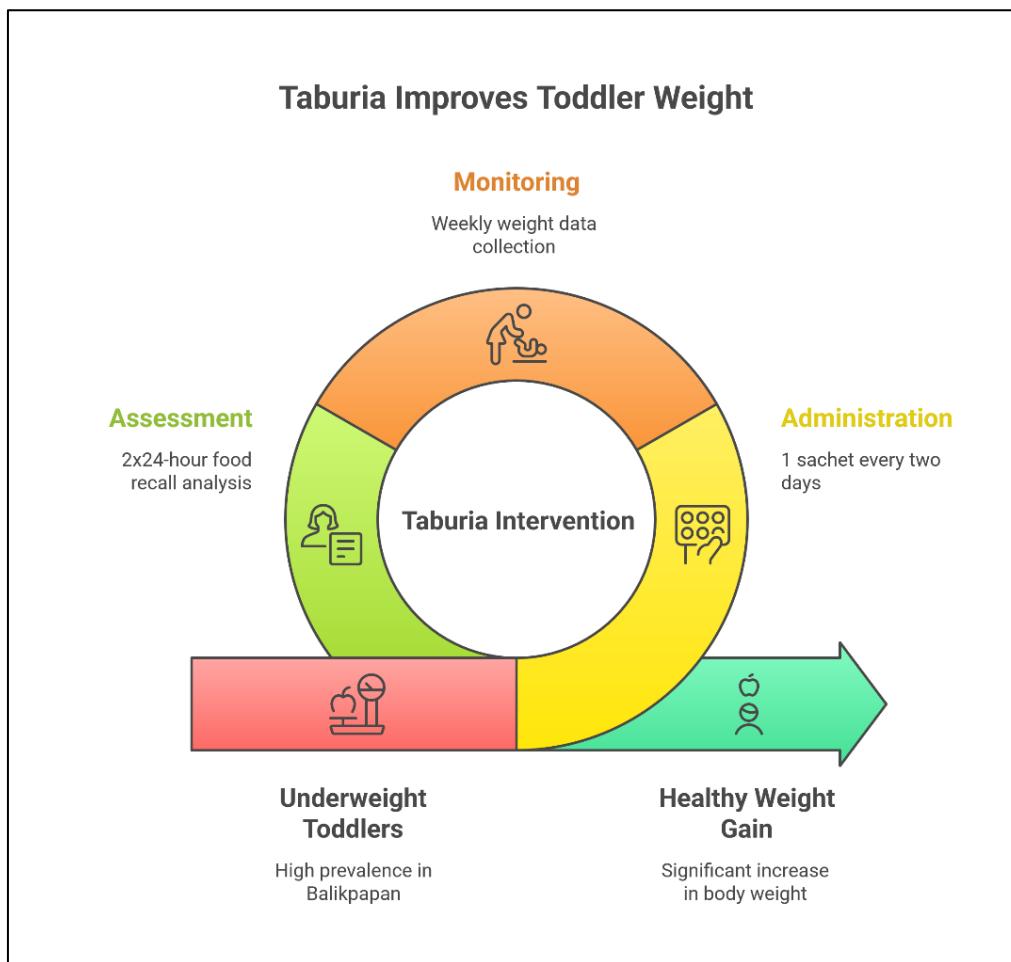
- Taburia administration is proven to significantly increase body weight and improve protein and fat intake in underweight toddlers aged 6–24 months, making it a potential nutritional intervention strategy to be implemented and expanded in areas with a high prevalence of underweight.

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## GRAPHICAL ABSTRACT



## INTRODUCTION

Underweight in toddlers is defined as a condition where weight-for-age is below -2 standard deviations (SD) from the WHO (World Health Organization) growth standard median(1). Globally, more than 100 million children under 5 years of age are classified as underweight, a figure accounting for approximately 19% of global child deaths. In 2024, the JME (Joint Child Malnutrition Estimates) reported that the prevalence of stunting reached 23.2%, while wasting and overweight remained significant, indicating that the reduction of child malnutrition has not yet reached global targets (2).

In Indonesia, data from the 2018 Basic Health Research (Risikesdas) showed the prevalence of underweight in children under five was 17.7%, with wide regional variations across provinces, such as East Kalimantan at 7.4% and East Nusa Tenggara recording a much higher underweight figure (29.5%)(3). Although the results of the 2023 Indonesian Health Survey (SKI) showed that the national prevalence of underweight toddlers decreased to 15.9%, this figure is still considered very high. Of this number, 12.9% of toddlers experienced moderate underweight and 3% experienced severe underweight. East Kalimantan Province recorded a higher prevalence of underweight compared to the national figure, at 18%, and the prevalence in Balikpapan City was slightly higher, reaching 18.2% (4).

Underweight in toddlers reflects an imbalance between nutritional needs and intake, which can disrupt child growth and development(5). Children who are underweight are at high risk of experiencing physical growth retardation, delayed motor development, and decreased immunity, making them more susceptible to infectious diseases such as diarrhea and pneumonia(6) (7). Cognitively, chronic malnutrition in early life can impair brain development, reduce learning ability, and impact academic achievement during school years (8). Underweight is not merely a nutritional status condition but also an indicator of

limited fulfillment of vital macronutrients, often characterized by lower intakes of energy, protein, fat, and carbohydrates. If not treated immediately, underweight can increase the risk of stunting, wasting, and child mortality, which ultimately impacts the quality of human resources in the future (1). A study reported geographical and socio-economic disparities, where the prevalence of underweight in children is much higher in remote and poor areas compared to more prosperous urban areas(9).

The first 1,000 days of life (from the fetus in the womb until the age of two years) is the golden age for child growth and development. Unfortunately, many children who should be the hope of the nation's future still experience nutritional problems (29.9%) at an early age. To address this, the Indonesian government allocated IDR 123.1 trillion in the 2019 State Budget (APBN) to improve access to and quality of health services and strengthen stunting handling (10). One of the flagship programs is Taburia, a multivitamin and mineral powder (11). The Taburia program, since its launch in 2006, is designed to overcome micronutrient deficiencies by providing 12 types of vitamins and 4 types of minerals through powder sprinkled onto toddler food. These contents include vitamins A, B complex, D3, E, K, vitamin C, folic acid, iron, zinc, iodine, and selenium. The expected benefits include increased appetite, immunity, growth and development, and improvement of toddler nutritional status(10). Previous research has proven that Taburia administration for 150 days with a final sample size of 471 resulted in weight and height increases with average values of 0.45 kg and 1.43 cm. In the identification of this study, it was found that there was a significant increase in weight and height over 150 days (5 months) (12). Within this broader national strategy to combat malnutrition during this critical window, the Taburia program, a multivitamin and mineral powder, stands as a key intervention.

Research regarding micronutrient interventions such as Taburia—a multivitamin and mineral powder for toddlers aged 6–59 months, with priority on the 6–24 month group—remains very limited, especially in the local context of East Kalimantan or Balikpapan City. At the Karang Jati Health Center, the prevalence of underweight was reported to increase from 14.1% in 2023 to 16.2% in 2024 (data from the Sigizi Terpadu EPPGBM Application). This indicates a high burden of underweight and the need for a systematic evaluation of interventions involving Taburia administration. However, the effectiveness of Taburia in increasing weight gain and nutritional intake has not been explored in the working area of the Karang Jati Health Center. This creates an important gap in knowledge and public nutrition service practice: interventions are carried out, but monitoring is ineffective because there has been no systematic evaluation (both of consumption and outcomes such as weight gain). There has been no scientifically designed research testing the local effectiveness of Taburia in the context of underweight children aged 6–24 months in Balikpapan. Therefore, this research is highly relevant and necessary, as it answers not only scientific needs but also practical needs in the field. Based on this background, the proposed title is to examine the effect of Taburia administration on weight gain and nutritional intake of underweight toddlers (6–24 months) at Karang Jati Health Center, Balikpapan.

## METHODS

This research was conducted for 30 days, specifically from May to June 2025, in the working area of Karang Jati Health Center, Karang Jati Village, Central Balikpapan District, Balikpapan City, East Kalimantan Province. The research location covered 32 integrated healthcare posts (posyandu) under the auspices of the Karang Jati Health Center. The type of research used was quantitative with a quasi-experimental design in the form of a pre-experimental design, specifically the one-group pre-test and post-test design. The sequence was pre-test, intervention, and post-test.

The research respondents were all toddlers aged 6–24 months with underweight nutritional status (Weight-for-Age < -2 SD) located in the working area of the Karang Jati Health Center. The sampling technique was total sampling. Before the intervention, screening was carried out to ensure initial nutritional status by weighing the respondents using a digital scale/baby scale. Toddler nutrient intake was measured using the 2x24 hour food recall method (weekday and weekend).

The treatment involved administering Taburia for 30 days at a dose of 1 sachet every 2 days, sprinkled on the toddler's morning meal (rice or baby porridge) that was not soupy, not hot, and at room temperature. Taburia administration at breakfast time (06:00–08:00 WITA) was chosen because it is

believed to increase nutrient absorption. During the intervention, posyandu cadres assisted in monitoring Taburia administration and recording it in the monitoring form. Weighing was carried out every week to monitor the progress of nutritional status, and after 30 days, respondents were weighed again, and a 2x24 hour food recall was conducted to observe changes in nutrient intake.

The independent variable of this study was Taburia administration, while the dependent variables were weight gain and toddler nutrient intake. Research instruments included respondent identity questionnaires, 24-hour food recall forms, food photo books to estimate consumption portions, digital scales/baby scales, the Nutrisurvey application for nutrient intake analysis, and computer applications for data processing. To ensure validity and reliability, digital scales were calibrated using a 1.5-liter mineral water bottle before use, while the 24-hour food recall is considered a standard instrument with tested validity and reliability in describing nutrient intake.

The data obtained then went through editing, coding, entry, and cleaning processes. Analysis was carried out univariately to describe respondent characteristics and bivariately using the Wilcoxon test because the data were not normally distributed.

The ethical aspects of the research were maintained through ethical approval from the Research Ethics Commission, with number DP.04.03/KEPK/295/2025, as well as official permission from the Karang Jati Health Center. All respondents were provided with informed consent forms signed by their parents/guardians, ensuring anonymity, data confidentiality, and comfort throughout the research process.

## RESULTS

Table 1 shows that the majority of underweight toddlers in this study were male (63.3%) and in the 12–24 month age group (86.7%). Regarding the fathers, the majority had a high school/vocational education (73.3%), were aged 29–38 years (63.3%), worked as private employees (76.7%), and had an income above the minimum wage (UMK) (53.3%). The most common paternal ethnicity was Javanese (43.3%), followed by Bugis (36.7%), while the least common were Makassar, Bima, and Sundanese, each at 3.3%. Regarding maternal characteristics, the majority had a high school/vocational education (70.0%), were aged 29–38 years (50.0%), were housewives (70.0%), and had no income (70.0%). The most common maternal ethnicity was Javanese (50.0%), followed by Toraja, Madura, and Bima at 3.3% each. Thus, the general overview of respondents shows that underweight cases are more commonly found in male toddlers aged 12–24 months, with parents who have a secondary education, fathers as the main breadwinners, and mothers who are housewives without an income.

**Table 1. Distribution of Characteristics of Underweight Toddlers**

Characteristics	n	%
<b>Sex</b>		
Male	19	63.3
Female	11	36.7
<b>Age</b>		
6-11 months	4	13.3
12 -24 months	26	86.7
<b>Father's Education</b>		
Elementary School	2	6.7
Yunior High School	2	6.7
Senior High School	22	73.3
Diploma	1	3.3
University	3	10.0
<b>Father's Age (Years Old)</b>		
19-28	6	20.0
29-38	19	63.3
39-48	5	16.7
<b>Father's occupation</b>		
Private employees	23	76.7
Self-employed	2	6.7
Laborer/Driver	5	16.7

Characteristics	n	%
<b>Father's Income</b>		
< City/District Minimum Wage Rp 3.700.000	14	46.7
>City/District Minimum Wage Rp 3.700.000	16	53.3
<b>Father's Tribe</b>		
Javanese	13	43.3
Banjar	3	10.0
Bugis	11	36.7
Makassar	1	3.3
Bima	1	3.3
Sundanese	1	3.3
<b>Mother's Education</b>		
Yunior High School	4	13.3
Senior High School	21	70.0
Diploma	1	3.3
University	4	13.3
<b>Mother's Age (Years Old)</b>		
19-28	13	43.3
29-38	15	50.0
39-48	2	6.7
<b>Mother's occupation</b>		
Private employees	7	23.3
Self-employed	2	6.7
Housewife	21	70.0
<b>Father's Income</b>		
< City/District Minimum Wage Rp 3.700.000	7	23.3
>City/District Minimum Wage Rp 3.700.000	2	6.7
No Income	21	70.0
<b>Mother's Tribe</b>		
Javanese	15	50.0
Banjar	4	13.3
Bugis	8	26.7
Toraja	1	3.3
Madura	1	3.3
Bima	1	3.3
<b>Total</b>	<b>30</b>	<b>100</b>

Table 2 shows nutrient intake in toddlers aged 6–11 months; an improvement in energy intake is visible, where before intervention, half experienced a deficit (50%), but after intervention, the majority were in the normal category (75%). Protein intake was relatively good from the start, with the majority being in excess (75%) and increasing to all (100%) after intervention. Fat intake also showed improvement, from a condition of half deficit and half normal before intervention to a majority normal (75%) after intervention. Meanwhile, carbohydrate intake did not change significantly, with half of the toddlers remaining in deficit (50%) both before and after intervention, although a small portion appeared in the excess category (25%) after intervention.

In toddlers aged 12–24 months, improvement was seen in energy intake; although the majority still experienced a deficit, the proportion decreased from 96.2% to 84.6%, and some began to enter the normal category (15.4%). Protein intake improved further, from a majority excess (69.2%) increasing to 88.5%, and no toddlers experienced a deficit. Positive changes were also seen in fat intake, which was initially majority deficit (80.8%) reducing to 46.2%, with an increase in the proportion of toddlers in the normal category (50%). However, no improvement was found in carbohydrate intake, as all toddlers aged 12–24 months remained in deficit (100%) both before and after intervention.

**Table 2. Distribution of Nutrient Intake of Toddlers Aged 6-11 Months and 12-24 Months Before and After Taburia Intervention**

Nutritional Intake for Children Aged 6-11 Months	Category	Before		After	
		n	%	n	%
Energy (kcal)	Deficit	2	50.0	0	0.0
	Normal	1	25.0	3	75.0
	Over	1	25.0	1	25.0
Protein (gram)	Deficit	0	0.0	0	0.0
	Normal	1	25.0	0	0.0
	Over	3	75.0	4	100.0
Fat (gram)	Deficit	2	50.0	0	0.0
	Normal	2	50.0	3	75.0
	Over	0	0.0	1	25.0
Carbohydrate (gram)	Deficit	2	50.0	2	50.0
	Normal	2	50.0	1	25.0
	Over	0	0.0	1	25.0
Nutritional Intake for Children Aged 12-24 Months	Category	Before		After	
		n	%	n	%
Energy (kcal)	Deficit	25	96.2	22	84.6
	Normal	0	0.0	4	15.4
	Over	1	3.8	0	0.0
Protein (gram)	Deficit	3	11.5	0	0.0
	Normal	5	19.2	3	11.5
	Over	18	69.2	23	88.5
Fat (gram)	Deficit	21	80.8	12	46.2
	Normal	5	19.2	13	50.0
	Over	0	0.0	1	3.8
Carbohydrate (gram)	Deficit	26	100.0	26	100.0
	Normal	0	0.0	0	0.0
	Over	0	0.0	0	0.0

Table 3 on the distribution of Taburia regarding weight gain in underweight toddlers shows that in the 6-11 month age group, prior to intervention, the majority did not experience weight gain (75%), while only 25% experienced an increase. After the intervention, improvement was visible, with 50% of toddlers experiencing weight gain, although 50% still did not. In the 12-24 month age group, before intervention, the majority (61.5%) did not experience weight gain, while 38.5% did. However, after intervention, a significant increase occurred, with 92.3% of toddlers experiencing weight gain and only 7.7% not experiencing it. These findings indicate that the intervention provided contributed positively to toddler weight gain, especially in the 12-24 month age group.

**Table 3. Distribution of Taburia on Weight Gain of Underweight Toddlers**

Age	Weight Before				Weight After			
	Gain		Not Gain		Gain		Not Gain	
	n	%	n	%	n	%	n	%
6-11 Months	1	25.0	3	75.0	2	50.0	2	50.0
12-24 Months	10	38.5	16	61.5	24	92.3	2	7.7

The research results in Table 4 show that Taburia administration influenced the nutrient intake of underweight toddlers aged 6-24 months. For the energy variable, the average intake increased in both the 6-11-month and 12-24-month age groups after intervention, although the difference between age groups was not significant ( $p=0.206$ ). Similarly, carbohydrate intake increased in both age groups but did not show a significant difference ( $p=0.317$ ). Conversely, there was a significant influence on protein and fat intake. Protein intake increased from  $24.9 \pm 10.9$  g to  $34.0 \pm 13.7$  g in toddlers aged 6-11 months, and from  $25.5 \pm 7.4$  g to  $33.1 \pm 7.9$  g in those aged 12-24 months, with a significant difference between groups ( $p=0.021$ ).

A similar trend was observed in fat intake, which increased significantly from  $26.4 \pm 12.2$  g to  $35.1 \pm 10.1$  g in the 6–11 month group, and from  $27.1 \pm 8.5$  g to  $35.6 \pm 8.2$  g in the 12–24 month group ( $p=0.002$ ). Thus, it can be concluded that Taburia administration has a more significant effect on increasing protein and fat intake compared to energy and carbohydrates in underweight toddlers.

**Table 4. The Effect of Taburia Administration on Nutrient Intake of Underweight Toddlers Aged 6-24 Months**

Variables	Time	6 – 11 Months	12 – 24 Months	p
Energy (kcal)	Before	$642.1 \pm 232.8$	$724.0 \pm 170.1$	0.206
	After	$828.5 \pm 194.1$	$926.8 \pm 162.0$	
Protein (g)	Before	$24.9 \pm 10.9$	$25.5 \pm 7.4$	0.021*
	After	$34.0 \pm 13.7$	$33.1 \pm 7.9$	
Fat (g)	Before	$26.4 \pm 12.2$	$27.1 \pm 8.5$	0.002*
	After	$35.1 \pm 10.1$	$35.6 \pm 8.2$	
Carbohydrate (g)	Before	$76.5 \pm 22.6$	$91.1 \pm 22.0$	0.317
	After	$93.2 \pm 21.8$	$116.9 \pm 20.5$	

The research results in Table 5 show that Taburia administration had a significant effect on the weight gain of underweight toddlers aged 6–24 months in the working area of Karang Jati Health Center. In the 6–11-month age group, the average weight gain was  $400.0 \pm 141.4$  grams, while in the 12–24-month age group, the average gain was  $376.9 \pm 127.4$  grams. Statistical tests showed a p-value = 0.005 ( $p<0.05$ ), meaning there was a significant difference between age groups. This indicates that Taburia administration was able to increase the body weight of underweight toddlers in both age groups, with a relatively higher response in the 6–11-month age group compared to the 12–24-month age group.

**Table 5. The Effect of Taburia on Body Weight of Underweight Toddlers (6-24 Months)**

Age Respondents	Mean $\pm$ SD	p
6-11 Months	$400.0 \pm 141.4$	0.005
12-24 Months	$376.9 \pm 127.4$	

## DISCUSSION

### The Effect of Taburia Administration on Weight Gain of Underweight Toddlers

The results showed that Taburia administration had a significant effect on the weight gain of underweight toddlers, with a p-value = 0.005. This indicates a significant difference in weight gain before and after intervention, both in the 6–11-month and 12–24-month age groups. This study aligns with previous studies finding that Taburia intervention was able to improve malnutrition problems in children (13). Our findings are reinforced by statistical results showing that toddlers aged 12–24 months experienced higher weight gain (92.3%) compared to toddlers aged 6–11 months (50%). This may be due to greater nutritional needs accompanying growth, as well as a more optimal response to micronutrient supplementation intervention.

In this study, the administration of Taburia/Micronutrient Powder (MNP) proved to have a significant influence on the weight gain of underweight toddlers aged 6–24 months. The average weight gain in the 6–11 month age group was  $400.0 \pm 141.4$  grams, and in the 12–24 month group, it was  $376.9 \pm 127.4$  grams ( $p = 0.005$ ). These results support an intervention study conducted in Nias, where a combination of intensive nutrition education plus MNP provided the highest daily weight gain compared to nutrition education alone (14). Similarly, in the Waipare study, East Nusa Tenggara, improvements in growth indices (WAZ, LAZ, WLZ) were seen in children receiving Taburia plus nutrition education compared to controls (15). Taburia administration is one of the strategies of the Ministry of Health of the Republic of Indonesia to prevent and overcome malnutrition in toddlers. Children aged 6 to 24 months are the target of this program because they are growing rapidly and are more vulnerable to nutritional problems during this period. WHO recommends MNP as an effective, easy-to-use, and safe point-of-use

intervention proved to reduce the prevalence of underweight, stunting, and anemia in children aged 6–23 months in developing countries. MNP includes essential minerals and vitamins such as iron, zinc, and vitamin A, which are important strategies in addressing toddler malnutrition. A systematic review showed that MNP and lipid-based nutrient supplements (LNS) can improve nutritional status in the context of LMICs (low and middle-income countries), including reducing the risk of anemia and improving growth scores (underweight, stunting) (16) (17).

Furthermore, we found that family education and income levels play a role as important factors in improving nutritional status in undernourished toddlers. The socio-economic context proved to influence the success of nutritional interventions, including Taburia administration. Families with relatively stable incomes are better able to provide balanced nutritious food, so Taburia functions optimally as a micronutrient complement, not as a staple food substitute. Most parents of toddlers in this study had secondary education (fathers 73.3% and mothers 70.0%), with fathers' income relatively balanced between <UMK (46.7%) and  $\geq$ UMK (53.3%). Meanwhile, the majority of mothers had no income (70.0%). These socio-economic conditions can affect food availability at the household level as well as family compliance in providing nutritional interventions consistently.

Previous research shows that families with stable socio-economic conditions tend to be better able to meet nutritional needs through balanced nutritional consumption patterns (18). Children in Indonesia asserts that low socio-economic status is an important determinant of malnutrition, especially stunting (18). Recent research results also support this finding, where poor families have a 1.24 times greater risk of experiencing nutritional problems compared to higher economic groups (19). Thus, stable family income becomes a protective factor because it allows households to maintain food availability consistently and meet the nutritional needs of family members. This aligns with Beal et al.(20) who assert that poverty and limited food access remain the main causes of malnutrition in developing countries, including Indonesia..

This research makes an important contribution to efforts to control nutritional problems, specifically underweight in toddlers. However, there are several limitations to note. First, the intervention duration was relatively short (30 days), so it could not yet describe the long-term impact of Taburia on linear growth. Second, the absence of a control group limits the strength of causal conclusions. Additionally, external factors such as history of infectious diseases and compliance with Taburia administration were not analyzed further. Nevertheless, the results obtained still support the effectiveness of Taburia as a point-of-use fortification strategy recommended by WHO for the prevention and improvement of micronutrient problems in developing countries (21).

The implication of this research is the importance of expanding the Taburia administration program as a micronutrient intervention for underweight toddlers, especially in families with economic limitations. Nutritional education support for parents is also needed so that Taburia administration can be integrated with balanced dietary patterns based on local food. Thus, prevention and management efforts for underweight at the community level can be more effective and sustainable. To strengthen the evidence, further research with a randomized controlled trial (RCT) design, larger sample size, and longer duration (3–6 months) is needed so that the effectiveness of Taburia on various growth indicators can be understood more comprehensively.

### **The Effect of Taburia Administration on Nutrient Intake of Underweight Toddlers**

The results showed that Taburia administration had a positive effect on increasing the nutritional intake of toddlers with underweight nutritional status, particularly in protein and fat intake. There was a significant difference in the 6–11 month age group compared to the 12–24 month group for protein ( $p = 0.021$ ) and fat ( $p = 0.002$ ), while differences in energy and carbohydrates were not significant. These results are consistent with a study in the Philippines stating that the use of Micronutrient Powder (MNP)/Taburia concurrently with complementary foods can improve macronutrient status, including protein (22). This indicates that micronutrient fortification in Taburia can improve toddler diet quality, especially through improved energy density and more optimal macronutrients..

The increase in protein intake after intervention shows that Taburia was able to support the improvement of toddler food consumption quality. Protein is an essential nutrient for tissue growth and

maintenance of body functions, making protein adequacy very important in underweight toddlers. Furthermore, a meta-analysis conducted by Keats et al. (23) found that interventions with multiple micronutrient powders (MNPs), including Taburia, can improve diet quality and contribute to increased macronutrient intake, especially protein.

A significant increase was also seen in fat intake. Fat is a major energy source and plays an important role in the absorption of fat-soluble vitamins (A, D, E, K) and brain development. Toddlers aged 6–24 months require a sufficiently high proportion of fat in their diet, around 30–45% of total energy. The results of this study support the evidence that Taburia supplementation can help improve nutritional balance by increasing the contribution of fat in the toddler diet. These findings align with research by Dewey & Vitta (24), which showed that MNP administration encourages food diversification, thereby increasing more adequate intake of macro and micronutrients.

Physiologically, the iron and zinc content in Taburia supports increased energy metabolism and improves child immune function. Iron plays a role in oxygen transport, which increases vitality and appetite, while zinc has been proven to influence growth hormone regulation and protein synthesis. This mechanism explains why after intervention, underweight toddlers showed more optimal increases in energy and protein intake. Recent research also highlights that MNP supplementation can stimulate the improvement of sensory taste function and appetite in toddlers, so food intake increases not only in quality but also in quantity (25).

## CONCLUSION

The results of this study indicate that Taburia administration in underweight toddlers has a positive effect on increasing nutrient intake, especially protein and fat, which showed significant differences after intervention. This indicates that micronutrient fortification in Taburia can increase the utilization of energy and nutrients from daily food, thereby supporting the improvement of toddler nutritional status. Although increases in energy and carbohydrates were not statistically significant, the upward trend remains clinically important and affirms Taburia's role as a complement, not a substitute for staple food.

As a follow-up, Taburia intervention should be combined with family-based nutrition education to improve household food variation and quality. Innovation can be achieved through the development of local recipes based on nutritious food, combined with Taburia, ongoing counseling for parents, and monitoring of toddler growth at posyandu. The utilization of digital technology, such as nutrition monitoring applications, can also increase compliance and make it easier for parents to monitor child development.

From a policy perspective, the results of this study support the need to strengthen the Taburia program on a national scale as part of the strategy to accelerate stunting reduction. Community Health Centers (Puskesmas) can work together with local governments to integrate Taburia distribution with posyandu services, while also providing intensive assistance to families at risk of undernutrition. The government also needs to strengthen cross-sector collaboration, for example, with food, education, and community empowerment agencies, to ensure the availability and affordability of nutritious food. With this comprehensive approach, Taburia becomes not just a supplementation intervention, but part of a sustainable public health policy strategy.

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## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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