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Relationship of Hemoglobin and Muscle Strength with Quality of Life in Patients with Chronic Renal Failure

Safitri Nur Rahayu[1], Patwa Amani[2*]

[1]Undergraduate Program, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia
[2]Department of Physiology, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia
E-mail: patwa.amani@trisakti.ac.id

Abstract

The elderly population is vulnerable to degenerative diseases, one of which is Chronic Kidney Disease (CKD). The age of most hemodialysis patients is between 45 and 54 years. Hemoglobin levels and muscle strength in CKD tend to be low which is associated with a decrease in quality of life in CKD. This research is an observational analytical study with a cross-sectional approach. A total of 24 data points from chronic kidney failure patients at Budhi Asih Regional Hospital, Jakarta, were used in this study. Both primary and secondary data were collected. Hemoglobin levels were obtained from medical records, muscle strength was measured using a Camry handgrip dynamometer, and quality of life was assessed through interviews using the Kidney Disease Quality of Life Short Form questionnaire. Statistical analysis was performed using Fisher's exact test with SPSS 29 for Windows, with a p-value of <0.05. Of the 24 study subjects, 20 (83.3%) had anemia, 17 (70.8%) had low muscle strength, and 9 (37.5%) had a poor quality of life. The study's results showed a significant relationship between hemoglobin levels and both muscle strength and the quality of life of chronic kidney failure sufferers, with p-values of 0.012 and 0.022, respectively. There is a relationship between hemoglobin levels and muscle strength and the quality of life of chronic kidney disease sufferers at Budhi Asih Regional Hospital.

Keywords: Hemoglobin, Muscle Strength, Quality of Life

1. Introduction

The elderly population is vulnerable to degenerative diseases, one of which is Chronic Kidney Disease (CKD). Several factors cause an increase in this disease, namely advanced age, family history of CKD, type 2 diabetes (DM), hypertension, autoimmune diseases, systemic infections, urinary tract infections (UTI), drug poisoning, and energy consumption patterns.[1]

Chronic kidney disease is a type of non-communicable disease. According to data from the Ministry of Health of the Republic of Indonesia in 2016, the age of most hemodialysis patients is between 45 and 54 years. Chronic Kidney Disease (CKD) is an abnormality in the structure of the kidneys or a continuous (progressive) and irreversible decrease in kidney function. Chronic kidney disease is a disease characterized by decreased kidney function over months or years. The glomerular filtration rate (GFR) decreases to ≤ 60 mL/minute/1.73 m for at least 3 months. Any pathological features, or signs of kidney damage, including blood, urine or imaging are signs of kidney damage.[2–4]

Hemoglobin, or Hb, is a protein pigment complex containing iron that functions to bind oxygen in blood transportation. The more adequate the hemoglobin level, the more oxygen can be transported, and increase the functional capacity.[5] Complications that may occur in CKD are coronary anemia. Increased morbidity and morbidity occur in CKD due to anemia. Symptoms that appear due to anemia are paleness, fatigue, lack of energy, sleep disturbances, impaired concentration, headaches, shortness of breath and decreased appetite. Anemia that occurs in chronic kidney failure has multifactorial causes, especially erythropoietin deficiency. One mechanism for kidney failure to synthesize sufficient erythropoietin is the

conversion of peritubular fibroblasts into myofibroblasts that express α-smooth muscle actin, thereby losing the ability to secrete erythropoietin. Other causes are Fe deficiency, blood loss, shortened erythrocyte life cycle, folic acid deficiency, and acute and chronic inflammatory processes.[6–9]

Chronic kidney disease has systemic effects such as loss of appetite, chronic inflammation, anemia, metabolic acidosis, and so on, all of which contribute to loss of muscle mass and decreased physical performance.[10] Chronic kidney disease patients experience several nutritional and catabolic changes known as protein energy wasting (PEW) syndrome. The specific meaning of PEW is the loss of muscle stores and visceral protein and is not completely explained by inadequate caloric intake.[11]

Research stated that there is a relationship between anemia and the quality of life of chronic kidney patients undergoing hemodialysis. Cheng et al. stated that participants with CKD tended to have lower muscle strength and were older. Other studies stated that there was no relationship between hemoglobin levels and quality of life in chronic kidney patients undergoing hemodialysis. In the study of Sugizaki et al., low muscle strength is not related to quality of life and mortality in kidney patients undergoing hemodialysis therapy.[10,12–14] The research results on the relationship between hemoglobin levels, muscle strength, and the quality of life of chronic kidney failure sufferers are still inconsistent. Therefore, researchers are interested in conducting this study.

2. Methods

The research was conducted using an analytical observational design with a cross-sectional approach which was carried out in November – December 2023 at the Hemodialysis Unit of Budhi Asih Regional Hospital with a total of 24 respondents. The collection technique was carried out using consecutive non-random sampling. Hemoglobin levels were measured by taking medical record data muscle strength was assessed using a handgrip and quality of life was measured using a questionnaire. The data that has been obtained will be processed and analyzed using IBM SPSS 29 with the Fisher exact test.

Ethical clearance needs to be obtained before the commencement of the study. Please include the number of your ethical clearance certificate here in this section This research has received permission from the Trisakti Medical Faculty Research Ethics Committee with number 152//KER-FK/VII/2023 on July 27 2023. This research has been approved and permitted by the Research Ethics Committee of Budhi Asih Hospital, Jakarta with certificate number 256/ KEP-ETIK/XI/2023 in November 2023. In this research, the confidentiality of research subject data is guaranteed by the researcher. In addition, the research subjects have agreed and voluntarily participated in this research as proven by signing an informed consent.

3. Results

The number of samples in this study was 24 people. However, in the hemodialysis room, 54 people were undergoing routine hemodialysis. During data collection, 25 people did not meet the inclusion criteria. The sampling technique in this study was non-random consecutive sampling.

Univariate analysis is used to analyze the independent and dependent variables studied and is presented in the form of frequencies and percentages. The variables analyzed were hemoglobin levels, muscle strength, and quality of life.

Based on Table 1, it was found that based on the characteristics of respondents, the male gender had the highest number of subjects at 17 (70.8%). The age category of 46-

55 years had the highest number of subjects, 14 (58.3%). The mean muscle strength was 22.74, with 17 (70.98%) subjects having low muscle strength. In 24 research subjects, hemoglobin results had a frequency of 83.3% anemia and 16.7% non-anemia. The median hemoglobin value was 9.40 (7.70-14.30). In the 24 research subjects, quality of life results had a frequency of poor quality of life of 37.5% and good quality of life of 62.5%. The median quality of life value was 69.30 (15.70-82.90), which was included in the good category. From the data obtained, it can be concluded that there are no subjects included in the medium, very good and excellent categories. All subjects only exist in bad and good categories.

The independent variables in this study were hemoglobin levels and muscle strength. The dependent variable in this study is quality of life. In the dependent variable, the measurement results are bad, moderate, good, very good and excellent. In the results of measuring the quality of life, cells are combined so that there are only two measurement results, namely bad and good quality of life. Merging cells in this table was carried out to fulfill the requirements of the Fisher exact test.

Table 1. Respondent characteristics

	Frequency (n)	Percentage (%)	Mean	Median	SD
Sex				1,00	
Male	17	70,8			
Female	7	29,2			
Age (year)				54,50	
46-55 yo	14	58,3			
56-65 yo	9	37,5			
>65	1	4,2			
Muscle strength (kg)			22,74		5,08
High	7	29,2			
Low	17	70,8			
Haemoglobin (g/dL)				9,40	
Anaemia	20	83,3			
Non anaemia	4	16,7			
Quality of life				69,30	
Bad	9	37,5			
Good	15	62,5			

Table 2. Relationship between hemoglobin levels and muscle strength with quality of life

Variable	Quality of life				Total	*p-value*
	Bad		Good			
	n	%	n	%		
Hemoglobin						
Anemia	5	20,8	15	62,5	24	0,012*
Non anemia	1	2,1	10	20,8		
Muscle strength						
High	0	0,0	7	29,2	24	0,022*
Low	9	37,5	8	33,3		

Based on Table 2, the results of bivariate analysis using the Fisher-exact test method between hemoglobin levels and quality of life, the value of p=0.012 was obtained, where this

result is smaller than the value of p=0.05, which means the hypothesis is meaningful and acceptable so it can be stated that there is a relationship between hemoglobin levels, with the quality of life of chronic kidney sufferers. The results of bivariate analysis using the Fisher-exact test method between muscle strength and quality of life, the value of p=0.022 was obtained, where this result is smaller than the value of p=0.05, which means the hypothesis is meaningful and acceptable so it can be stated that there is a relationship between muscle strength. with the quality of life of chronic kidney sufferers.

4. Discussion

The results showed that the majority of subjects were in the 46-55 year age category, namely 14 (58.3%) subjects. These results are in line with research conducted by Cheng Y, et al. which states that the number of CKD patients is large in this age category because older people are more likely to have a low quality of life.[10] The demographic factor of gender shows that the majority are male with 17 (70.8%) subjects. These results are in line with research conducted by Susanti E, et al. which states that the number of patients with chronic kidney disease is mostly in the male gender category. Gender is not the main risk factor for CKD because CKD is also influenced by other factors.[15]

The results showed that the majority of subjects had low hemoglobin levels which were interpreted as anemia, reaching 83.3%. These results are in line with research conducted by El-Shahed A, et al. which states that patients with chronic kidney disease have low hemoglobin levels.[16] Occurs in chronic kidney failure due to erythropoietin deficiency. The mechanism of kidney failure to synthesize sufficient erythropoietin is the conversion of peritubular fibroblasts into myofibroblasts that express α-smooth muscle actin, thereby losing the ability to secrete erythropoietin.[7]

The research results showed that the majority of respondents had low muscle strength with a percentage reaching 70.8%. These results are in line with research conducted by Gungor O, et al. which states that patients with chronic kidney disease have low muscle strength.[17] Chronic kidney patients experience several nutritional and catabolic changes which are known as protein energy wasting (PEW) syndrome. PEW is a loss of muscle and visceral protein stores and is not completely explained by inadequate caloric intake.[11]

The research results showed that the majority of respondents had a good quality of life, reaching 62.5%. Chronic kidney disease sufferers experience a decrease in quality of life due to high symptoms and treatment burden.[18] The quality of life of CKD patients experiences progressive impairment in the 5 stages of CKD, with the physical domain being more affected than other domains.[19]

In this study, there was a significant relationship between hemoglobin levels and quality of life in chronic kidney sufferers with a p value <0.05 (0.012). The number of patients treated for end-stage renal disease globally is estimated at 2,786,000 with a growth rate of 6-7% which continues to increase at a much higher rate than the world population.[16] Hemoglobin is needed to transport oxygen. When hemoglobin levels are too low, the blood's ability to carry oxygen to body tissues is reduced. This can cause symptoms such as fatigue, weakness, dizziness, and shortness of breath, which can affect the patient's quality of life.[20]

Research by Uzzuhdi N et al and Sitompul A et al supports the results of this research. Uzzuhdi N et al's research was conducted at Dr. Soetomo, Surabaya, Indonesia in 2023 supports the results of this research with a p-value <0.05 regarding the relationship between hemoglobin levels and the quality of life of chronic kidney sufferers

undergoing hemodialysis. The research states that the higher the hemoglobin level, the higher the quality of life.[20,21]

The limitations of this research include that the research method used only assesses at one time so that a cause and effect relationship cannot be obtained, and hemoglobin data is not measured directly.

5. Conclusion

There is a relationship of hemoglobin and muscle strength with quality of life in patients with chronic renal failure at Budhi Asih Regional Hospital.

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