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IDENTIFICATION OF NUTRITIONAL STATUS OF TODDLERS IN SUKAMANAH VILLAGE USING THE SAW METHOD

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ABSTRACT

This study aims to assess the nutritional status of toddlers in Sukamanah Village using the Simple Additive Weighting (SAW) method. Stunting is a major health problem in Indonesia, especially for toddlers, which has a long-term impact on their physical and cognitive development. The SAW method is used to assess the nutritional status of toddlers based on criteria such as weight, height, age and gender in a systematic and structured manner. Data on toddlers from Posyandu in Sukamanah Village was collected and analyzed using this method to determine nutritional status and identify toddlers at risk of stunting. The research results show that the SAW method is effective in identifying the nutritional status of children under five, thereby enabling timely and accurate nutritional interventions to reduce the prevalence of stunting in the region.

KEYWORD
Stunting
Nutrional Status
Toddlers
Simple Additive Weighting
Posyandu

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1. Introduction

As a developing country, Indonesia faces a serious health challenge, namely stunting in children under five. Stunting, which is a failure of growth in children due to chronic malnutrition and recurrent infections, has a long-term impact on children's physical and cognitive development. The role of the state and society is very significant in influencing stunting conditions in their areas. Various external factors such as culture, education, health services, economic and political conditions, agriculture and food systems, as well as water, sanitation, and environmental conditions contribute to this problem. In addition, internal factors in the household such as child care, exclusive breastfeeding, and optimal breastfeeding (MPASI) are also very important to overcome stunting in children. [1]

This problem not only reflects the nutritional status of children but also reflects the socio-economic conditions, access to health services, sanitation, and parenting applied in the community. These factors are interrelated and contribute to the high rate of stunting in Indonesia. This is a complex problem in the health sector in Indonesia, in 2022 the prevalence of stunting in Indonesia is 21.6%. Where, of course, in the following year it is expected that there will be a decrease in the prevalence.

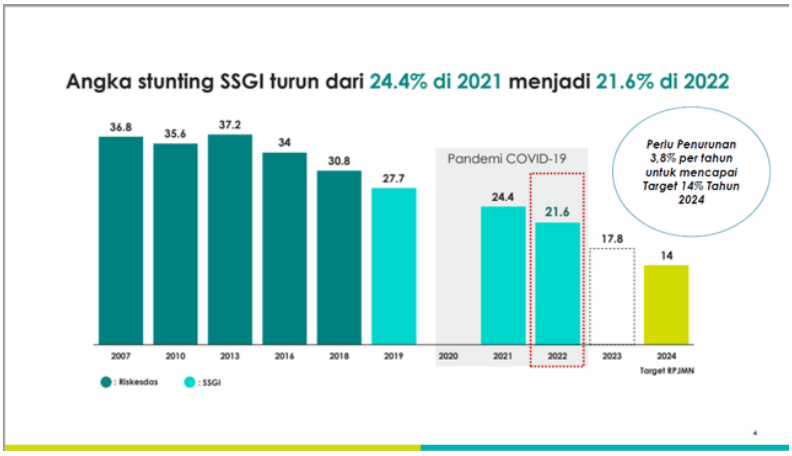

Fig. 1. Stunting Data based on SSGI [2]

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According to the President of the Republic of Indonesia, Joko Widodo, in Indonesia, the prevalence of stunting is targeted to decrease to 14% in 2024. Although the target of reducing stunting prevalence has been set, of course there are many challenges to achieve this goal. [2]

Stunting is a chronic nutritional problem caused by a lack of nutritional intake for a long time, which results in impaired child growth. Stunting is also one of the reasons for the inhibition of children's height, so that they are shorter than children of their age. Stunting begins to occur from the time the child is in the womb and can be seen when they reach the age of two years, which is commonly called the critical growth period. Stunting that occurs in the short term can certainly interfere with brain development which can affect children's abilities and achievements, metabolic disorders, and physical growth disorders. Meanwhile, stunting that occurs in the long term results in a decrease in cognitive ability and learning achievement, lowers immunity so that children get sick easily, and increases the risk of diabetes, obesity, heart and vascular disease, cancer, stroke, and disability in old age. [4]

The problem of high stunting in Sukamanah Village from year to year is a serious concern because stunting has an impact on various aspects of children's health and development. Therefore, stunting needs to be handled comprehensively and sustainably to prevent its adverse impact on the health and future of children in Sukamanah Village.

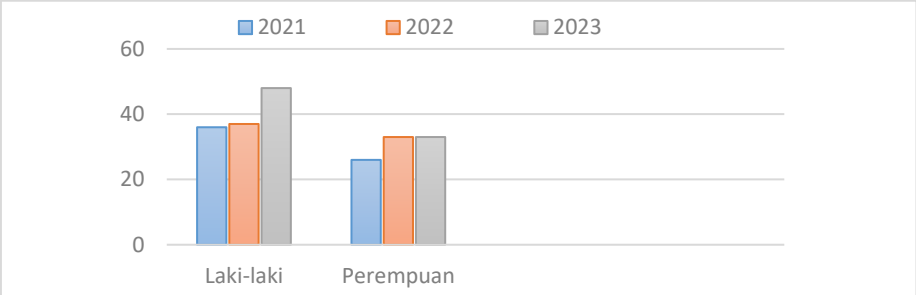

Fig. 2. Stunting Data in Sukamanah Village

In an effort to reduce the prevalence of stunting, accurate and timely identification of the nutritional status of toddlers is very important. One method that can be used to support this process is the Simple Additive Weighting (SAW) method. The SAW method allows the assessment of the nutritional status of toddlers based on various criteria, such as weight, height, age, and gender, in a more systematic and structured way. By calculating using the SAW method, health workers can more easily and quickly determine the nutritional status of toddlers, so that the necessary nutritional interventions can be provided immediately. This is expected to help accelerate the reduction of stunting prevalence in Indonesia, by ensuring that every toddler receives proper monitoring and care to support their optimal growth and development.

2. Literature Riview

2.1. Previous Research

Previous research has made a significant contribution to the development of information systems and decisions related to the nutritional status of toddlers, which also uses the Simple Additive Weighting (SAW) method. Research by Rifkie Nurdian Adi Nugroho, Candra Bella Vista, and Rokhimatul Wakhidah in 2024 entitled "Information System in Determining the Status of Nutrition of Toddlers by Utilizing the Simple Additive Weighting Method." Developing an information system for determining the nutritional status of toddlers at the Kejayan Health Center, which successfully overcame the problem of inaccuracy of manual data input and achieved a 100% accuracy level in determining the nutritional status of toddlers. This system makes it easier for midwives and nutritionists in the process of data input, calculation, and reporting. [5]

M. Abu Jihad Plaza R, Haliq, and Chandra Irawan conducted a study in 2022 with the title "Decision Support System for Toddlers Identified with Stunting Using the SAW Method". This research focuses on identifying stunting in toddlers to improve their health status. This study involved 20 children at the Kalibalangan Health Center using the parameters of height per age (TB/U), weight per age (BB/U), weight per height (BBTB), and body mass index. -age (BMI/U). The Simple Additive Weighting (SAW) method was used in this study. Of the 20 children, 7 children were identified as stunted, and 13 children were classified as having normal nutritional status. This system facilitates the process of determining stunting status in toddlers. [6]

Arie Prabowo, Wida Prima Mustika, Mohamad Idris, and Andi Sanjaya in 2023 also used the SAW method in their research entitled "Implementation of the Child Growth and Development Decision Support System at Posyandu with the SAW Method". They succeeded in creating a web-based system that improves the

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management of child growth and development data at Posyandu Cendana, making it more systematic and integrated. [7]

These studies provide a strong foundation for the research entitled "Identification of Nutritional Status of Toddlers in Sukamanah Village Using the SAW Method." By examining the successes and challenges in the application of the SAW method in various previous studies, this study aims to further optimize the identification of nutritional status of toddlers, ensuring higher accuracy and efficiency in the health information system.

2.2. Thingking Framework

The framework of thinking is the intellectual foundation of a research that is built on information obtained from facts, observations, and literature studies. This frame of mind contains the theories, assumptions, or concepts on which this research is based. In the framework of thinking, the research variables are described in detail and relevant to the problem being researched, so that it becomes the basis for answering research questions. The following is the framework of thinking that has been prepared:

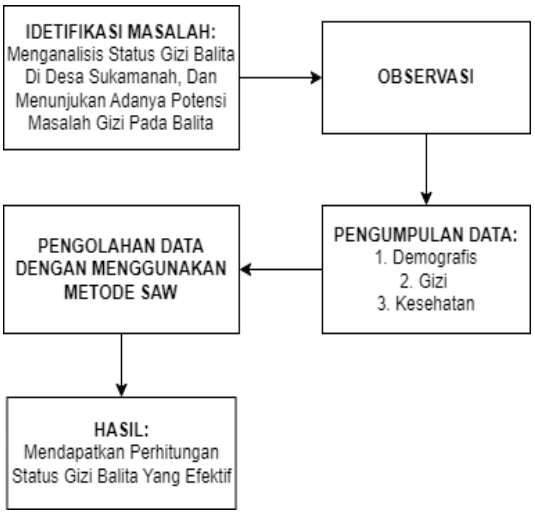

Fig. 3. Thingking Framework

3. Methodology

3.1. Research Methods

In this study, the SAW decision support system method was applied to identify children affected by stunting at the Posyandu in Sukamanah Village. The Simple Additive Weighting (SAW) method is a technique that combines the sum with the weights and calculates the total weighted sum of the performance values for each alternative based on the available attributes. This process includes normalizing the decision matrix (X) to allow comparison with all existing alternative values. [9]

The advantage of the SAW method is its simplicity and ease of implementation, so it is often used in situations with various criteria and alternatives. However, this method also has some drawbacks, such as the inability to handle interactions between criteria as well as sensitivity to changes in criterion weights. [10] Here are the steps to apply the SAW method, namely:

• Establishing Assessment Criteria: The initial stage is to establish the criteria that will be used to assess the nutritional status of toddlers. In the context of stunting, the main criteria include weight by age (BB/U), height by age (TB/U), weight by height (BB/TB), and upper arm circumference measurement (LiLa). These criteria were chosen because they are relevant to the assessment of the nutritional status and growth of children.

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Table 1. Determination of Criteria

Kriteria		
Weight by Age (BB/U)	Very Less	1
	Less	2
	Usual	3
Height by Age (TB/U)	Very Short	1
	Short	2
	Usual	3
Weight by Height (BB/TB)	Very Less	1
	Less	2
	Usual	3
Upper arm circumference (LiLa)	Very Less	1
	Less	2
	Usual	3

- Collecting Toddler Data: The toddler data to be analyzed was collected from the Posyandu in Sukamanah Village. This data includes information about the weight, height, age, and gender of each registered toddler. The data must be accurate and up-to-date to ensure valid analysis results.
- Data Normalization: The data that has been collected is then normalized to convert the different values into the same scale, usually between 0 and 1. Normalization is necessary so that criteria that have different scales can be directly compared. The formula used for normalization in the SAW method is:

  r_ij=x_ij/(maxx_ij) for the benefit criterion

  r_ij=(minx_ij)/x_ij for cost criteria [11]
- Determining Weight for Each Criterion: Weight is assigned to each criterion based on its level of importance. This weight is determined by a nutritionist or experienced health worker. The total weight must be equal to 1 (or 100% if it is in percentage form).

Table 2. Weight and criteria

Criteria	Weight(100%)
BB/U	25
TB/U	30
BB/TB	25
LiLa	20

- Calculating the Final Score: Once the data is normalized and the weights are determined, the final score for each toddler is calculated by summing the result of the multiplication between the normalized value and the weight of each criterion. The formula is:

  V_i=∑▒ 〖(w_(j . r_ij)

  Where V_i is the final score for the ith toddler, w_(j) is the weight of the jth criterion, and r_ij is the normalization value for the ith toddler in the jth criterion. [12]
- Sorting and Determining Nutritional Status: The final score obtained is used to rank toddlers from those most at risk of stunting to those with normal nutritional status. Toddlers with the lowest scores were identified as the most at risk of stunting. In this way, health workers can prioritize nutritional interventions for toddlers who need it most.

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3.2. Tools And Materials

3.2.1. Tools

Using Microsoft Word software in writing and Microsoft Excel to process data as well as to calculate the SAW method in determining the nutritional status of toddlers.

3.2.2. Materials

Toddler data from the Posyandu in Sukamanah Village totaled 20 toddlers taken for samples.

Table 3. Data Toddlers

Sampel	BB/U	TB/U	BB/TB	LiLa
R1	3	1	3	3
R2	2	1	3	3
R3	2	2	1	3
R4	1	1	1	3
R5	3	2	3	3
R6	3	2	3	3
R7	3	2	3	3
R8	2	2	3	3
R9	3	2	3	3
R10	3	2	3	3
R11	3	2	3	3
R12	2	2	1	3
R13	1	1	3	3
R14	2	1	3	3
R15	2	2	3	3
R16	3	2	3	3
R17	3	1	3	3
R18	2	2	3	3
R19	2	1	3	3
R20	2	2	3	3

3.3. Data Collection

The data on toddlers with indications of stunting used in this study was obtained in collaboration with local posyandu agencies. Data collection is carried out by survey methods and direct recording by trained posyandu officers. The data collected includes demographic and anthropometric information of children under the age of five, including height, weight, age, gender, upper arm circumference. Each posyandu follows a standard measurement protocol that has been established to ensure consistency and accuracy of data. The data is then collected at regular intervals and recapitulated in digital format (CSV or Excel) to facilitate further analysis.

3.4. Research Schedule

This research was conducted from January to June. In January, the research team will make preparations and coordinate with the local posyandu. This includes socialization of research objectives, training of posyandu officers on appropriate data collection methods, and preparation of necessary tools and materials. The month of February will be filled with the initial data collection process. Posyandu officers will begin recording anthropometric data of children under five years old, including height, weight, age, gender, and nutritional status. This data collection was carried out during routine posyandu activities in the village.

In March, the data that has been collected will be verified and cleaned to ensure accuracy and consistency. The research team will validate the data, identify, and correct errors that may occur during the collection process. April will be focused on the initial analysis of the data. The data that has been cleaned will be processed and analyzed using statistical software. The results of this initial analysis will help identify stunting patterns and trends in Sukamanah Village.

In May, the research team will conduct a follow-up analysis and begin compiling a research report. This further analysis will be more in-depth, covering various factors that affect stunting, as well as comparing data

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with national and international health standards. Finally, June will be filled with the completion of the final report. The results of this study are expected to provide a clear picture of stunting conditions in Sukamanah Village and become the basis for more effective interventions.

4. Results and Discussion

4.1. Result

After observation, analysis and calculation using the SAW method in depth on the data of toddlers at the Posyandu in Sukamanah Village, the following results were obtained.

Table 4. Final Calculation Data

Sampel	BB/U	TB/U	BB/TB	LiLa	Total	Rank
R1	0.25	0.15	0.25	0.2	0.85	12
R2	0.166667	0.15	0.25	0.2	0.766667	14
R3	0.166667	0.3	0.083333	0.2	0.75	17
R4	0.083333	0.15	0.083333	0.2	0.516667	20
R5	0.25	0.3	0.25	0.2	1	1
R6	0.25	0.3	0.25	0.2	1	1
R7	0.25	0.3	0.25	0.2	1	1
R8	0.166667	0.3	0.25	0.2	0.916667	8
R9	0.25	0.3	0.25	0.2	1	1
R10	0.25	0.3	0.25	0.2	1	1
R11	0.25	0.3	0.25	0.2	1	1
R12	0.166667	0.3	0.083333	0.2	0.75	17
R13	0.083333	0.15	0.25	0.2	0.683333	19
R14	0.166667	0.15	0.25	0.2	0.766667	14
R15	0.166667	0.3	0.25	0.2	0.916667	8
R16	0.25	0.3	0.25	0.2	1	1
R17	0.25	0.15	0.25	0.2	0.85	12
R18	0.166667	0.3	0.25	0.2	0.916667	8
R19	0.166667	0.15	0.25	0.2	0.766667	14
R20	0.166667	0.3	0.25	0.2	0.916667	8

Variable trends show that toddlers with low SAW scores tend to be stunted. This is due to a lack of adequate nutritional intake as well as environmental factors that affect the growth of toddlers. The SAW analysis gives weight to each relevant criterion, so that variables such as weight and height are important indicators in determining nutritional status. The SAW method integrates a variety of relevant assessment criteria in a single structured assessment framework, allowing for more accurate identification of nutritional problems than conventional methods. The criteria used reflect various aspects that affect the nutritional status of toddlers, thus providing a more comprehensive picture.

4.2. Discussion

Based on the data that has been processed, we can see that the highest score for each criterion (BB/U, TB/U, BB/TB, and LiLa) resulted in a total score of 1, which was achieved by several respondents (R5, R6, R7, R9, R10, R11, and R16). This total value reflects optimal conditions where children are not stunted and have healthy growth. This shows the importance of keeping the values of BB/U, TB/U, BB/TB, and LiLa within the ideal range to prevent stunting.

On the other hand, the smallest rank that indicates the greatest risk of stunting is found in the respondents with the lowest total score, such as R4 which has a total score of 0.5167. Children with such low total scores show serious problems in their growth and development, which has a great potential for stunting. This

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underscores the need for immediate and effective interventions, such as targeted nutrition programs, regular health monitoring, and nutrition education for parents to ensure children get adequate nutrition.

The significant difference between the highest and lowest scores in this data shows a large variation in the nutritional status and growth of the children assessed. Lower ratings, such as those possessed by R4, should be the primary focus of public health programs. Efforts to increase the total value through increasing the values of BB/U, TB/U, BB/TB, and LiLa must be a priority in health policies to prevent and overcome stunting. These programs must be inclusive, sustainable, and supported by rigorous monitoring to ensure their effectiveness in improving children's nutritional status and health.

Previous studies have shown that the SAW method is effective in identifying stunting in toddlers. Both the research in the Kalibalangan Health Center and in Sukamanah Village used similar parameters, such as TB/U and BB/U, for nutritional status assessment. However, the research in Sukamanah Village involves a larger population and focuses on the application of the SAW method on a wider scale. This provides additional validation that the SAW method can be applied effectively in a variety of locations and conditions.

The effectiveness of the SAW method in these two studies can occur because this method allows the combination of various relevant criteria in one assessment framework. This ensures that all important aspects that affect the nutritional status of toddlers are considered, thus providing more accurate results. The results of this study support the hypothesis that the SAW method can improve the accuracy of identifying the nutritional status of toddlers compared to conventional methods. With the data collected, it is evident that this approach allows for more precise determination of nutritional status, which in turn can facilitate more effective interventions to reduce the prevalence of stunting.

5. Conclusion

This study identified the nutritional status of toddlers in Sukamanah Village using the Simple Additive Weighting (SAW) method. This method allows the combination of various relevant criteria in a single structured assessment framework, resulting in more accurate results than conventional methods. The results of the study showed that toddlers with low SAW scores tended to be stunted, caused by a lack of adequate nutritional intake as well as environmental factors that affect their growth. The study also emphasizes the importance of immediate and effective interventions such as targeted nutrition programs, regular health monitoring, and nutrition education for parents. This study provides additional validation that the SAW method can be applied effectively in a variety of locations and conditions. In the context of stunting, the main criteria used include weight per age (BB/U), height per age (TB/U), weight per height (BB/TB), and upper arm circumference measurement (LiLa). The results support the hypothesis that the SAW method can improve the accuracy of nutritional status identification of toddlers compared to conventional methods, allowing for more precise determination of nutritional status that can facilitate more effective interventions to reduce the prevalence of stunting. The implementation of a web-based system with the SAW method has also been proven to improve the management of child growth and development data in Posyandu, making it more systematic and integrated. For future studies, it is recommended to expand the scope of the population and study location to identify more variables that may affect the nutritional status of children. Further studies could involve regions with different demographic and socio-economic characteristics to explore the influence of these factors on stunting prevalence. In addition, the application of the SAW method can be combined with other methods such as the Analytic Hierarchy Process (AHP) or the fuzzy method to improve accuracy and sensitivity in assessing the nutritional status of toddlers. This approach will provide a more comprehensive perspective in understanding the main determinants of stunting in various contexts. In addition, further research can also explore the effectiveness of nutrition and health interventions designed based on the results of the SAW analysis. By applying measurable and specific interventions to groups identified as at high risk of stunting, research can measure the short- and long-term impact of the program on children's nutritional status and growth. Longitudinal studies can provide in-depth insights into how changes in nutrition and health interventions affect a child's development over a longer period of time. This approach will be very useful in formulating more effective and sustainable health policies for stunting prevention in the future.

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