

## THE EFFECTIVENESS OF CONSUMING MORINGA LEAF PUDDING TO PREVENT STUNTING AMONG CHILDREN AT PAUD ADELWEIS IN WEST CIKARANG, BEKASI DISTRICT IN 2023

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| Article Information                                                                                                                                                                      | Abstract                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| <b>Received:</b><br>July 21, 2023                                                                                                                                                        | <i>Stunting is a global health problem affecting 165 million children around the world. The prevalence of stunting in Indonesia reached 21.6% in 2021. Four children were identified as stunted (12.1%), and 29 were normal (87.9%) in PAUD Adelwais in March-April 2023. Moringa leaves are one intervention that can be used to prevent stunting. Moringa oleifera (Moringa plant) is a widely and easily cultivated plant in Indonesia with the potential to be an ergonomic, cheap, and nutritious supplemental food. Many communities have widely used Moringa plants. The research aimed to determine the efficacy of Moringa leaf pudding in preventing child stunting. A quasi-experimental one-group pre-test and post-test approach was used as the research design. A total sample of 33 children were selected as respondents to the survey. The research results show that the consumption of Moringa leaf pudding effectively increases the height and weight of the children significantly, with a p-value of 0.000 (<math>&lt; 0.05</math>). However, there was no statistically significant change in the body mass index with a p-value of 0.310 (<math>&gt; 0.05</math>). There is a decrease in the prevalence of stunting in the PAUD Adelwais children, which decreased to 2 children (6.1%). Conclusion: Pudding with Moringa leaves is an effective intervention for preventing stunting in children.</i> |
| <b>Revised:</b><br>August 11, 2023                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Accepted:</b><br>January 4, 2024                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Available Online:</b><br>January 30, 2024                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Keywords:</b> <i>stunting, moringa leaf pudding</i>                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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### 1. Introduction

Stunting is a global health issue. According to the WHO, stunting is a growth disorder in children caused by poor nutrition, repeated infections, and inadequate psychosocial stimulation. Indonesia's 2018 Basic Health Survey results showed a 6.4% decrease in stunting among young children, from 37.2% (2013) to 30.8%.<sup>[1]</sup> Research by Rahayu, Pamungkasari, and Wekadi Gunawan in 2017 stated that stunting is a growth disorder caused by malnutrition, most common in children under 5.<sup>[2]</sup> Stunting is also a condition where the height is short or very short, calculated by

the index of height for age (PB / U) or height for age (TB / U) with a threshold (z score) between -3 SD and  $< -2$  SD<sup>[3]</sup>. According to de Onis & Franca<sup>[4]</sup>, children can be considered stunted if their height/length is less than -3 SD based on the World Health Organization's (WHO) median growth standards for children of the same age and sex category. Symptoms of stunting in children to look for include delayed bone growth, low body weight compared to children their age, children who are shorter than their age, and body proportions that are more normal but look younger/more petite for their age.

Moringa oleifera is a plant that is widely and easily cultivated in Indonesia and has the potential to be an ergonomic and inexpensive yet nutritious supplemental food. Many communities have widely used Moringa plants. For example, a study conducted in Yogyakarta found that adding moringa leaves to infant formula resulted in a positive increase in body mass index to an average of about 13-14 children out of 30 respondents<sup>[5]</sup>. In a study conducted by Opalakrishnan et al. in 2016, it was stated that moringa leaves have an excellent nutritional content to meet the body's nutritional needs<sup>[6]</sup>. The processed products of moringa leaves are very diverse, including processed moringa leaf tea drinks, moringa leaf powder, biscuits, moringa leaf pudding, and various snacks for children. Moringa leaves contain phytosterol compounds, which are compounds that cannot be dissolved in water. Therefore, in the processing of Moringa pudding, it is necessary to use fresh Moringa leaves by using all the parts of the leaves. Pudding has a soft texture and long shelf life at certain temperatures, lasting up to 64 hours at 17 °C and 59 hours at 27 °C<sup>[7]</sup>. According to Selpina Embuai, in his review of the literature, there were ten articles on the use of Moringa leaves as a nutritional product for preventing stunting.<sup>[8]</sup> From the results of research conducted by Rusmataji in 2021 on the acceptability and nutritional content of Moringa leaf biscuits as an alternative for stunting toddlers, it was found that Moringa leaf biscuits can be used as an alternative to snacking and are even very good for stunting toddlers.<sup>[9]</sup> In addition, Mulyati and Hutagol in 2020, in their research on the formulation of energy and protein source biscuits from Moringa leaf flour (Moringa Oleifera) and Sidat fish bones (Anguila Sp) for stunting toddlers, found that biscuits with the selected formula have the requirements of complementary foods and contain high energy and as a source of protein which is very useful for preventing stunting in children.<sup>[10]</sup>

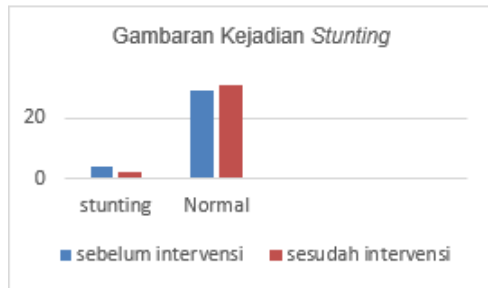
Another study on Moringa Oleifera conducted by Muliawati and Sulystiawati in 2019 on providing Moringa Oleifera extract as a preventive effort for stunting incidence in toddlers found that the results of Moringa oleifera extract can increase the height by 0.342 cm with a prediction of 16.2%, while 83.8% is likely to be caused by other factors<sup>[11,12]</sup>. The results of the multivariate analysis show the best model: when Moringa oleifera extract is controlled by maternal education, it can increase infants' height by 0.476cm with a prediction of 34.1%. Based on this background, where the high nutritional content of Moringa leaves is easy to cultivate and process, this study aims to determine the effectiveness of Moringa leaves in the form of pudding in preventing stunting in children.

## 2. Method

A quasi-experimental design with one group pretest and posttest design approach is used in this study. The pretest was carried out by observing the variables first, and the posttest was carried out after the respondent got the intervention. However, the pretest was carried out by observing the variables first, and the posttest was carried out after the respondent received the intervention. The independent variable of this study is the provision of moringa leaf pudding to children. Referring to previous research, pudding with 2 grams of moringa leaf content was given daily for 30 days<sup>[17]</sup>; before the pudding was given, anthropometric measurements were taken first, and then anthropometric measurements were taken after 30 days. The dependent variable of this study is stunting in children, which is measured based on height (TB) and age (TB/U). There were 33 participants; all respondents were toddlers from PAUD Adelwais.

## 3. Result and Discussion

According to the results of this study, the incidence of stunting in the children of PAUD Adelweis decreased from 4 children to 2 children.



**Figure 1.** Results of measurements of the incidence of stunting before and after the intervention.

This chart shows that stunted children decreased from 4 (12.1%) to 2 (6.1%), and the number of children with average weight are 31(93.9%).

**Table 1.** Distribution of mean height, weight and body mass index before and after consuming moringa leaf pudding.

| Variable | Before | After  |
|----------|--------|--------|
| Height   | 107.79 | 108.58 |
| Weight   | 17.85  | 18.06  |
| BMI      | 15.3   | 15.28  |

Table 1 shows that the average anthropometric measurements before the intervention increased after the intake of moringa leaf pudding, especially in height from the previous mean of 107.79 to 108.58 and in weight from the previous mean of 17.85 to 18.06. However, there was no increase in BMI.

Although the weight and height of children under five increased following the intervention, their nutritional status did not change much <sup>[13,14]</sup> However, it should be noted that there is potential for improving the nutritional status of children under five if the intervention is implemented over a more extended period, such as more than 2 or 3 months. This research was conducted while fasting. This can affect the eating patterns and nutritional intake of children under five which can impact changes in their nutritional status. Thus, the results of this

study indicate the potential for improvement in the nutritional status of children under five. However, a more extended intervention and consideration of other factors affecting their nutritional intake is needed.

According to the results of the collection of anthropometric data before and after the statistical tests were carried out, the following results were obtained:

**Table 2.** Wilcoxon Signed Rank Test Results

|                     | Mean Positive | Mean Negative | Sig. (2-tailed) |
|---------------------|---------------|---------------|-----------------|
| Height Pre and Post | 12.5          | 0             | 0.000           |
| Weight Pre and Post | 13.23         | 4.5           | 0.000           |
| BMI Pre and Post    | 11.45         | 13.25         | 0.310           |

Table 2 shows that the administration of moringa leaf pudding affects the increase in height and weight with Sig. (2-tailed) of 0.000 ( $<0.05$ ).

And the positive mean is greater than the negative mean, which means that more children experience an increase in height and weight. The average increase in height was 0.79 and 0.21 for weight.

The rich nutritional content of moringa leaf extract is very beneficial for the growth and development of infants and toddlers. The high calcium content in the Moringa leaf extract makes it one of the ways to increase the height of the infant as an additional food or as a companion to breast milk. Moringa leaf extract can be sprinkled on food or taken directly with water or orange juice.<sup>[13]</sup> Dried or extracted Moringa leaves contain higher calcium levels than fresh ones, ranging from 1600-2200 mg. Research also indicates that Moringa leaves have vitamin C equivalent to 7 oranges, vitamin A equivalent to a carrot, calcium equivalent to 4 glasses of milk, and potassium equivalent to 2 yogurts <sup>[13]</sup>..

A study conducted by Zakaria et al. in 2012 found that an intervention conducted in children under the age of 5 years by adding 2 to 3 grams of Moringa leaf meal to their daily diet for one month resulted in 18 out of 25 respondents (72.0%) experiencing an increase in height <sup>[14]</sup>. A study on the benefits of Moringa oleifera extract was conducted by Muliawati, Sulistyawati, and Utami in 2019; it showed a difference in mean height of 1.849 cm between the treated and control groups. These results indicate that Moringa oleifera extract can be an additional nutrient to help children with stunted growth.<sup>[15]</sup>

Vitamin B complex is essential in increasing the body's metabolic rate. It stimulates the hypothalamus to increase appetite and support growth. Vitamin C, on the other hand, increases the acidity of the stomach, which can lead to hunger. Vitamin C also has a role in maintaining physical fitness and preventing various infectious diseases. Children who are malnourished and do not have an adequate intake of food can be treated by adding Moringa to their diet. This can help improve the quality of nutrition these children receive. As additional data, seven parents reported an increase in their children's appetite after giving Moringa pudding. This suggests that Moringa pudding may stimulate children's appetite and be an effective alternative for increasing infant food intake.<sup>[13]</sup>

Research conducted by Muliawati in 2020 found that regular daily administration of Moringa leaf extract for 30 days can increase body weight by 0.420kg, predicting that this factor contributes approximately 18.9% to weight gain <sup>[17]</sup>.

There was a notable rise in average body weight before and after the intervention in the treatment group, as per the findings of Fathnur's 2018 study.<sup>[18]</sup> This indicates that the use of moringa leaf pudding contributed to the increase in body weight in the treatment group and no significant rise in body weight was noted in the control group. However, a study by Juhartini in 2015 revealed that incorporating a moringa mixture into

biscuits consumed by toddlers was linked to a noteworthy increase in body weight.<sup>[19]</sup> After 30 days, the treatment group given Moringa leaf pudding showed a 0.46 kg increase in body weight compared to the control group. However, the Sig. (2-tailed) BMI is 0.310 ( $>0.05$ ), indicating that giving Moringa leaf pudding has no significant effect on increasing BMI. The negative mean outweighs the positive mean, suggesting that more children did not experience an increase in BMI. This contradicts a 2018 study by Rahayu and colleagues, which reported an average BMI of 13.29 before treatment and 14.19 after treatment, indicating a positive effect of the intervention on improving the nutritional status of the research subjects.<sup>[20]</sup>

A 2012 study by Zakaria et al. found that although children under five gained weight and height following the intervention, their nutritional status did not change significantly. However, the intervention is implemented over a more extended period, such as more than 2 or 3 months. In that case, there is a potential to improve the nutritional status of children under five.<sup>[21]</sup>

The results of this study indicate the potential for improving the nutritional status of children under five years of age, but more extended intervention and consideration of other factors that may affect the nutritional intake of children under five years of age, which may have an impact on changes in their nutritional status. Thus, the results of this study indicate the potential for improving the nutritional status of children under five, but more extended intervention and consideration of other factors that may influence their nutritional intake are needed.

#### 4. Conclusion

The study found that daily consumption of Moringa leaf pudding at 2 grams for one month significantly reduced the incidence of stunting in children, as indicated by a p-value of 0.000. This suggests a positive impact on the children's height and weight. However,

there was no significant change in body mass index (BMI) following the intervention, with a p-value of 0.310. Overall, the findings suggest that Moringa leaf pudding may help prevent stunting in children under five years by positively influencing their height and weight.

The study has limitations, such as the short duration that restricts direct observation and monitoring of children's progress. The influence of other desserts consumed during the study is also a factor. Moreover, the small sample size affects the generalizability of the results to a larger population. The study may only capture a partial range of variations in the population. Additionally, the accuracy and reliability of the data may be compromised by the methods used to measure relevant variables. Using valid and reliable measurement tools is essential to improve research accuracy. Bagi peneliti selanjutnya diharapkan untuk mengatasi keterbatasan yang ada. Sehingga bisa didapatkan hasil yang lebih baik dan akurat.

## 5. Acknowledgment

We appreciate the involvement of all parties in this study, particularly the school and parents of PAUD Adelweis students, for their permission, support, and active participation. The contributions and collaboration of the school and parents have been crucial for the success of this research. The support from all parties has significantly enhanced the quality of this research. We are thankful for the willingness and cooperation shown in the endeavor to enhance understanding and knowledge regarding the nutrition and health of children in PAUD Adelweis.

We anticipate that the findings of this study will positively impact children and society and will make a valuable contribution to the efforts to prevent stunting and improve the health of future generations.

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