

The Role of Anthropometry in Monitoring and Evaluating the Nutritional Status of Elementary School Students at SD Mesjid Lheu, Darul Imarah District, Aceh Besar Regency

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Abstract

Nutritional status is defined as the balance between nutrient requirements and intake, measured through anthropometric, biochemical, and dietary history variables. This study aimed to evaluate the role of anthropometry in monitoring and evaluating the nutritional status of elementary school students at SD Mesjid Lheu, Darul Imarah District, Aceh Besar Regency. This quantitative study used a descriptive observational method with total sampling of 31 sixth-grade students. The main variables measured included weight, height, mid-upper arm circumference (MUAC), and body mass index (BMI) to classify nutritional status into categories of malnutrition, good nutrition, and overnutrition. The results showed that the majority of students (70.9%) had good nutritional status, while 19.3% were malnourished and 9.6% were overnourished. The use of anthropometry proved to be effective as a simple and economical tool for detecting nutritional problem and as a basis for planning targeted nutritional interventions in the school environment. These findings reinforce the importance of implementing continuous nutritional monitoring to support the optimal growth and development of elementary school children, especially in suburban areas.

Keywords: Nutritional Status; Body Mass Index (BMI); Upper Arm Circumference (UAC)

Introduction

School age is a very important stage in life and is one of the main focuses in the field of health. This is because school-age children are a great asset and the future generation of the nation, who are numerous and organized in educational institutions such as schools or madrasas. Therefore, health programs are easier to implement in this group (Ministry of Health of the Republic of Indonesia, 2020).

In line with the importance of the school age, every child has the right to obtain nutrient-rich food to support their growth and brain development. Nutrition plays an important role in this process, especially in helping brain development. Thus, a person's ability to develop optimally depends heavily on balanced and proper nutrition.

Additionally, nutrition is a complex process in the utilization of food consumed by the body, which goes through the stages of digestion, absorption, distribution, storage, and metabolism. This process not only creates the energy needed to maintain life, growth, and normal organ function, but also involves the excretion of substances that are not needed by the body (Paramitha et al., 2024). As explained by (Supariasa 2001) in (Eldawaty et al., 2020), nutritional status is an indicator of the body's balance that can be measured through certain variables u (Eldawaty et al., 2020).

The nutritional status of elementary school children requires attention because children currently experience significant growth in weight and height. Nutrient intake must be adequately met to support optimal growth and

development. Achieving good nutritional status is very important because it is a factor that affects intelligence, health status, immunity, productivity, and serves as a preventive measure against various chronic diseases and premature death. Therefore, assessing the nutritional status of school children is necessary. This assessment aims to identify nutritional problems in a community or group (Sari, 2020).

Based on a statement by the Assistant Deputy for Nutritional Security and Health Promotion of the Coordinating Ministry for Human Development and Culture, children in Indonesia currently experience a triple burden of malnutrition, namely undernutrition, overnutrition, and micronutrient deficiencies. This statement is also reinforced by data on school children aged 5-12 years, 18.7% of whom are stunted. Wasting/thinness is at 11%, obesity at 19.7%, and anemia at 16.3%. Meanwhile, nutritional problems among toddlers include underweight at 15.7% and the prevalence of stunting among toddlers is still at 21.5%. This figure is still considered high according to WHO categories. We must strive to reduce it to 14% by 2024. Jelsi further stated that " 's nutritional problems among other school children include 65% of school-age children not eating a healthy breakfast, 97.7% of children aged 5-14 years consuming insufficient vegetables and fruits, and 54% of school children choosing unhealthy snacks such as consuming excessive sweets per day (Kemenko PMK, 2020).

A study conducted in Takalar Regency (2024) measured the nutritional status of students from several elementary schools using BMI. The results of measurements from 304 students showed that 8.90% were in the underweight category, 10.90% were in the overweight category, and 21.40% were in the obese category, emphasizing the phenomenon of the triple burden of malnutrition among elementary school students (Salsabiila et al., 2025).

In recent years, various studies in Indonesia have shown that the use of anthropometry as a method of monitoring the nutritional status of elementary school children is increasingly important and relevant. Anthropometry, which includes measurements of weight, height, and Body Mass Index (BMI), has been proven to be a simple but effective tool for detecting nutritional problems such as malnutrition, stunting, and obesity at an early stage. A study conducted at SDN 05 Kota Bima (2025) found that out of 53 students, 9.43% were underweight and 5.66% were overweight, indicating a double burden of nutritional problems among elementary school-aged students. These results highlight the importance of regular nutritional monitoring as part of prevention and early intervention efforts (Dewi et al., 2024).

Interestingly, a comparison of the nutritional status of elementary school students in urban and rural areas also shows different patterns. The results of a study by Rosyenne Kushargina and Nunung Cipta Dainy (2021) in Garut Regency and South Jakarta show that the incidence of stunting is higher in rural areas than in urban areas, with 36.4% of stunting cases in rural areas and 20.4% in urban areas. As many as 6.4% of elementary school children in urban areas were obese, higher than in rural areas at 2.3% (Asatuti et al., 2021). This proves that the anthropometric approach is not only important as an individual detection method but can also be used for spatial analysis of children's nutritional status. From these various studies, it is clear that anthropometric measurements are needed not only as clinical data, but also as a basis for evaluating school policies and targeted nutritional interventions, especially in elementary schools such as SD Mesjid Lheu Blang, which is located in a suburban area.

The impact of stunting on a child includes making the child more susceptible to disease and, in the future, may lead to a decline in productivity. Ultimately, stunting can broadly hinder economic growth, increase poverty, and widen inequality.

The use of anthropometry as a means of evaluating nutritional status has proven to be effective and relevant in the

context of primary school children. Measuring weight, height, and Body Mass Index (BMI) is a simple but effective way to detect various nutritional problems, ranging from malnutrition to obesity. Policies and standards issued by the WHO and the Indonesian Ministry of Health also emphasize the importance of this method as part of the health surveillance system in schools. However, the implementation and evaluation of anthropometric methods in schools in suburban areas of such as SD Mesjid Lheu, are still lacking and not fully reported. In this context, this study aims to improve the lack of data and provide a realistic picture of the nutritional status of students at SD Mesjid Lheu through an anthropometric approach. By choosing a location in a suburban area, this study makes an important contribution to understanding nutritional problems in environments that may not be adequately covered by nutrition health programs. This study also aims to provide information that can be used as a basis for decision-making in developing and evaluating more effective nutrition intervention programs that are tailored to the needs of school-age children in this location.

Therefore, this study focuses on the role of anthropometry in monitoring and evaluating the nutritional status of nutritional status of students based on anthropometric parameters in order to support the planning of targeted and sustainable nutritional interventions in the school environment. elementary school students at SD Mesjid Lheu. The main objective of this study is to measure and analyze the

Methods

This study is a quantitative study with a descriptive observational approach, which aims to describe the nutritional status of students through anthropometric measurements as part of monitoring and evaluating nutritional status in elementary schools. This approach was chosen because it allows for obtaining a real picture of the nutritional status of students at a certain point in time based on anthropometric data collected directly in the field.

The study was conducted at SD Mesjid Lheu, Darul Imarah District, Aceh Besar Regency, Aceh Province, on July 30, 2025. The location was chosen based on considerations of accessibility and good cooperation with the school. The population consisted of all sixth-grade students at SD Mesjid Lheu. Because the number of students was relatively limited and could be fully reached, this study used total sampling, namely all sixth-grade students who were present, totaling 31 students, and who met the inclusion criteria were used as the research sample.

Data collection was carried out by measuring the weight, height, and upper arm circumference of the student respondents in the sixth grade at SD Mesjid Lheu, Darul Imarah District, Aceh Besar Regency, Aceh Province. The main variable in this study was the nutritional status of students, which was determined based on anthropometric measurements, including weight, height, upper arm circumference (UAC), and Body Mass Index (BMI). Meanwhile, the supporting variables in this study were the age and gender of students.

Data collection was conducted through anthropometric measurements by a team of two Public Health students from Teuku Umar University, who had received training on standard measurement procedures. The tools used were digital scales, stadiometers, and LILA (Upper Arm Circumference) calipers. The procedures carried out in these anthropometric measurements included:

- a. Body weight was measured without shoes and wearing light school uniforms.
- b. Height was measured with the student standing upright, looking straight ahead, and without shoes.
- c. LILA measurement was performed by extending the standard LILA tape on the upper left arm, starting from

the shoulder to the elbow,

- d. Then measure the distance from the shoulder to the elbow.
- e. Mark the midpoint and place the tape measure at the marked midpoint of the arm.
- f. Ensure the tape is neither too tight nor too loose.
- g. Finally, read the LILA measurement.

The measurement results are used to calculate the Body Mass Index (BMI) and classified according to the nutritional status standards for school-age children. Nutritional status classification is categorized into 3 categories, namely, malnutrition, normal nutrition, and overnutrition. This classification is based on the WHO growth curve and the Indonesian Ministry of Health guidelines, taking into account BMI by age and LILA measurements as additional indicators.

The research procedure was carried out by requesting permission from the school and the Keuchik of Lheu Blang Village, Darul Imarah District, Aceh Besar Regency, Aceh Province, then conducting a socialization program for students at SD Mesjid Lheu regarding the objectives and benefits of the measurement activity. The measurements were carried out in turns and in an orderly manner, and the data were recorded directly in an Excel table and checked for completeness. This measurement method has been widely used to monitor and assess nutritional status, especially among elementary school children. Using this method not only provides an overview of the condition of each individual and group, but the measurement results can also be used as indicators to accurately determine the nutritional status of students (Mikawati et al., 2023).

The measurement of students' nutritional status in this study was compared with the general guidelines used for nutritional assessment, namely through the Age-Specific Body Mass Index (BMI/A) and Upper Arm Circumference (UAC) in accordance with the official directives from the WHO and the Ministry of Health of the Republic of Indonesia based on Minister of Health Regulation Number 2 of 2020 (Minister of Health of the Republic of Indonesia, 2020). The following is the classification of nutritional status based on BMI/A:

- a. Malnutrition: Z-score < -3 SD
- b. Moderate malnutrition: Z-score between -3 SD and < -2 SD
- c. Normal nutrition: Z-score between -2 SD and +1 SD
- d. Risk of Overweight: Z-score between +1 SD and +2 SD
- e. Overweight: Z-score between +2 SD and +3 SD
- f. Obesity: Z-score > +3 SD

Results

This study involved 31 sixth-grade students at SD Mesjid Lheu, Darul Imarah District, Aceh Besar Regency, Aceh Province. There were 31 students who participated in the study, ranging in age from 10 to 13 years old. The largest age group was 12 years old, with 13 students (41.94%), followed by 11 years old, with 12 students (38.71%). The gender composition was also relatively balanced, with 14 male students (45%) and 17 female students (55%).

Anthropometric measurements included weight, height, upper arm circumference (UAC), and Body Mass Index (BMI). This data was used to classify the students' nutritional status based on categories that refer to WHO and Indonesian Ministry of Health standards. The students' nutritional status was categorized as malnourished, well-

nourished, and over-nourished. This classification was based on a comparison of the students' BMI values with the standard Body Mass Index for Age (BMI/A). The formula used to calculate BMI is:

$$BMI = \frac{\text{Height (m}^2\text{)}}{\text{Weight (kg}^2\text{)}}$$

After the BMI value is calculated, the result is then compared with the Growth Curve for Children Aged 5-19 Years published by the World Health Organization (WHO) in 2007. This standard uses Z-Score as a reference to classify nutritional status (De Onis et al., 2007).

Furthermore, the following formula is used to determine

$$Z\text{-Score} = \frac{X_i - M_i}{S_{B_i}}$$

With the calculation of S_{B_i} :

- If $X_i > M_i$, $S_{B_i} = 1 \text{ SD-Median}$
- If $X_i < M_i$, $S_{B_i} = \text{Median} - (-1\text{SD})$

With the Z-Score calculation, there are several categories or classifications of nutritional status, namely:

1. Malnutrition Category, if Z-score ≥ -3.0
2. Moderate Malnutrition Category, if Z-score ≥ -3.0 to Z-score < -2.0
3. Good Nutrition Category, if Z-score ≥ -2.0 to Z-score ≤ 2.0
4. Overweight Category, if Z-score > 2.0

The following is a table of the frequency distribution of students' nutritional status, determined based on calculations using the Z-Score formula and categorized according to nutritional status classification:

Table 1. Frequency Distribution of Nutritional Status Based on BMI

Nutritional Status Category	Number of Children	Percentage (%)
Malnutrition	6	19.35
Good Nutrition	22	70.96
Overweight	3	9.67
Total	31	100

Based on Table 1, it shows that most respondents have good nutritional status, namely 22 respondents (70.9%) and 6 respondents (19.3%) with poor nutritional status. Meanwhile, 3 respondents (9.6%) have excessive nutritional status.

Table 2. Distribution Based on Body Weight

Body Weight Category	Number of Children	Percentage (%)
< 25 Kg	3	9.7
25-49.9Kg	26	83.9
≥ 50 kg	2	6.4
Total	31	100

Based on Table 2 above, it shows that most respondents have a body weight in the 25–49.9 kg category, namely 26 subjects (83.9%). Meanwhile, there were 3 subjects (9.7%) with a body weight of < 25 kg and 2 subjects (6.4%) with a body weight of ≥ 50 kg.

Table 3. Distribution Based on Height

Height Category	Number of Children	Percentage (%)
< 130 cm	2	6.5
130- 149.9 cm	24	77.4
≥ 150 cm	5	16.1
Total	31	100

Based on Table 3 above, it shows that most respondents have a height in the 130–149.9 cm category, namely 24 subjects (77.4%). Meanwhile, there were 2 subjects (6.5%) with a height of < 130 cm, and 5 subjects (16.1%) with a height of ≥ 150 cm.

Table 4. Distribution Based on Height

LILA Category	Number of Children	Percentage (%)
< 18.5 cm	7	22.6
18.5- 22.9 cm	18	58.1
≥ 23 cm	6	19.3
Total	31	100

Based on Table 3, it shows that most respondents had LILA in the normal category (18.5–22.9 cm), totaling 18 subjects (58.1%). Meanwhile, 7 subjects (22.6%) had a LILA < 18.5 cm, and 6 subjects (19.3%) had a LILA ≥ 23 cm.

Discussion

This study presents important information about the nutritional status of elementary school students at SD Mesjid Lheu through anthropometric measurements. The indicators used are weight, height, upper arm circumference (UAC), and Body Mass Index (BMI) as monitoring tools that are closely related to identifying nutritional problems such as malnutrition, normal nutrition, and overnutrition in elementary school-aged children. The findings of this study are in line with a number of previous studies in Indonesia which revealed that elementary school children experience various nutritional problems, ranging from malnutrition to obesity, known as the triple burden of malnutrition (Logo et al., 2025).

The results of the study show variations in the distribution of nutritional status, indicating a double nutritional burden, both underweight and overweight, among students. The double nutritional burden among students is a condition in which students experience malnutrition (such as stunting, wasting, and micronutrient deficiencies) along with overnutrition (such as overweight and obesity). These findings are in line with reports by Nur (2025) and Pranata (2024), which noted a significant percentage of students with underweight and overweight categories in other regions of Indonesia. This situation emphasizes the need for routine monitoring to reduce the possibility of long-term health problems due to nutritional problems, such as decreased productivity in adulthood and an increased risk of disease (Dewi et al., 2024).

Furthermore, the findings of this study reinforce the conclusion that anthropometry is not only useful for individual detection but also has a strategic role as a tool for assessing school policies and nutritional interventions. For example, LILA measurement as an additional indicator besides BMI can provide deeper insights into the status of protein reserves in students' bodies, which are often not revealed by weight and height alone. This approach provides a more holistic view of children's nutritional health, which can serve as a basis for designing nutrition programs and nutrition education in schools.

A comparison of the nutritional status of children in suburban areas, such as SD Mesjid Lheu Blang, with the results

of other studies shows that socioeconomic and environmental factors have an impact on children's nutritional status. Research by Rosyenne Kushargina and Dainy (2021), which shows striking differences between children in urban and rural areas, supports the hypothesis that environmental factors and access to nutritious food are highly influential. Therefore, interventions must take into account the local context in order to be more successful (Kushargina & Dainy, 2021).

Additionally, the fact that many schoolchildren do not consume a healthy breakfast and have inadequate intake of vegetables and fruits, as highlighted by Jelsi, aligns with the need for nutrition education as a preventive measure. The high rate of stunting and the increasing prevalence of obesity indicate that nutritional challenges today are not only related to deficiencies but also to disproportionate consumption of nutrients. Thus, combining anthropometric monitoring methods and educational programs is crucial to establishing good eating habits from an early age (Susilowati & Irawan, 2021).

Methodologically, the application of total sampling in a limited population provides the advantage of a comprehensive representation of the nutritional status of all sixth-grade students at SD Mesjid Lheu Blang. However, this also limits the application of the research results to a larger population. Thus, further research using a larger sample and a variety of locations would be very useful to obtain an overview of the nutritional status of children in elementary schools at the regional or national level.

Overall, this study confirms the important role of anthropometry as a practical, simple, and economical tool in monitoring the nutritional status of elementary school children. The results of this study can be used as a basis for decision-making by education and health policy makers to implement targeted and sustainable nutritional intervention programs so that children can grow and develop optimally.

A child with poor nutrition will easily become sleepy and lack enthusiasm, which can affect the child's learning and thinking processes. In addition, nutritional problems in children can cause a decrease in immunity, child mortality, and reduced work productivity.

School-aged children are still in the process of growth and development, making them quite vulnerable to nutritional problems. Possible short-term risks include apathy, communication problems, and other developmental disorders. On the other hand, possible long-term risks include decreased IQ, cognitive decline, sensory integration problems, attention disorders, lack of self-confidence, and decreased learning outcomes.

Malnutrition in school children can cause them to become lethargic, tire easily, and be susceptible to illness, making it difficult for them to learn. Meanwhile, the long-term impact is a decline in the quality of life of the individual. Problems that often occur in school children are underweight, iron deficiency anemia, and vitamin E deficiency. On the other hand, other problems that may arise are obesity, malnutrition, vitamin A deficiency, and iodine deficiency (Aulia, 2022)

Conclusion

This study shows that anthropometric measurements, such as weight, height, upper arm circumference (UAC), and Body Mass Index (BMI), are simple yet effective methods for monitoring the nutritional status of elementary school children. Findings from the study at SD Mesjid Lheu indicate that the majority of students fall into the good nutrition category, although there are still some who experience malnutrition or overnutrition. These results indicate the

phenomenon of double nutritional burden that requires special attention.

Acknowledgment

The author would like to express his deepest gratitude to all those who contributed to this research. Thank you to the Principal of SD Mesjid Lheu for his permission, support, and cooperation during the research process. Thank you to all those who provided guidance in writing this article. Thank you to the team who assisted in the data collection process.

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