ARKUS
Journal Homepage:
https://hmpublisher.com/index.php/arkus

Overview of Hemoglobin Levels and Nutritional Status Based on Body Mass Index (BMI) and Upper Arm Circumference (LLA) Indicators in Foster Families in Uteunkot Village, Muara Dua District, Lhokseumawe in 2021

Mardiati[1*], Noviana Zara[2], Anna Millizia[3]

[1] Department of Pediatric, Faculty of Medicine, Universitas Malikussaleh, Lhokseumawe, Indonesia
[2] Department of Public Health Sciences, Faculty of Medicine, Universitas Malikussaleh, Lhokseumawe, Indonesia
[3] Department of Anesthesiology and Intensive Therapy, Faculty of Medicine, Universitas Malikussaleh, Lhokseumawe, Indonesia

ARTICLE INFO

Keywords:
Hemoglobin
Nutritional status
Body mass index
Upper arm circumference
Fostered family

Corresponding author:
Mardiati

E-mail address:
mardiati@unimal.ac.id

All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.37275/arkus.v8i1.130

ABSTRACT

Hemoglobin is a protein found in red blood cells. Hemoglobin levels that are less than normal or anemia can cause complications in the form of fatigue and stress on the body's organs. Nutritional status is one of the factors that can affect hemoglobin levels. Measurement of nutritional status can be done through several methods including anthropometry and clinical laboratories. Among these methods, the most frequently used in the field is anthropometry using body mass index (BMI) and upper arm circumference (LLA). This study aims to determine the hemoglobin level and nutritional status of the assisted families located in Uteunkot Cunda Village, Lhokseumawe. This study is a descriptive study with a cross-sectional approach to determine the description of hemoglobin levels and nutritional status based on indicators of Body Mass Index and Upper Arm Circumference in the fostered family. The sampling technique used is total sampling with a total of 79 respondents. The results obtained were the average hemoglobin level of the respondents was 12.34 g/dL in the normal category. Nutritional status based on Body Mass Index, most respondents were in normal nutritional status as many as 27 respondents (34.2%). The most nutritional status based on upper arm circumference was malnutrition, namely 55 respondents (69.6%).

1. Introduction

Hemoglobin is an iron-containing protein-pigment complex. The main function of Hb is to transport oxygen (O_2) from the lungs to the tissues, bind and release O_2 cooperatively, which represents the saturation of O_2 Hb (SO_2) at various O_2 pressure (pO_2).[1] Hemoglobin levels that are less than normal or anemia can cause complications in the form of fatigue and stress on body organs.[2] Factors that determine the production of hemoglobin levels consist of internal and external factors. The internal factors are age, gender and race. Meanwhile, external factors are socio-economic conditions, demographic conditions, lifestyle and nutritional status which means health status resulting from a balance between nutrient needs and inputs.[3]

In Aceh in 2017, there were general nutritional problems associated with a body mass index of 52.4% with the highest proportion being obese (36.4%). The districts with the highest obesity rates are Bener Meriah (45.5%), Sabang City (43.4%), and Lhokseumawe City (38.6%). The lowest proportion was in Sieumeulu (23.6%) and Pidie (29.6%) districts.

Based on gender, the adult population of Aceh with obesity is more common in women compared to men (12,2%). [4]

Anemia is also one of the nutritional problems that are still huge. According to the WHO classification, anemia in women and children is still a public health problem in the severe category. According to estimates, more than 30% of the world's population or as many as 1500 million people suffer from anemia, most of which are residents who live in the tropics. The global prevalence of anemia is around 51%. The prevalence for toddlers is around 43%, school-age children 37%, adult men 18%, and non-pregnant women 35%.[2] Based on the results of 2017 Indonesian Demographic and Health Survey, the incidence of anemia in Indonesia in children aged 5-12 years is 26%, in women aged 13-18 years it is 23%.[5]

Nutritional problems are a reflection of the consumption of nutrients that are not sufficient for the body's needs. A person will have a good nutritional status if the nutritional intake is following the needs of his body. Inadequate intake of nutrients in food can lead to malnutrition, on the other hand, people who have excess nutritional intake will suffer from excess nutrition. Nutritional status is a picture of an individual as a result of daily nutritional intake. Measurement of nutritional status can be done through several methods including anthropometry and clinical laboratories.[6] Among these methods, the most frequently used in the field is anthropometry using Body Mass Index (BMI) and Upper Arm Circumference (LLA). BMI is a measurement that shows the relationship between weight and height, while LLA is a measurement made by measuring the circumference of the upper arm with a tool called the LiLA tape.[7]

The fostered family is a family where one of its members has a health problem (especially the mother and/or child). The fostered family is one form of case visit in family medicine. Case visits aim to carry out patient care activities, provide education and advice on health for patients, their families and the surrounding community so that they can overcome various health problems faced.[8,9]

Currently, Indonesia is still facing challenges in the field of nutrition caused by several factors such as the economy and the level of knowledge that is still lacking in society. The family is part of the community that has an important function in the development, prevention, and improvement of any health problems found in the family. In addition, the family also plays an important role in monitoring the fulfillment of the nutritional needs of each member, especially those who are still children. If the role of the family is functioning properly it will result in good nutritional status. A healthy family will form a healthy society as well. This can be seen from the nutritional status of each individual in the family.[10]

2. Methods

This study is a descriptive study with a cross-sectional approach. The research was conducted from July to October 2021 in Uteunkot Village, Muara Dua District, Lhokseumawe City. The population in this study were all family members of the Family Oriented Medical Education (FOME) 2017 batch of the Malikussaleh University Medical Study Program, totaling 79 people. In this study, the entire population is sampled or called total sampling.

The source of data in this study came from primary data, namely data taken directly, this data was obtained from the assisted families in Uteunkot Village by checking hemoglobin (Hb) levels using the Blood test (Easy Touch GCHb) tool, determining nutritional status based on body mass index measurements and upper arm circumference. Measurement of upper arm circumference using a tape measure expressed in cm. The criteria for calculating upper arm circumference are categorized as obesity: >120%, overweight: 110-120%, normal: 90-110%, undernourished: 60-90%, poor nutrition:

<60% in fostered family members. After obtaining a permit, data collection will be carried out directly to the research location, namely the fostered family home. Before data collection was carried out, the researcher explained related to the research and the actions to be taken to the respondents, after the respondents stated they were willing, measurements would be taken. The results that have been obtained will then be recorded and univariate data processing is carried out.

Data analysis is done by grouping data based on variables, making tabulations, presenting data for each variable studied, performing calculations to answer the formulation of the problem. The method of analysis in this study consisted of univariate analysis to obtain an overview of the hemoglobin levels and nutritional status of the respondents.

3. Results and Discussion

Table 1. Characteristics of respondents by gender, age, and occupation

Characteristics	Frequency (n)	Percentage (%)
Gender		
Female	50	63.3
Male	29	36.7
Total	**79**	**100.0**
Age	**Frequency (n)**	**Percentage**
Children aged (6-59 months)	4	5.1
Children aged (5-14 years)	17	21.5
Female aged > 15 years	38	48.1
Male aged > 15 years	20	25.3
Total	**79**	**100**
Occupation		
Housewives	23	29.1
Construction workers	2	2.5
Self-employed	3	3.8
Laundry workers	6	7.6
Traders	5	6.3
Pedicab drivers	4	5.1
Employees	3	3.8
Honorary teachers	1	1.3
Students	22	27.8
Not working	10	12.7
Total	**79**	**100**

Based on table 1, it was found that from 79 respondents in Uteunkot Village, Muara Dua District, Lhokseumawe City, the most respondents were women, namely 50 respondents (63.3%), while 29 respondents (36,3%) 7%). Most respondents were found to be women aged >15 years (38%). For the highest level of work, there are housewives with a total of 23 respondents (29.1%), while the lowest is for honorary teachers, namely 1 respondent (1.3%).

Based on the results of the survey researchers, the low level of education possessed by the respondents caused the respondents not to work, and some worked as laborers to fulfill their daily lives. This description is one of the factors that influence the lack of eating patterns carried out by respondents.

Table 2. Results of measuring hemoglobin levels in respondents

Hemoglobin levels in 79 respondents	**Hemoglobin (gr/dL)**
Average	12.34
Standard Deviation	1.808
Highest Value (Max)	18
Lowest Value (Min)	7.6

The table above shows the distribution of hemoglobin levels Overall, 79 respondents with an average hemoglobin level of 12.34 g/dL, a standard deviation of 1.808, the highest hemoglobin level is 18 g/dL and the lowest hemoglobin level is 7.6 g/dL

Table 3. Description of anemia based on limit of hemoglobin levels

Hemoglobin level	Frequency	Percentage
Children aged 6-59 months		
Mild anemia	0	0
Moderate anemia	2	50.0
Severe anemia	0	0
Normal Hb level	2	50.0
Children aged 5-11 years		
Mild anemia	0	0
Moderate anemia	3	42.9
Severe anemia	1	14.2
Normal Hb level	3	42.9
Children aged 12-14 years		
Mild anemia	2	22.2
Moderate anemia	1	11.1
Severe anemia	0	0
Normal Hb level	6	66.7
Women aged >15 years		
Mild anemia	9	23.7
Anemia moderate	8	21.0
Severe anemia	0	0
Normal Hb level	21	55.3
Male aged >15 years old		
Mild anemia	5	25.0
Moderate anemia	2	10.0
Severe anemia	0	0
Normal Hb level	13	65.0
Total	**79**	**100**

Table 3 shows the categories of hemoglobin levels in children aged 6-59 months are normal and moderate anemia, every 2 respondents. In children aged 5-11 years, normal and moderate Hb levels were the same, namely 3 respondents and severe anemia 1 respondent, in the age group of 12-14 years obtained the highest category was normal hemoglobin levels of 6 respondents, in the group of women aged >15 years, it was obtained the most normal category is 21 people and in the male category

>15 years old, the most normal category is 13 respondents. It can be concluded that most of the respondents are in the category of normal hemoglobin levels.

The factor behind the occurrence of low hemoglobin levels or anemia is due to lack of nutritional intake in the body and this causes nutritional needs in the body not to be met, especially nutritional needs such as iron where iron is one of the most important components in the formation of hemoglobin, with a lack of iron intake in the body. The body will reduce the red blood cell-forming material so that the red blood cells cannot perform their function in supplying oxygen which will lead to anemia.[11]

In the results of research that has been carried out, it was found that several respondents had hemoglobin levels below the standard. Low levels of hemoglobin are a condition called anemia. Anemia is a condition in which the number of red blood cells is not sufficient to meet the physiological needs of the body. Iron deficiency is considered the most common cause of anemia globally, but deficiencies in other nutrients (including folate, vitamin B12, and vitamin A), acute and chronic inflammation, parasitic infections, and congenital or acquired disorders affect the synthesis of hemoglobin, red blood cells. Hemoglobin concentration alone cannot be used to diagnose iron deficiency. However, hemoglobin concentration should be measured, although not all anemia is caused by iron deficiency. Hemoglobin concentration can provide information about the severity of iron deficiency.[12]

Table 4. Description of nutritional status based on body mass index

BMI	Frequency (n)	Percentage (%)
Underweight	21	26.6
Normal	27	34.2
Overweight	3	3.8
Obesity I	12	15.2
Obesity II	16	20.3
Total	**79**	**100**

Based on the research results listed in the table above, it was found that the body mass index of respondents in the thin category was 21 respondents (26.6%). Respondents who have a normal BMI are 27 respondents (34.2%), followed by overweight as many as 3 respondents (3.8%), followed by obesity I as many as 12 respondents (15.2%), and those who have a BMI obesity II as many as 16 respondents (20.3%).

Nutritional status can be influenced by income, where the higher a person's income, the better his nutritional status because the purchasing power of food will affect a person's behavior towards the nutrients the body needs. Healthy food can be a source of energy for the body where the more nutritious the food consumed will strengthen the stability of the body mass index.[13] According to Almaetsir (2004), a person's nutritional status can be influenced by the food consumed. Consumption of foods that do not contain balanced nutrition will cause various nutritional problems.[14]

Table 5. Description of nutritional status based on upper arm circumference

circumference	Frequency (n)	Percentage (%)
Malnutrition	2	2.5
Undernutrition	55	69.6
Normal Overweight Obesity	20 2 0	25.3 2.5 0
Total	**79**	**100**

The Table above shows the results of the measurement of upper arm circumference which is the least in the obesity category and the highest in the undernutrition category of 69.6%. Upper arm circumference is one of the measurements of body composition. Measurement of upper arm circumference can provide an overview of the state of muscle tissue and subcutaneous fat layer.[15] This study is not in line with Alifah's research (2017), in which low hemoglobin levels were found in female students who have an upper arm circumference of less than 23 cm or fall into the category of chronic energy deficiency as much as 26.7% and normal 73.3%.[7]

4. Conclusion

The characteristics of the respondents are mostly female with the age group > 15 years old and work as housewives. The overview of the average hemoglobin level in the foster family is 12.34 g/dL which is in the normal category. Nutritional status based on BMI most respondents were normal at 34.2%. Nutritional status based on upper arm circumference in most respondents was undernourished by 69.6%.

5. References

1. Ahmed, MH, Ghatge, MS, Safo, MK Hemoglobin: structure, function and allostery. Sub-Cellular Biochemistry. 2020; 94: 345-82.
2. WHO. anemia. World Health Organization (WHO). 2017. https://www.who.int/health-topics/anaemia#tab=tab_3
3. Harjatmo TP. Assessment of nutritional status. Indonesian Ministry of Health. 2017.
4. Ministry of Health Aceh. Report on the nutritional status monitoring survey of Aceh Province. Aceh's Ministry of Health. 2017.
5. Indonesian Ministry of Health. Healthy adolescents are the main component of Indonesia's human resource development. Indonesian Ministry of Health. 2021. Available from: https://www.kemkes.go.id/article/view/21012600002/remaja-sehat-elektron-utama-pembinaan-sdm-indonesia.html
6. Pérez A, Santamaria EK, Operario D, Tarkang EE, Zotor FB, et al. Assessment of nutritional status of health human resources education center 2017. BMC Public Health.
7. Alifah, NH. The relationship between nutritional status and hemoglobin levels in female students at Al Munawir Islamic Boarding School Krapyak Bantul Yogyakarta. Digilib Unisa. 2017; 7(2): 150-9.
8. Badireddy M, Baradhi KM. Chronic Anemia. In: StatPearls [Internet]. Treasure Island (FL). StatPears Publishing. 2021.
9. Friedman, MM Textbook of family nursing: theoretical and practical research. 2010. Jakarta: EGC.
10. Indonesian Ministry of Health. Report on the

nutritional status monitoring survey of Aceh Province. Aceh's Ministry of Health. 2017.
11. Arnanda Q, Fatimah D, Lestari S, Widiyastuti S, Oktaviani D, et al. Relationship between levels of hemoglobin, erythrocytes, and menstrual cycle in pharmacy students at Padjadjaran University class 2016. Undergraduate Thesis. 2019; 17:15–23. https://doi.org/10.24198/jf.v17i2.22053.g11390
12. Chan M. Haemoglobin concentrations for the diagnosis of anemia and assessment of severity. Geneva, Switzerland: World Health Organization. 2020; 1–6.
13. Syamsul M, Nur NR. The relationship between personal hygiene and the incidence of helminthiasis in garbage scavengers of elementary school age at the Antang final disposal site, Makassar City. Journal of Uin-Alauddin. 2016; 7(2):199-205.
14. Almatsier S. Fundamental principles of nutrition. Jakarta: Gramedia Pustaka Utama; 2009.
15. Anggraeni, AC. Nutritional care: nutritional care process. Yogyakarta: Graha Ilmu. 2012.