Original Article

Application of Modified SGNA (Subjective Global Nutritional Assessment) to Assess Malnutrition Status in Children with Transfusion-Dependent Thalassemia

Assess Malnutrition Status in Children with Transfusion

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ABSTRACT

Objective: To assess the malnutrition status of the children with thalassemia by Modified SGNA classification at Dr. Cipto Mangunkusumo Hospital Jakarta Indonesia.

Study Design: Prospective cohort study

Place and Duration of Study: This study was conducted at the Dr. Cipto Mangunkusumo Hospital Jakarta Indonesia from August – December 2023.

Methods: The children in this study are between the ages of 24 and 216 weeks, and they have hemoglobin A1c levels that are high enough to be detected by blood transfusions and hemoglobin D-levels determined by non-probabilistic sampling. Various anthropometric measurements, such as the Mean Upper Arm Circumference (MUAC) and waist circumference, were taken. The next step is to use the WHO Antro plus and pediTools lunak platforms to measure and classify the Z MUAC for age and height. The GI status is determined using the Global Sub-Evaluation Scale (SGNA) as normal, abnormal, or worse.

Results: Out of 120 participants ranging in age from 24 to 216 months, 55 were female and 65 were male, making up 54.16% of the total. The frequency of malnutrition due to SGNA alteration was shown to be significantly related to age in this study (p=0.005). Out of the 24-60 month age group, no severe malnutrition was detected, and 4 (33.33%) were moderately malnourished. In the group of 61–144 month olds, moderate malnutrition affected 34 (51.51%), whereas severe malnutrition affected 7 (10.61%). Thirteen children (or 33.33 percent) were significantly undernourished between the ages of 145 and 216 months, while another fourteen (33.33%) were moderately undernourished.

Conclusion: Children with thalassemia are at risk of malnutrition. Modified SGNA is used to assess malnutrition. The prevalence of malnutrition grows as people get older, regardless of gender.

Key Words: Malnutrition, SGNA, Thalassemia-dependent transfusion, MUAC, Nutritional status

Citation of article: Fitrianti S, Syauqy A, Darmawan S. Application of Modified SGNA (Subjective Global Nutritional Assessment) to Assess Malnutrition Status in Children with Transfusion-Dependent Thalassemia. Med Forum 2025;36(4):17-21. doi:10.60110/medforum.360404.

INTRODUCTION

Thalassemia is a hereditary blood disorder characterized by a disorder in the production of both alpha and beta globin chains and requires blood transfusions and iron chelation in its treatment [1,2]. Children with thalassemia are at risk of malnutrition due to impaired iron absorption, low dietary intake, increased energy requirement, and the effects of ongoing blood transfusion therapy[3–5]. Paediatric malnutrition is a condition resulting from poor growth due to an imbalance between nutrients consumed and those needed [6-8]. (SGNA) tools [9–11] can be used to evaluate malnutrition in children. The SGNA is a trustworthy and proven questionnaire that evaluates children's nutritional status. It goes beyond nutritional screening and offers a thorough evaluation of nutrition, incorporating a nutritional-focused medical record and a physical examination to find a global[12, 13, 16]. Anthropometric data, including changes in height and weight, are used by one of the SGNA tests to evaluate nutritional status[9,14]. Hepatosplenomegaly makes it improper to use body weight as a measure of nutritional status in children with thalassemia.

Hepatosplenomegaly can develop as a result of chronic liver disease or an overabundance of iron in the blood. The measurement of weight becomes erroneous due to this condition. An alternative to the weight-for-height

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Received: November, 2024
Reviewed: December, 2024
Accepted: February, 2025

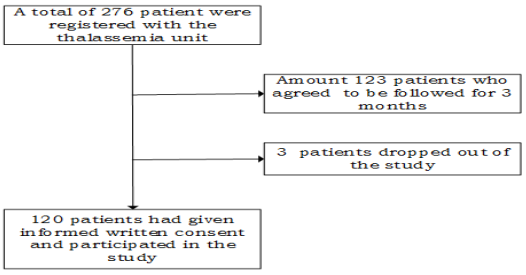
indicator that was missing from the first SGNA is the age-related change in mid-upper arm circumference (MUAC). When looking for signs of youth wasting in communities and healthcare facilities, the World Health Organization suggests measuring MUAC[15]. As a result, the researcher adjusted the original SGNA so it could be administered to thalassemia patients. A change was made by replacing the weight-for-height method with the mid-upper arm circumference Z-score. The primary objective of this study was to find out how common malnutrition is in children with transfusion-dependent thalassemia by using a modified SGNA to compare the nutritional status of boys and girls in each group.

METHODS

The Dr. Cipto Mangunkusumo National Referral Hospital in Jakarta, Indonesia served as the site of this prospective cohort study, which ran from August to December of 2023. The Ethic Committee of the University of Indonesia's Faculty of Medicine granted prior clearance (KET-875/UN2.F1/ETIK/PPM. 00.02/2023). Parents gave their informed permission before their 120 transfusion-dependent thalassaemic children, ranging in age from 24 to 216 months, could take part in the study. Thalassaemic children with mal-absorption disease, congenital abnormalities, chronic disease, patients who had a bone marrow transplant, patients with splenectomy, and have not gotten iron chelation therapy were excluded from this study. The disease history and blood transfusion were assessed by questionnaire during the interview with parents. The nutritional status was assessed with Subjective Global Nutritional Assessment (SGNA) Modification.

Height and other anthropometric measures taken monthly for three months, also MUAC of the subject were taken. Height measurement using stadiometer Seca type 217, MUAC measured using Seca type 201. The measurements were taken with international guidelines. Z-score category for height-for-age by WHO Anthro and WHO Anthro plus, MUAC used the Z-score category by WHO Anthro and peditools[16].

Statistical Analysis: The Statistical Package for the Social Sciences, version 27, was used for data analysis. Pearson correlation analysis for validity questionnaire SGNA modification and Cronbach Alpha method for reliability SGNA Modification, and using chi-square test was applied to compare qualitative data, and p-value less than 0.05 was taken as significant.



RESULTS

In all, 120 participants ranging in age from 24 to 216 months were a part of this investigation, in addition, the study involved 65 (54%) were male and 55 (45%) were female as the subjects. The subject was assessed for malnutrition status by SGNA modification. The SGNA modification questionnaire was tested for validity and reliability in children with thalassemia, out of 18 questions, only 11 were valid, including height percentile (<0,001), appropriate considering mid-parenteral height (<0,001), MUAC for age (<0,001), Serial MUAC (<0,001), MUAC reduction (<0,001), current intake versus usual, functional capacity, function in past 2 weeks (<0,001), lost of subcutaneous fat (<0,001), muscle wasting (<0,001) (Table 1)

Table No. 1: Validity and reliability of SGNA modification

Questionnaire SGNA Modification	p-Value
Height Percentile	<0,001*
Appropriate considering mid-parental height	<0,001*
Serial growth	0,493
MUAC for age	<0,001*
Serial MUAC	<0,001*
MUAC reduction	<0,001*
Change in the past 2 weeks	<0,001*
Adequacy of dietary intake	0,104
Current intake versus usual	0,024*
Duration of change	0,159
Gastrointestinal Symptoms	0,236
Duration of symptom	0,761
Functional capacity (nutritionally related)	<0,001*
Function in past 2 weeks	<0,001*
Metabolic Stress of Disease	-
Loss of subcutaneous fat	<0,001*
Muscle wasting	<0,001*
Eema (Nutrition-Related)	-
Cronbach's Alpha	0,794

* = (p<0.05)

This study involved 120 cases in the age range of 24-60 months, 61-144 months, and 145-216 months. According to the findings, 12 cases at the age of 24-60 months, consisting of 7 males (58.33%) and 5 females (41.66%) the majority had normal nutritional status 8 (66.66%), moderate malnutrition 4 (33.33%) and no severe malnutrition was found. At 61-144 months, 40 children (60.60%) were male and 26 (39.39%) were female. In this age group, the majority of children were malnourished 41 children (62.12%) consisting of moderate malnutrition 34 (51.51%), and severe malnutrition 7 (10.61%). In the 145–216-month age group, there were 18 (42.87%) males and 24 (57.14%) females. In this age group, 14 cases (33.33%) of

moderate malnutrition and 14 cases (33.33%) were found to be severely malnourished compared to other age groups. There was an increase in severe malnutrition by 33.33% in older children. (Table 2)

Table No. 2: Malnutrition Status of 24-216 months old thalassemic children based on SGNA modification

SGNA category	24-60 months (n = 12)			61 -144 months (n = 66)			145-216 months (n = 42)			Total Cases 120		
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
Normal	6 (85.7)	2 (40)	8 (66.7)	16 (40)	9 (34.6)	25 (37.9)	2 (11.1)	12 (50)	14 (33.3)	24 (36.9)	23 (41.8)	47 (39.2)
Moderate malnutrition	1 (14.3)	3 (60)	4 (33.3)	19 (47.5)	15 (57.7)	34 (51.5)	7 (38.9)	7 (29.2)	14 (33.3)	27 (41.5)	25 (45.5)	52 (43.3)
Sever malnutrition	0	0	0	5 (12.5)	2 (7.7)	7 (10.6)	9 (50)	5 (20.8)	14 (33.3)	14 (21.5)	7 (12.7)	21 (17.5)
Total	7	5	12	40	26	66	18	24	42	65	55	120

Chi-square (p=0.005)

DISCUSSION

The difference between the existing SGNA and the modification is the indicator of the appropriateness of current weight for height (wasting) is replaced with MUAC (Middle Upper Arm Circumference). Splenomegaly is a common condition in children with thalassemia. This condition makes body weight indicators inaccurate[17]. MUAC Z-score height and body mass index (BMI) can be utilized to evaluate dietary status as an alternative to weight. The MUAC Z-score is a measure of the percentage of fat and muscle in a given body. Body mass index and weight-for-length were shown to be substantially linked with MUAC. MUAC is a more accurate predictor of death than weight-for-age Z-score19, and it is a straightforward and efficient way to evaluate malnutrition. Similar rates of severe acute malnutrition in toddlers were found in another investigation that counted by MUAC (11,2%) and weight for height (11%)[20].

This study showed that malnutrition is a very common problem in thalassemia. There were 73 (52.1%) malnutrition with detail 52 (43.3%) moderate malnutrition and 21(17.5%) severe malnutrition. This figure is higher than the previous study which showed a malnutrition prevalence of 42%[21] until 48.2%[1]. Other study shown 22 research about Undernutrition is more common in lower-middle income countries (e.g., India, Pakistan, Iran, and Egypt) than in high-middle or high-income countries (e.g., Turkey, Greece, North America, USA, and Canada). The prevalence of undernutrition varies greatly among the 12 countries studied, ranging from 5.2% to 70%.

The prevalence of malnutrition was significantly related to participants' ages in our study (p=0.005). This result is similar to that conducted by a researcher who found a significant association between age and wasting and also a study by Joshi et al (2023) who stated there was an association between age and nutritional status[3].

In our study, increasing tendency for malnutrition with increasing age In the elderly, there is a greater prevalence of mild to severe malnutrition. Several factors may explain this tendency, including:

Increased energy requirement: Children with thalassemia have energy requirements that are approximately 30-50% higher than those of healthy children[4]. As they grow older, their energy needs continue to rise. However, inadequate nutritional intake may lead to an energy imbalance, ultimately contributing to malnutrition.

Impact of chronic anemia: Chronic anemia experienced by children with thalassemia results in reduced appetite leading to insufficient energy intake[23] and also decreased efficiency in nutrient absorption and utilization. This condition can lead to impaired growth and more significant weight deficits, particularly in older age groups.

Iron Overload due to regular transfusions

Routine blood transfusions can cause an overabundance of iron in the blood. Iron excess adversely affects as function about vital organs, including the liver and endocrine glands, which play crucial roles in growth and metabolism. Consequently, this contributes to stunted growth and an increased risk of malnutrition in older children[24].

Splenomegaly: Splenomegaly, a common condition in children with thalassemia, may cause early satiety, leading to reduced food intake. Splenomegaly also increases metabolic activity as a result of hematopoiesis that does not occur in the bone marrow, a process outside of the medulla. This condition elevates energy and nutrient requirements. Studies have shown that children with splenomegaly have a higher risk of malnutrition[1].

CONCLUSION

The danger of malnutrition increases for children with thalassemia. Modified SGNA is used to assess malnutrition in thalassemia children who commonly have organomegaly (splenomegaly and hepatomegaly). The prevalence of malnutrition increases with advancing age irrespective of sex. This finding

highlights that enhanced nutritional interventions must be implemented for older age groups. A more intensive approach, including regular nutritional monitoring, and education on a balanced diet is essential to mitigate the risk of malnutrition and improve the overall quality of life for transfusion-dependent children with thalassemia.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Suci Fitrianti, Ahmad Syauqy
Drafting or Revising Critically:	Syarief Darmawan
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None
Ethical Approval: No.875/UN2.F1/ETIK/ PPM.00.02/2023 Dated 26.06.2023

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