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Hemoglobin Levels in Patients with Chronic Kidney Failure Undergoing Hemodialysis Therapy at RSUD Ciamis

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ABSTRACT

Background & Objectives: The prevalence of chronic kidney failure in Ciamis Regency based on medical records data from Ciamis Regional General Hospital in 2023 was 318 patients. In kidney failure, the level of erythropoietin produced will decrease and have an impact on the decline in red blood cell production, a condition that also causes a decrease in hemoglobin levels. Clinically, hemoglobin levels are used to determine anemia. If hemoglobin levels are low, the oxygen supply is insufficient and can lead to anemia. The purpose of this study was to determine hemoglobin levels in patients with chronic kidney failure undergoing hemodialysis therapy.
Method: This study is a descriptive study using purposive sampling techniques and was conducted at the Hematology Laboratory of STIKes Muhammadiyah Ciamis in May 2024. The respondents in this study were 39 people with chronic kidney failure at Ciamis Regional General Hospital.
Results: The results obtained from 39 respondents with chronic kidney failure undergoing hemodialysis therapy at Ciamis Regional General Hospital were below normal levels.
Conclusion: From the results of this study, it can be concluded that there were 14 people with mild anemia with Hb levels ≥10 g/dl, and 25 people with moderate anemia with Hb levels of 7-10 g/dl.

Keywords: Chronic Kidney Failure, Hemoglobin, Erythropoietin.

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INTRODUCTION

Clinically, hemoglobin levels are used to determine anemia. If Hb levels are low, the amount of oxygen delivered is insufficient and can lead to anemia. Based on the cause, anemia is divided into two types: absolute anemia caused by nutritional deficiencies and anemia caused by chronic diseases such as kidney disease (Lailla et al., 2021).

Anemia is an important public health issue worldwide, especially in developing countries such as Indonesia. Anemia occurs because the kidneys of patients with chronic kidney disease do not function properly, including in the production of erythropoietin, a hormone that plays a role in the formation of red blood cells. A decrease in the production of this hormone causes a decrease in the production of red blood cells, which directly leads to a decrease in hemoglobin levels in the blood (Fitriany & Saputri, 2018).

The kidneys function to produce erythropoietin, a hormone that regulates red blood cell production. In kidney failure, the level of erythropoietin produced will decrease and have an impact on the decline in red blood cell production, a condition that also causes a decrease in hemoglobin levels. Erythropoietin in chronic kidney failure (CKF) decreases due to the effects of toxins on the bone marrow and reduced erythropoietin biosynthesis. Blood urea and creatinine levels in patients with chronic kidney failure are generally high (Permana, 2019).

According to the WHO (World Health Organization, 2020), the incidence of chronic kidney disease worldwide reaches 10% of the population. The number of chronic kidney disease patients in Indonesia increased from 0.20% in 2013 to 0.385% in 2018, based on Indonesia's population of 252,124,458 people. In West Java, the prevalence of chronic kidney disease is 0.48%, ranking 6th with 21,051 active hemodialysis patients, increasing in 2018 to 33,828 patients (Indonesian Ministry of Health, 2020). The number of patients with chronic kidney failure at Ciamis Regional General Hospital in 2023 was 318 patients (Medical Records, 2023).

Clinical laboratory tests that assist in this diagnosis include routine blood tests, which aim to count blood components such as hemoglobin, leukocyte count, and platelet count. These three blood components are related to chronic kidney disease. Routine urine tests are conducted macroscopically, assessing urine color, odor, specific gravity, and urine strip tests (glucose, protein, nitrite, blood, urobilinogen, bilirubin). Blood chemistry tests include urea creatinine, uric acid, and electrolytes (potassium, sodium, calcium) (Nurkamila & Hidayati, 2013).

Damage to kidney structure and function may be accompanied by a decrease in GFR. This decrease in glomerular filtration rate is associated with clinical findings in patients, one of which is a decrease in hemoglobin or hematocrit levels in the blood, which can be described as anemia (Hidayat et al., 2016).

Clinical manifestations become evident when blood urea exceeds 200 mg/dl, as blood urea concentration is an indicator of retained protein metabolic waste in the body. The glomerular filtration rate (GFR) in patients with chronic kidney failure decreases to ≤60ml/minute/1.7m^2 while the normal GFR is in the range of 90-120ml/minute/1.73m^2 (Siregar, 2020).

Hemodialysis is a replacement therapy to partially replace the kidneys' function in removing metabolic waste, excess fluids, and substances that are not needed by the body. On average, patients undergo hemodialysis 1-2 times a week, with each session lasting 3-5 hours (Santoso, 2018).

The main objective of hemodialysis in patients with chronic kidney failure is to control the accumulation of metabolic waste in the body, including uremia, electrolyte imbalance, and body fluids (Khanmohmadi, 2014).

OBJECTIVE

The purpose of this study was to examine hemoglobin levels in patients with chronic kidney failure undergoing hemodialysis therapy at Ciamis Regional General Hospital.

METHOD

The method used was descriptive with purposive sampling techniques conducted in May 2024 with inclusion criteria of chronic kidney failure patients undergoing hemodialysis therapy at Ciamis Regional General Hospital who voluntarily agreed to be respondents. The instrument used was a 5010 V5+ photometer for enzymatic colorimetric examination (IFCC). This study was conducted in the Hematology Laboratory at STIKes Muhammadiyah Ciamis.

RESULTS

This study was conducted on 39 samples of chronic kidney failure patients undergoing hemodialysis therapy at Ciamis Regional General Hospital. There were 20 male respondents and 19 female respondents, with the percentages shown in the table below.

Hemoglobin levels were examined using the cyanmethemoglobin method with a photometer. Before the samples were examined, control materials were examined with controlled results.

TABLE 1. Respondent Characteristics

Characteristic	n	%
Male	20	51.2
Female	19	48.8
Total	39	100

This erythropoietin hormone is produced by interstitial cortical cells around the proximal tubules (peritubular) of the kidneys. Chronic kidney damage causes the kidneys to function suboptimally, especially in producing erythropoietin hormone. A decrease in the volume of this hormone in the body causes disruption in the formation of red blood cells, which directly causes a decrease in hemoglobin levels in the blood. The extent of the decrease in hemoglobin levels in patients with kidney failure is determined by the degree of kidney damage; the more severe the kidney damage, the greater the decrease in hemoglobin levels in the blood.

Hemoglobin is measured using the cyanmethemoglobin method with a photometer and venous blood sampling. Respondents do not require any special preparation for pre-analytical, analytical, and post-analytical procedures. In the pre-analytical stage, respondents met the inclusion and exclusion criteria, recorded patient identities, and then took venous blood samples. In the analytical stage, hemoglobin tests were performed on patients with chronic renal failure undergoing hemodialysis therapy using a cyanmethemoglobin method photometer. In the post-analytical stage, the results were documented and recorded.

Table 1 shows that the study sample consisted of 20 males (51.2%) and 19 females (48.8%). Of the 39 samples, 39 had low hemoglobin levels.

DISCUSSION

Data from a study of hemoglobin levels in 39 patients with chronic kidney failure (CKF) at Ciamis Regional General Hospital, examined at the STIKes Muhammadiyah Ciamis Laboratory. Based on the examination results, 20 male patients had levels <14 g/dl and 19 female patients had levels <12 g/dl. Hemoglobin levels in people diagnosed with anemia are less than 12 g/dl for women and less than 14 g/dl for men. Based on these criteria, the percentage of chronic kidney failure patients with anemia can be calculated. This means that the hemoglobin levels of patients with chronic kidney failure are below normal levels.

The decrease in hemoglobin levels in patients with chronic kidney failure is caused by many factors, such as erythropoietin hormone deficiency, iron deficiency, reduced red blood cell lifespan, acute or chronic inflammation, infection, and folic acid deficiency. However, the main cause of the decrease in hemoglobin levels is erythropoietin hormone deficiency.

The cyanmethemoglobin method is the most widely used because the reagents and instruments can be easily controlled to stable and accurate standards. Its advantages include stable standards and a simple technique. Factors that may cause errors in hemoglobin level test results using the cyanmethemoglobin photometer method include insufficient blood pipetting, incubation that is too long or too short, which can cause erythrocytes to not react completely with potassium cyanide, pipetting samples with tips that have not been wiped with tissue first, and pipetting reagents with too little or too much drabkin. Inadequate homogenization during the mixing of the drabkin reagent and the sample. Samples stored for too long due to time-consuming travel constraints.

Mild anemia at this stage usually does not cause symptoms, or symptoms may include fatigue after strenuous activity or exercise, which is generally felt to be more severe/tiring than usual. Moderate anemia begins to cause symptoms such as heart palpitations, fatigue, shortness of breath, and sweating, which are mainly triggered or exacerbated by physical activity, and some symptoms may persist even at rest.

Anemia is a medical condition characterized by a decrease in red blood cell count or when red blood cells do not function properly. Generally, one of the benchmarks in assessing anemia is based on hemoglobin levels (which is an important component in the blood for binding and carrying oxygen).

CONCLUSION

Based on the results of this study, it can be concluded that of the 39 patients with chronic kidney failure at Ciamis Regional General Hospital, 5 people (13%) had above-normal (increased) reticulocytes and 34 people (87%) had normal reticulocytes.

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CONFLICT OF INTEREST

There is no conflict of interest in preparing this research and writing this article.

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