

Differences in Erythrocyte Indices in the First and Third Months of Hemodialysis in Chronic Kidney Failure Patients at Praya Regional Hospital

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ABSTRACT

Hemodialysis therapy plays a role in replacing the kidneys' performance in filtering toxins and forming the hormone erythropoietin which forms and matures red blood cells. For this reason, it is necessary to conduct an examination of the erythrocyte index which functions to monitor the severity of anemia caused by chronic kidney failure. This study is a descriptive study with a cross-sectional approach. The sampling technique with purposive sampling is a technique with sample determination according to the researcher with a sample of patients with erythrocyte index examination data in the first and third months of undergoing hemodialysis. Data were analyzed using the Wilcoxon difference test. The total number of complete data of erythrocyte index examination in the first and third months was 22 patients. The average value of the first month erythrocyte index MCV 83.58 fL, MCH 28.31 pg, and MCHC 33.06 g/dL. In the third month the average value of the erythrocyte index MCV 85.35 fL, MCH 28.89 pg, and MCHC 33.90 g/dL. The results of the study stated a significance value of p 0.000 for MCV, MCH value p 0.015, and MCHC value p 0.005. There is a difference in the erythrocyte index in the first and third months of chronic kidney failure patients undergoing hemodialysis.

INTRODUCTION

Chronic kidney disease is a disease that affects approximately 10% of the world's population, where this number can reach up to 800 million people. This can be caused by several factors that generally occur in elderly people, minority races and several complications of the disease.(Kovesdy, 2022)In West Nusa Tenggara, there are already 13 hemodialysis units and an increasing number of kidney failure cases have been reported, the most common being diabetes due to unhealthy lifestyles.(Azmah, 2024).

In kidney failure, the function of the kidneys is damaged so that they cannot carry out their function of producing the hormones needed by the body.(Suherman

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et al., 2023) Therefore, hemodialysis therapy is performed to replace the kidneys' function. While this therapy is not perfect, it can help restore the body's metabolic and electrolyte balance. (Maulana et al., 2021).

In patients with stage 5 chronic kidney failure, this therapy is carried out two to three times a week and lasts for two to three hours. (Rahayu, 2023). Hemodialysis therapy cannot repair damaged kidney function to function properly, but it is recommended to increase a person's lifespan. (Hasanah et al., 2023). Patients will experience anemia if it is chronic, caused by a reduction in the erythropoietin hormone which is produced in the kidneys and plays a role in decreasing red blood cell production. (Lumbantobing, 2022).

The purpose of examining the erythrocyte indices is to classify anemia and determine the type of anemia experienced by patients with chronic kidney disease. Knowing the type of anemia can serve as a guideline for improving the patient's quality of life and reducing mortality. (Marweri et al., 2022).

In previous research by Marweri et al (2022) that the erythrocyte index and hemoglobin levels of patients after undergoing hemodialysis decreased because the patients underwent long-term therapy, which resulted in blood remaining in the dialyzer, leading to iron deficiency. However, in the study (Garini, 2019) stated that patients experienced an increase, although men were categorized as moderate anemia compared to women, who were categorized as severe anemia, as seen from the results of hemoglobin levels over a six-year study period. In the study (Tola'ba et al., 2023) There was an increase in erythrocyte indices after one year of hemodialysis therapy. Based on this background, research is needed to determine the differences in erythrocyte indices between the first and third months of hemodialysis in patients with chronic kidney failure at Praya Regional Hospital.

MATERIALS/METHOD

This study was an observational study with a cross-sectional approach. The objective was to examine the differences in erythrocyte index values between the first and third months of chronic kidney failure (CKD) in hemodialysis patients. This study was conducted at Praya Regional General Hospital (RSUD), Central Lombok, in December 2024. A saturated sample size of 22 patients met the inclusion and exclusion criteria. The sample consisted of patients undergoing hemodialysis who had complete erythrocyte index examination results in the first and third months of their hemodialysis course. This study used primary data obtained from primary sources, either from individuals or groups. (Husein, 2013). Data were processed using SPSS for different tests using the Wilcoxon Test.

RESULTS AND DISCUSSION

Data on the number of hemodialysis patients who had a complete erythrocyte index examination in the first and third months in 2024 was 22 patients. Patients underwent a complete blood count including erythrocyte indices. The results of the erythrocyte indices examination showed that the average MCH value in the first month was 28.31 pg and increased in the third month with an average of 28.89 pg. The average MCV value in the first month was 83.58 fL and increased with an average of 85.35 fL. In the MCHC value, there was an increase in the average in the first month from 33.06 g/dL to 33.90 g/dL. For the difference test of MCV, MCH, and MCHC in the first and third months, the following results were obtained.

Table 1. Results of the Wilcoxon Difference Test for Erythrocyte Index

Erythrocyte Index	Asymp. Sig
MCV	.000
MCH	.015
MCHC	.005

The results of the different test of data analysis using the Wilcoxon test showed a significance value of MCV of $p = 0.000$, a significance value of MCH of $p = 0.015$, and a significance value of MCHC of $p = 0.005$. The value of the results of the different test of each erythrocyte index showed ($p < 0.05$) so it can be concluded that there is a significant difference between the values of each erythrocyte index in the first month and the third month of undergoing hemodialysis.

DISCUSSION

A total of 22 patients underwent hemodialysis and met the sample criteria in 2024 at Praya Regional Hospital. During hemodialysis therapy, a complete blood count, including an erythrocyte index, is necessary to determine the follow-up therapy plan for patients with stage 5 chronic kidney failure complicated by anemia.(Togatorop & Arto, 2022). Apart from being caused by hemodialysis therapy, the lifespan of erythrocytes in the body is generally 120 days, after which they become old cells and are destroyed and replaced by new erythrocyte cells.(warningsih, 2018)During hemodialysis therapy, several changes occur in the formation of red blood cells, which can affect their number.(Sukeksi & Prafiyahesa, 2023).

In the descriptive data test, the average erythrocyte index value of patients was within the normal range, with the erythrocyte index value increasing from the first month to the third month after hemodialysis. This normal average value is in line with research.(Togatorop & Arto, 2022)which states that erythrocyte index values that remain within the normal range can be caused by several things, such as undergoing regular hemodialysis and proper anemia management with strong nutritional intake. In this study,(Rosini et al., 2020)The increase in the erythrocyte index, hemoglobin, and hematocrit levels after hemodialysis is due to the patient's previous decreased kidney function in removing toxins from the body, resulting in increased fluid in the kidneys. The increased fluid causes dilution, resulting in low hemoglobin, hematocrit, and erythrocyte index levels. After undergoing hemodialysis, the process of removing fluid in the kidneys causes an increase in the number of red blood cells.

In the data analysis test, the examiner used the Wilcoxon test because the data were not normally distributed during the normality test. The results of the MCV, MCH, and MCHC data analysis showed significant differences and an increase after the third month of hemodialysis. This research aligns with research conducted

by(Puspita et al., 2019)which states that there is a significant difference in hemoglobin levels and erythrocyte indices before and after hemodialysis. The increase in MCV is due to improved erythropoietin production, which is one of the functions of the kidneys. Improved kidney function increases the elimination of toxins, so this improvement increases the erythropoietin enzyme in the formation of red blood cells and hemoglobin within them, which causes this to affect MCH and MCHC values, increasing them.

The results of this study concluded that erythrocyte index values, including MCV, MCH, and MCHC, increased after hemodialysis. These results contradict those of research by(Marweri et al., 2022)which states that after hemodialysis, there will be a decrease because during the long hemodialysis therapy process, the red blood cell structure will be left behind in the dialyzer, causing elements such as hemoglobin and hematocrit to decrease along with the loss of fluids from the body. However, the results of this study are supported by research by(warningsih, 2018)stated that the increase in the erythrocyte index value could be caused by increased erythrocyte activity or individual therapies such as iron therapy and other supportive therapies.(Rosini et al., 2020)also said that the erythrocyte index after undergoing hemodialysis increased and it can be said that hemodialysis is an effective therapy to extend the life span of patients with chronic kidney failure.

CONCLUSION

The number of patients undergoing hemodialysis in 2024 with complete data on erythrocyte index examinations in the first and third months was 22 patients. The results of the data analysis test showed that the average erythrocyte index value increased with an MCV value in the first month of 83.58 fL and in the third month of 85.35 fL; the average MCH value in the first month of 28.31 pg and in the third month of 28.89 pg; and the average MCHC value in the first month of 33.06 g/dL and in the third month of 33.90 g/dL. The results of the data analysis test for different erythrocyte indices showed a significant difference in the examinations in the first and third months with significance ($p < 0.05$).

It is hoped that future researchers will examine the erythrocyte index by examining the results in the first and sixth months of hemodialysis. This will help the public understand the impact of hemodialysis on the erythrocyte index, which is used to assess the severity of anemia.

REFERENCE

- Azmah, B. (2024). Kidney Failure Patients at NTB Regional Hospital Increase by 10 Percent Every Year. <https://insidelombok.id/kesehatan/pasien-gagal-ginjal-di-rsud-ntb-meningkat-10-persen-setiap-tahun/>
- Garini, A. (2019). Hemoglobin Levels in Chronic Kidney Failure Patients Undergoing Hemodialysis. *JPP (Palembang Health Polytechnic Journal)*, 13(2), 111–116. <https://doi.org/10.36086/jpp.v13i2.234>
- Hasanah, U., Dewi, NR, Ludiana, L., Pakarti, AT, & Inayati, A. (2023). Analysis of Risk Factors for Chronic Kidney Disease in Hemodialysis Patients. *Jurnal Wacana Kesehatan*, 8(2), 96. <https://doi.org/10.52822/jwk.v8i2.531>
- Husein, U. (2013). Research Methods for Theses and Dissertations. 4(June), 2013.
- Kovesdy, C. P. (2022). Epidemiology of chronic kidney disease: an update 2022. *Kidney International Supplements*, 12(1), 7–11.

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- <https://doi.org/10.1016/j.kisu.2021.11.003>
- Lumbantobing, MP (2022). Description of Hemoglobin and Creatinine Levels in Chronic Kidney Failure Patients Undergoing Hemodialysis at Tarutung Regional Hospital. *Meditek Medical Journal*, 28(3), 264–268. <https://doi.org/10.36452/jkdoktmeditek.v28i3.2297>
- Marweri, RJ, Ekawati, ER, & Santoso, SD (2022). Differences in Hemoglobin Levels and Erythrocyte Indices in Pre- and Post-Hemodialysis Chronic Kidney Failure Patients at Dr. Ramelan Hospital, Surabaya. *Jurnal SainHealth*, 6(2), 39–44. <https://doi.org/10.51804/jsh.v6i2.1886.39-44>
- Maulana, I., Shalahuddin, I., & Hernawaty, T. (2021). Education on the Importance of Routine Hemodialysis for Patients with Chronic Kidney Failure. *Journal of Community Service Creativity (Pkm)*, 4(4), 897–906. <https://doi.org/10.33024/jkpm.v4i4.4076>
- Puspita, AA, Setianingrum, ELS, & Lidia, K. (2019). The Effect of Hemodialysis Frequency on Differences in Hemoglobin Levels and Erythrocyte Indices in Chronic Kidney Failure Patients Pre- and Post-Hemodialysis at Prof. Dr. WZ Johannes Regional General Hospital in 2018. *Cendana Medical Journal*, 7(1), 102–111. <http://ejurnal.undana.ac.id/CMJ/article/view/1462>
- Rahayu, RA (2023). Getting to Know Hemodialysis (HD) Therapy Better. <https://rsud.mataramkota.go.id/baca-artikel?xId=f4e638e3-ad85-4a06-937a-80f879785b05>
- Rosini, DD, Aini, & Ramadanti, E. (2020). Hemodialysis Effectiveness Based on Hemoglobin Parameters,. *Journal of Bioscience Medical Analysis (JAMBS)*, 7(2), 146–152.
- Suherman, Sopiah, P., & Ridwan, H. (2023). Literature Review: The Relationship Between Diabetes Mellitus and the Incidence of Chronic Kidney Failure. *Scientific Journal of Nursing*, 9(5), 639–644. <https://doi.org/10.33023/jikep.v9i5.1634>
- Sukeksi, A., & Prafiyahesa, AY (2023). Erythrocyte count in anemic patients with kidney failure. *Proceedings of the UNIMUS National Seminar*, 6, 534–538.
- Togatorop, YI, & Arto, NS (2022). Description of Erythrocyte Indices in Chronic Kidney Disease Patients Undergoing Hemodialysis. *Andalas Health Journal*, 11(1), 45–49.
- Tola'ba, Y., Syahrul, M., & Tika, D. (2023). The Effect of Hemodialysis on Hemoglobin Levels in End-Stage Renal Disease Patients. *Jurnal Ners Universitas Pahlawan*, 7(1), 68–73. <http://journal.universitaspahlawan.ac.id/index.php/ners>
- Warningsih. (2018). Differences in Erythrocyte Index Values Before and After Hemodialysis in Chronic Kidney Failure Patients. *Manuscript*. 1–10.