



DOI:

10.22301/IJHMCR.2494-2501.2043

Article can be accessed online on:

<http://www.ijhmcr.com>

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL  
OF HEALTH MEDICINE AND  
CURRENT RESEARCH

## THE EFFECT OF SERVING TEMPE-BASED PORRIDGE AND SATURATED LEAVES ON THE NUTRITIONAL STATUS OF TODDLERS AT RISK OF STUNTING IN PITU VILLAGE 2025

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### ARTICLE INFO

#### Article History:

Received 19th Jan, 2025

Received in revised form

15th February, 2025

Accepted 20th February, 2025

Published online 10th March, 2025

#### Key words:

Stunting, Toddler tempeh, katuk leaf porridge

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### ABSTRACT

**Background:** Stunting is a serious health problem that requires comprehensive and sustainable management. In addition to ensuring adequate breastfeeding, interventions such as providing nutritious supplementary foods to support toddlers' nutritional needs are necessary. Tempeh and moringa leaf porridge are expected to be a nutritious local food alternative that can meet toddlers' macro and micronutrient needs, thus contributing to efforts to prevent and reduce stunting. **Research Method:** This type of research uses. One group pretest design and observations were made through pretest first, then given treatment, then given a posttest so that it can find out the changes that occur before and after giving treatment **Research Results:** for this research, a normality test was carried out and the pragmatic statistical test was used (paired-sample t-test). This means that  $H_0$  is rejected and  $H_1$  is accepted. The intervention, which included 150 grams of tempeh porridge and katuk leaves for 14 days, was shown to improve toddlers' nutritional status. Average weight increased from 11.6 kg to 12.4 kg (a 0.8 kg increase), while average height increased from 93.3 cm to 94.2 cm (a 0.9 cm increase). The results obtained from data processing with the *Uji Wilcoxon Test* showed that the systolic p-Value was 0.00 0.05 and the diastolic p-Value was 0.00 0.05. **Conclusion:** all of them returned to good nutrition, with an average weight gain of 0.8 kg and height gain of 0.9 cm.

Citation: Sarlinda<sup>1</sup>, Ida Laila Nur<sup>2</sup>, Andi Amrayani<sup>3</sup>, Selvie Ticoalu<sup>4</sup>  
"Bachelor Of Midwifery Study Program", International Journal of Health Medicine and Current Research, 10, (01), 2494-2501.

## PRELIMINARY

Stunting is a health problem caused by chronic malnutrition in toddlers that lasts for a long period of time, resulting in stunted physical growth, brain development, and cognitive abilities. Children who do not receive exclusive breastfeeding have a higher risk of experiencing stunting. Breast milk (ASI) plays a very important role in supporting the growth and development of children, especially during the golden period of life, namely the ages of 0–24 months, which is a crucial period in the formation of quality health and human resources in the future.<sup>1,2,4</sup>

Stunting, a manifestation of impaired child growth triggered by chronic malnutrition and recurrent infections, remains a crucial public health issue in Indonesia. Although its prevalence has decreased nationally from 31.4% in 2018 to 21.6% in 2022, and in North Maluku Province from 26.1% in 2022 to 23.7% in 2023, these figures still exceed the WHO-recommended threshold of 20% and have not yet reached the national target of 14%. This underscores the need for sustainable and integrated cross-sectoral interventions.<sup>3,4</sup>

One way to prevent developmental delays is to improve nutritional knowledge about good nutrition. Adequate nutrition does not have to be expensive and can be provided in the form of supplementary food in the form of katuk leaf pudding which is rich in important nutrients such as protein, iron, fat, carbohydrates, and fiber which can support children's growth and development and increase children's immune systems during optimal growth and development.<sup>5,8,9,10</sup>

Katuk leaves, or *Sauropus androgynus*, are a highly nutritious traditional medicinal plant. They contain vitamins A, B, C, K, and provitamin A (beta-carotene), calcium, phosphorus, iron, and fiber. They also function as antioxidants and contain steroids and polyphenols that can increase prolactin levels, a hormone that stimulates breast milk production.<sup>5,10,11</sup>

Tempe is a traditional Indonesian food made using a mixed culture of *Rhizopus* spp. This vegetable protein has high digestibility, a unique taste and texture, and is beneficial for health. Tempeh contains amino acids, fatty acids, isoflavones, protein, vitamin B12, iron, and more.<sup>6,7,8</sup>

Utilizing nutritious local foods, such as tempeh porridge and katuk leaves, has strategic potential in preventing and reducing stunting, particularly in eastern Indonesia, including North Maluku Province. Tempeh, a fermented soybean product, is a source of high-quality vegetable protein, B-complex vitamins, and essential minerals such as iron, calcium, and phosphorus, which play a vital role in supporting children's linear growth and tissue development. Meanwhile, katuk leaves are known to be rich in protein, vitamin A, vitamin C, iron, and calcium, contributing to meeting micronutrient needs and boosting immunity. The combination of tempeh porridge and katuk leaves, as a locally sourced food that is easily accessible and acceptable to the community, has the potential to improve children's nutritional intake, improve their health, and become an alternative sustainable nutritional

intervention to reduce stunting prevalence in North Maluku.

Based on an initial survey conducted by researchers, which included interviews with mothers who have babies to toddlers in Pitu Village, a total of 12 toddlers.

## METHOD

This research is an experimental study with a quasi-experimental design with pre-post tests. The aim of this study was to analyze the effect of tempeh porridge and katuk leaves on the nutritional status of toddlers at risk of stunting in Pitu Village, Tobelo Tengah District, North Halmahera Regency. The intervention group in this study were patients who would undergo the intervention procedure with tempeh porridge and katuk leaves.

This study was conducted in Pitu Village, Tobelo District, North Halmahera Regency, from June to August 2025. The total population in this study was 12 toddlers. The sample size for this study was 12 toddlers who met the inclusion criteria.

## RESULTS

### Univariate analysis

This analysis aims to describe the average nutritional status after intervention in toddlers at risk of stunting in the Pitu Community Health Center (Puskesmas Pitu) work area. The following table shows the analysis:

**Table 1. Weight/Height Measurement Results Before and After Tempeh and Sauropus androgynus (Sauropus androgynus) Porridge**

Table 1 shows that all toddlers experienced improved growth after being given 150 grams of tempeh porridge and katuk leaves for 14 days. Before the intervention, the average toddler weight was recorded at 11.6 kg, then increased to 12.4 kg after the intervention, with an average gain of 0.85 kg. In terms of height, the initial average of 93.3 cm increased to 94.2 cm, with a height increase of 0.92 cm.

**Table 2. Frequency Distribution of Respondents by Education.**

| Education | N  | %    |
|-----------|----|------|
| SD        | 5  | 42.0 |
| SMP       | 5  | 42.0 |
| SMA       | 2  | 16.0 |
| Total     | 12 | 100  |

Meanwhile, education in this study is related to the last education or diploma owned by the respondent. Based on table 3 above, it is explained that of the 8 respondents (100%) it was found that the majority of respondents had elementary education level, namely 5 people (42.0%), junior high school level was 5 people (42.0%) and high school level was 2 people (16.0%).

**Table 3. Frequency Distribution of Maternal Characteristics**

| Education | N  | %    |
|-----------|----|------|
| Primipara | 3  | 25.0 |
| Multipara | 9  | 75.0 |
| Total     | 12 | 100  |

Based on Table 3. shows the distribution of respondents by parity. Of the 12 respondents, 9 were multiparous (75%) and 3 were primiparous (25%). This illustrates that the respondent group was dominated by mothers who had given birth more than once.

| Jumlah Anak                  | BB (Kg) Sebelum | BB (Kg) Sesudah | TB (Cm) Sebelum | TB (Cm) Sesudah |
|------------------------------|-----------------|-----------------|-----------------|-----------------|
| 1                            | 11.4            | 12.8            | 91.5            | 95.2            |
| 2                            | 10.5            | 11.1            | 89.3            | 90              |
| 3                            | 12.1            | 12.6            | 96              | 96.8            |
| 4                            | 9.2             | 10.2            | 82.1            | 83.2            |
| 5                            | 12.9            | 13.4            | 98.1            | 98.7            |
| 6                            | 11.5            | 13.1            | 92              | 98.2            |
| 7                            | 12.8            | 13.2            | 97.2            | 97.8            |
| 8                            | 11.3            | 12.4            | 92.1            | 93.1            |
| 9                            | 12.2            | 12.8            | 96.3            | 96.7            |
| 10                           | 12.6            | 13.1            | 97.1            | 97.8            |
| 11                           | 11,3            | 12,2            | 91              | 91,6            |
| 12                           | 12,1            | 12,5            | 93,2            | 93,8            |
| <b>Rata-rata</b>             | 11.6            | 12.4            | 93.3            | 94.2            |
| <b>Peningkatan rata-rata</b> | 0.85 kg         |                 |                 | 0.92 cm         |

**Table 4. Frequency Distribution of Respondents by Occupation.**

| Job          | N  | %    |
|--------------|----|------|
| Entrepreneur | 3  | 37.0 |
| IRT          | 4  | 63.0 |
| Total        | 12 | 100  |

Based on Table 4. Shows the Distribution of respondents by Occupation. Of the 12 respondents, it is explained that 8 respondents (100%) found that the majority of respondents were housewives, entrepreneurs as many as 3 people (37.0%) and work as laborers, namely 9 people (63.0%).

**Table 5. Frequency Distribution of Respondents by Education.**

| Education | N  | %    |
|-----------|----|------|
| SD        | 5  | 42.0 |
| SMP       | 5  | 42.0 |
| SMA       | 2  | 16.0 |
| Total     | 12 | 100  |

Based on Table 5, the majority of respondents' final education level was at high school level, totaling 5 people (42%), junior high school level totaling 5 people (42%), and a minority was at elementary school level totaling 2 person (16%).

**Table 6. Respondent characteristics based on child gender and child age**

| Karakteristik | N  | %    |
|---------------|----|------|
| Age           |    |      |
| 1-3           | 3  | 25.0 |
| >3            | 9  | 75.0 |
| Total         | 12 | 100  |

Table 6 shows the distribution of the characteristics of the children who were respondents in the study at Pitu Community Health Center. Of the 12 children, 9 (75%) were aged >3 years, while 3 (25%) were aged 1–3 years.

**Table 7. Frequency Distribution of Respondents by Age.**

| Age    | N  | %    |
|--------|----|------|
| Male   | 8  | 66.0 |
| Female | 4  | 34.0 |
| Total  | 12 | 100  |

Table 7 shows the distribution of the characteristics of the children who were respondents in the study at Pitu Community Health Center. Of the 12 children, based on gender, the respondents consisted of 8 boys (66%) and 4 girls (34%).

**Tabel 8. Frequency Distribution Based on Nutritional Status Before and After Administration**

| Nutritional status                      | Frequency (f) |      | Persentase (%) |
|-----------------------------------------|---------------|------|----------------|
|                                         | Pre           | Post |                |
| Malnutrisi<br>(- 3,0 SD s/d < - 2,0 SD) | 12            | 0    | 100            |
| Good Nutrition<br>(- 2,0 SD s/d +1 SD)  | 0             | 12   | 0              |
| <b>Total</b>                            | 12            | 12   | 100            |

Table 7 shows the nutritional status of toddlers before and after the tempeh porridge and katuk leaves intervention in Pitu Village, Tobelo Tengah District. The results show that before the intervention, all toddlers were classified as malnourished (100%). After receiving the tempeh porridge and katuk leaves, nutritional status improved, bringing all toddlers into the well-nourished category (100%).

**Table 8. Uji Wilcoxon Signed Test**

| Nutritional Status of Toddlers                     | n  | Mean Sum of Rank | p-value |
|----------------------------------------------------|----|------------------|---------|
| Before being given porridge and Katuk leaves       | 12 |                  | 0.003   |
| After being given tempeh porridge and Katuk leaves | 12 |                  |         |

Table 8 shows the results of the analysis using the Wilcoxon test, with a p-value of 0.003, smaller than the significance level of  $\alpha = 0.005$ . This indicates that  $H_0$  is rejected and  $H_1$  is accepted, so it can be concluded that there is a significant effect of providing tempeh porridge and katuk leaves on the nutritional status of toddlers. The Wilcoxon Signed Ranks data confirms that all samples experienced an increase in nutritional status, as seen from the positive rank value of 12 respondents, which means all toddlers experienced an improvement from before (pretest) to after (posttest).

## DISCUSSION

This study found changes in toddlers' nutritional status, measured by weight/height before and after the intervention. Regarding maternal education, the majority of respondents (50%) had an elementary or junior high school education, indicating a link between parental education and children's nutritional status. Education is considered to influence a family's quality of life, including dietary patterns. The intervention, which included 150 grams of tempeh porridge and katuk leaves for 14

days, was shown to improve toddlers' nutritional status. Average weight increased from 11.6 kg to 12.4 kg (a 0.8 kg increase), while average height increased from 93.3 cm to 94.2 cm (a 0.9 cm increase).

In April 2018, Tri Budi Rahayu and Yespy Anna Wahyu Nurindahsari conducted the study. The results indicated a significant effect of moringa leaf consumption on toddler nutrition, specifically BMI/Age. Measurements showed an average increase in BMI of 0.13 before and after treatment (Rahayu & Nurindahsari, 2018).

Toddlers who do not receive balanced nutrition are at risk of health problems such as wasting and stunting (Ahsari, 2018). Children will have a better quality of life if their growth and development needs are met. Therefore, nutritious food intake plays a crucial role in optimal toddler growth (Dhilon & Harahap, 2022).

Its vitamin C content is seven times higher than oranges, four times higher than carrots, four times higher than milk, three times higher than bananas, and twice as high as yogurt. With these benefits, moringa leaves have the potential to be a solution to addressing malnutrition in Indonesia. Furthermore, moringa leaf powder contains even richer nutrients, including ten times more vitamin A than carrots, 17 times more calcium than milk, 15 times more potassium than bananas, nine times more protein than yogurt, and 25 times more iron than spinach (Letiora, Sineke, & Purba, 2020).

Moringa is known as a highly nutritious plant. The large amount of calcium found in moringa leaves can prevent osteoporosis and support height growth. Moringa oleifera extract even contains

calcium levels between 1600–2200 mg, making it crucial for meeting children's nutritional needs. With its abundant nutritional content, moringa is beneficial for improving health while addressing malnutrition.

As a superfood, moringa leaf powder has significant benefits in addressing malnutrition in toddlers aged 2–5 years. Research shows improved nutrition in 25 children in the control group after being given moringa leaf powder. The essential amino acids arginine and histidine in moringa leaves play a role in binding proteins needed for growth, making them beneficial for children experiencing protein deficiency (Letiora et al., 2020). Furthermore, developing the use of traditional medicine to boost children's immunity is a strategic step in supporting improved health and growth (Nugraha, Gayatri, & Ugrasena).

## CONCLUSION

Initially, 12 toddlers were categorized as at risk for stunting. After consuming 150 grams of tempeh porridge and katuk leaves daily for two weeks, all of them returned to good nutrition, with an average weight gain of 0.8 kg and height gain of 0.9 cm. SPSS testing demonstrated a significant effect.

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