Jurnal CoreIT, Vol.11, No.1, June 2025
ISSN 2460-738X (Print)
ISSN 2599-3321 (Online)

Stunting Detection System and Nutritional Status of Toddlers Using Anthropometric Index and Body Mass Index

I Wayan Widi Karsana[1*], Putu Andhika Kurniawijaya[2], Rai Riska Resty Wasita[3]
[1,3]Dept. of Health Recorders and Information, Universitas Dhyana Pura, Indonesia
[1]Dept. of Information System, Universitas Dhyana Pura, Indonesia
widikarsana@undhirabali.ac.id*

Abstract. The stunting problem in Indonesia is a problem that has become a national concern. The target of reducing stunting in 2024 is 14%, while in 2022 it is still at 24%. Various efforts to deal with stunting have been carried out by the Indonesian government at both the central and local government levels but have not been able to reduce stunting significantly. To conduct early detection of stunting in toddlers, one can use anthropometric index data as a reference and body mass index for nutritional status in toddlers. Parameters in the anthropometric index use height by age or body length by age, while the body mass index uses body weight and height as indicators. This study aims to develop a stunting detection system and nutritional status of toddlers using anthropometric indices and body mass index and validate the comparison of system output results with the results of manual calculations with standard formulas from the Ministry of Health of the Republic of Indonesia. The research found that there is a match between the results of manual calculations and calculations from the developed system, or, in other words, it can be concluded that there is a valid influence of nutritional status on the potential for stunting in toddlers.

Keywords: Stunting, Nutritional Status, Child Anthropometry, Body Mass Index

Received December 2024 / **Revised** April 2025 / **Accepted** May 2025

INTRODUCTION

Stunting is a chronic nutritional condition characterized by a shorter height than the average growth of children of the same age. This illness is typically caused by long-term dietary inadequacies as well as the influence of environmental variables, such as an assessment of the health and nutritional adequacy of children under the age of five using markers such as weight, height, and age. Optimal child growth plays an important role in their health and development [1].

Stunting is a worldwide child health problem, and stunting is an important indicator of child health and well-being. UN statistics in 2020 recorded that more than 149 million (22%) children worldwide were stunted, of which 6.3 million were children under five from Indonesia [2]. Data from the Ministry of Health of the Republic of Indonesia shows that stunting is a significant health problem in Indonesia with a prevalence of 24.4% recorded in 2023 [3]. Despite the decrease, the prevalence of stunting in Indonesia is still below the WHO standard, which requires the figure to be below 20 percent [4].

Stunting not only affects height but is also associated with learning ability, mental retardation, and risk of chronic diseases [5]. Early detection of stunting by periodic measurement of weight and height according to age can help prevent stunting [6]. Detecting stunting in children can be done with anthropometric indices of height and length according to age. The method of monitoring children's growth and development carried out by posyandu cadres still has several shortcomings, including the use of conventional measurements recorded on the Towards Health Card [7]. For children's nutritional status, it is done by calculating the body mass index of toddlers. Children's nutritional status is determined by several criteria, including weight-for-age, length-for-age, and weight-for-height [8]. Stunting and nutritional status are closely related to one another because these factors influence each other. Based on the above problems, researchers are interested in conducting research and developing a system for early detection of stunting and nutritional status of toddlers.

DOI: 10.24014/coreit.v11i1.33882

METHODS

System Development Model

The development stage of the stunting detection system, along with the nutritional status of toddlers using anthropometric indices and body mass index, are described below.

Problem Analysis Stage

This stage formulates the problems that exist in the field, especially about the importance of stunting detection and nutritional status of toddlers using anthropometric indices and body mass index. Problems that occur are collected through the research data collection stage.

Data Collection Stage

At this stage, researchers collect data by direct observation at the health center and posyandu. Direct observation is used to obtain anthropometric data on toddlers, as well as what techniques are used by medical personnel to diagnose and detect stunting and nutritional status in children. Data collection was done by contacting health analysts to learn more about calculation techniques commonly used to evaluate nutritional status and early diagnosis of stunting in children [9]. A literature review was conducted by reviewing papers, journals and books relevant to the research problem.

Needs Analysis Stage

This stage describes the needs required in this study. Hardware and software requirements for implementing a stunting detection system and nutritional status of toddlers using anthropometric indices and body mass index [10].

System Design Stage

At this stage, system design and system process flow design are carried out to produce information about nutritional status and early detection of stunting in toddlers. The vital sign parameters measured in this study are anthropometric information and body mass index of toddlers.

System Implementation Stage

The stage of implementing the system in accordance with the system design that has been made using the programming language [11].

System Testing Stage

This stage is carried out by conducting initial tests on the work process of the system that has been built and testing the output results of the system. This stage is also an indicator of system improvement if errors are found during testing.

Validation Stage

The system validation stage is carried out in two stages. The first stage is carried out with validation by health analysis personnel to validate the anthropometric index parameters and body mass index of toddlers to see whether they are in accordance with the standards. The next validation stage is to compare the output results of the system with the results of manual calculations according to standard tables and formulas. If the comparison of the data obtained does not occur with significant differences, it can be concluded that the system output results are valid.

Methods in Determining the Nutritional Status of Children

Based on the Indonesian Minister of Health Regulation Number 2 of 2020 concerning Anthropometric Standards for Children, the determination of children's nutritional status is determined based on the Body Mass Index. The calculation of the body mass index uses indicators of the child's weight and height [12]. The following is the formula for calculating a child's body mass index.

$$\text{body mass index} = \frac{\text{body weight (kilogram)}}{\text{height (meters)} x \text{ height (meters)}} \qquad (1)$$

After the body mass index calculation is obtained, the nutritional status will be determined based on the age of the child [13]. The formula for determining the nutritional status of children is as follows:

$$\text{nutrition status by age} = \frac{\text{BMI- BMI Median}}{\text{BMI Median-(BMI-1SD)}} \quad (2)$$

Here, BMI is body mass index value, BMI Median and BMI-1SD determined from the standard table of child anthropometry Regulation of the Minister of Health of the Republic of Indonesia Number 2 of 2020. Indicators of nutritional status seen from the results of calculations using standard deviation (SD) are malnutrition < -3 SD, undernutrition -3 SD to < -2 SD, normal nutrition -2 SD to +1 SD, overnutrition +1 SD to +2 SD, and obesity > +2 SD [14].

Methods in Determining Child Stunting Potential

Stunting potential in children is determined based on the height or length of the child's body adjusted for age [15]. The standard formula for determining the potential for stunting in children is as follows:

$$\text{stunting potential} = \frac{\text{TB- TB Median}}{\text{TB Median-(TB-1SD)}} \quad (3)$$

Here, TB is height or length of toddlers, TB Median and TB -1SD is a table of standard deviations based on height according to the age of toddlers. The stunting categories from the calculation results are stunting < -3 SD, potentially stunting -3 SD to < -2 SD, normal -2 SD to +3 SD, and tall > +3 SD [16].

RESULT AND DISCUSSION

System Implementation

The following system has been developed, and system testing has been carried out. The system display is as follows:

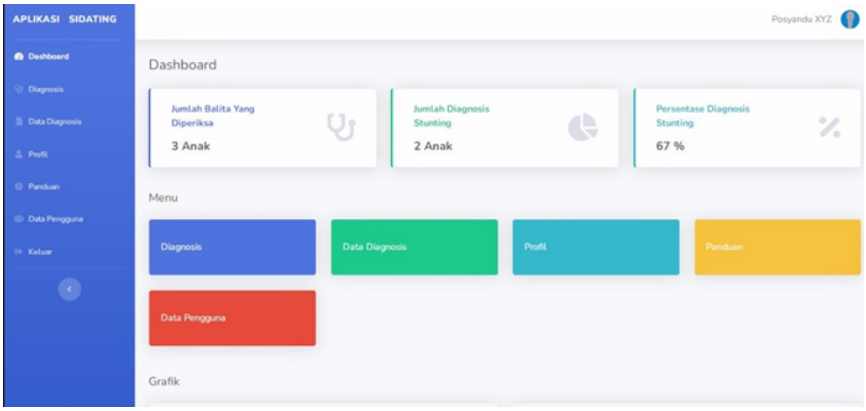

Figure 1. View of the System Dashboard Page

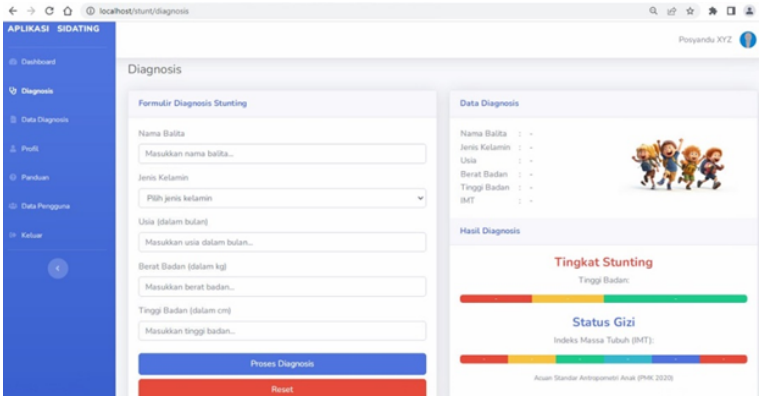

Figure 2. Diagnosis Page View

Testing

Testing was carried out with a sample of a male toddler aged 14 months with a body weight of 8 kg and a height of 75 cm, with manual calculations getting the results of Body Mass Index (BMI) = 14.22, Nutritional Status = -1.83 SD (Good Nutrition), and Stunting Potential = -1.25 SD (Not Stunting). Testing using the system by entering the same data in the manual calculation, the results displayed by the system are the same as the manual calculation. The following is a display of the diagnosis results using the system

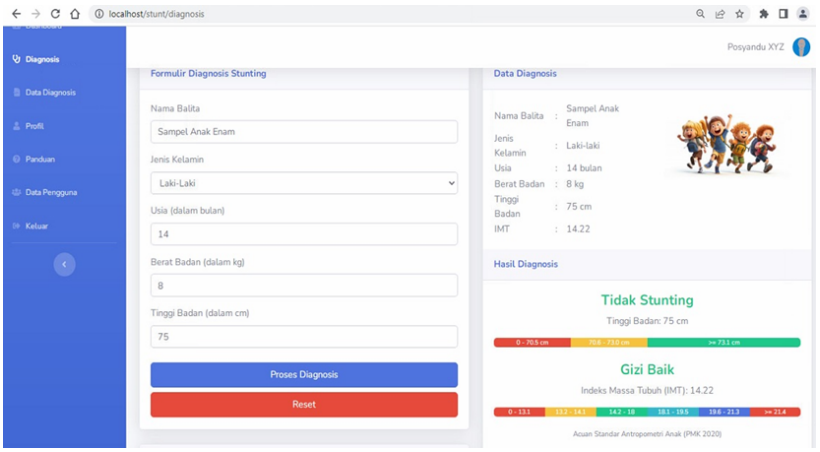

Figure 3. Display of Diagnosis Results using the System

Table 1. Comparison of Manual Calculation Results with Results from the System

No	Name	Gender	Age (month)	Body weight (kg)	Body height (cm)	BMI	Nutritional status		Stunting Potential		Validation
							Manual	System	Manual	System	
1	Child sample 1	Male	14	8	75	14,22	Good Nutrition	Good Nutrition	Not Stunting	Not Stunting	Valid
2	Child sample 1	Female	10	5	62	13,01	Less Nutrition	Less Nutrition	Heavy Stunting	Heavy Stunting	Valid
3	Child sample 1	Female	12	8	70	16,33	Good Nutrition	Good Nutrition	Not Stunting	Not Stunting	Valid
4	Child sample 1	Male	8	7	67,2	15,5	Good Nutrition	Good Nutrition	Not Stunting	Not Stunting	Valid
5	Child sample 1	Male	19	7,5	74,4	13,55	Less Nutrition	Less Nutrition	Heavy Stunting	Heavy Stunting	Valid

From the results of tests carried out with several samples, it was found that the results of manual calculations were in accordance with the results of the system. The system validation test by comparing the results of manual calculations and the results of the system is valid.

CONCLUSION

The conclusion obtained from this research is that the stunting detection system and the nutritional status of toddlers using anthropometric indices and body mass index were successfully developed and implemented. The test results obtained conformity between the results of manual calculations and the output results of the system, and the results of manual calculations and the results of the system show that there is an influence of nutritional status on the potential for stunting in toddlers.

REFERENCES

[1] N. K. T. Apriastini, N. P. T. Adnyani, P. O. Selvyani, and K. H. Setiawan, "STUNTING: FAKTOR RISIKO, DIAGNOSIS, TATALAKSANA, DAN PROGNOSIS," *GM*, vol. 4, no. 1, pp. 17–23, Jun. 2024, doi: 10.23887/gm.v4i1.77137.

[2] E. P. Ati, "Studi Deskriptif Permasalahan Status Gizi Pada Anak Usia 6-24 Bulan Di Kota Manado".

[3] A. Ernawati, "Gambaran Penyebab Balita Stunting di Desa Lokus Stunting Kabupaten Pati," *JL*, vol. 16, no. 2, pp. 77–94, Dec. 2020, doi: 10.33658/jl.v16i2.194.

[4] S. A. Frasetya, V. Nuraini, D. A. P. Sari, and I. Ketut, "Mengatasi Stunting dalam Pertumbuhan dan Perkembangan Balita," vol. 7, 2023.

[5] I. Ibrahim, Mas Rukin, and Sulyana Dadan, "Pengetahuan tentang Stunting pada Pasangan Usia Subur (PUS) di Kabupaten Banyumas Kelurahan Mersi," *AUJPSI*, vol. 5, no. 1, pp. 236–248, Jun. 2024, doi: 10.55623/au.v5i1.301.

[6] R. Jannah, A. Rahman, and H. Walidainy, "Kajian Literatur tentang Pendeteksian Stunting: Tinjauan terhadap Lokasi, Metode, dan Indeks yang Digunakan di Indonesia".

[7] S. N. Kamilah, R. Supriati, H. Haryanto, Sipriyadi, and V. Y. Atmaja, "Pemeriksaan Status Gizi berdasarkan Nilai Indeks Massa Tubuh pada Anak Usia 10-12 Tahun di SDN 159 Bengkulu Utara," *ICOMES*, vol. 2, no. 2, pp. 95–100, Dec. 2022, doi: 10.33369/icomes.v2i2.25579.

[8] F. Khairani and H. Ningsih, "HUBUNGAN KURANG ENERGI KRONIK (KEK) DENGAN KEJADIAN STUNTING PADA BALITA 2- 4 TAHUN DI WILAYAH KERJA UPTD PUSKESMAS PRINGGARATA".

[9] P. A. Kurniawijaya and I. W. W. Karsana, "Implementasi Metode AHP Dalam Sistem Penunjang Keputusan Penerima KIP Kuliah," vol. 5, 2023.

[10] I. Listiani and A. Ikhwan, "SISTEM INFORMASI MONITORING POSYANDU DALAM PENGELOLAAN DATA KESEHATAN ANAK BALITA MENGGUNAKAN INDEKS ANTROPOMETRI," *Technologia*, vol. 15, no. 4, p. 897, Oct. 2024, doi: 10.31602/tji.v15i4.16580.

[11] . M., E. Lusiana, S. Suriyani, M. Muaningsih, and R. Pratiwi, "Deteksi Dini Stunting Melalui Pengukuran Antropometri pada Anak Usia Balita," *akm*, vol. 4, no. 1, pp. 277–284, Jul. 2023, doi: 10.36908/akm.v4i1.862.

[12] B. Putra and A. H. Muhammad, "Prediksi Prevalensi Stunting di Indonesia dengan Ordinary Least Square (OLS)," *G-Tech*, vol. 8, no. 3, pp. 1890–1900, Jul. 2024, doi: 10.33379/gtech.v8i3.4623.

[13] R. M. Putra and F. H. Sadiyyah, "Ciherang Stunting Corner: A step to reduce the prevalence of stunting," *dedic. j. community services*, vol. 1, no. 2, pp. 335–348, Dec. 2023, doi: 10.17509/dedicated.v1i2.62468.

[14] E. R. Wijhati, R. Nuzuliana, and M. L. E. Pratiwi, "Analisis status gizi pada balita stunting," *Jurnal Kebidanan*, vol. 10, no. 1, p. 1, Feb. 2021, doi: 10.26714/jk.10.1.2021.1-12.

[15] M. Z. Wulandari *et al.*, "Penggunaan Perhitungan Indeks Massa Tubuh sebagai Penanda Status Gizi pada Mahasiswa Prodi Kesehatan Masyarakat Rombel 2D".

[16] V. Natalia and D. Hertati, "Analisis Faktor-faktor yang Mempengaruhi Kejadian Stunting di Kalimantan Tengah Berdasarkan Literature Review: Analysis of Factors Influence Stunting in Central Kalimantan Based on Literature Review," *J Surya Medika*, vol. 9, no. 3, pp. 181–189, Dec. 2023, doi: 10.33084/jsm.v9i3.6487.