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Correlation of Neutrophil-Lymphocyte Ratio (NLR) with Serum Albumin Level, Body Mass Index (BMI) and Erythropoetin Resistant Index (ERI) in Patients Undergoing Hemodialysis

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Objectives : Inflammation, nutritional status, erythropoetin hyporesponsiveness are factors that affect mortality and morbidity in hemodialysis patients. Netrophil-lymphocyte ratio (NLR) value is a biomarker of inflammation that is quite accurate, easy and cheap. Inflammation is one of the causes of erythropoetin hyporesponsiveness and undernutrition in patients undergoing HD, further undernutrition can cause erythropoetin hyporesponsiveness. Albumin is a surrogate marker of inflammation. Albumin also describes nutritional status in addition to body mass index (BMI). So this study wanted to determine the correlation between NLR, BMI, albumin levels and ERI in patients undergoing HD.

Methods : A total of 67 patients undergoing hemodialysis at the hemodialysis unit of Raden Mattaher Jambi Hospital during January-September 2022 participated in this study. Data collected were BMI, routine blood tests such as Hb, neutrophil, lymphocyte measured by automated hematoanalyzer. The NLR value is the ratio of absolute quantification of neutrophils and lymphocytes, while the ERI value is calculated based on the weekly dose of erythropoetin weekly/kgBB/average Hb value. Serum albumin levels were examined by the brom cresol green method. Furthermore, bivariate correlation analysis with Spearman rank was performed.

Results : NLR showed a significant negative correlation with albumin (r=-0.238; p=0.026), BMI showed a significant negative correlation with ERI (r=-0.560; p=<0.01) while NLR with ERI showed a positive correlation but not significant (r=0.081; p=0.257). This study showed that NLR values were negatively correlated with albumin values and statistically significant. This study reported that poorer nutritional status was significantly correlated with erythropoetin hyporesponsiveness, but the inflammatory marker correlation was not significant.

Conclusions : This study proved that inflammation, nutritional status and erythropoetin hyporesponsiveness are correlated in patients undergoing HD. Furthermore, the correlation between nutritional status and erythropoetin responsiveness was stronger than that between inflammation and nutrition.

Table 1 Characteristics of study subjects.png

Table 1. Characteristics of study subjects

Characteristics of study subjects	Mean ± SD	Median	Minimum-maximum
Age, years	50.12 ± 11.62	53.00	22.00-77.00
BMI, kg/m^2	21.24 ± 2.74	20.76	15.67-28.04
Haemoglobin, gr/dL	8.33 ± 1.55	8.20	5.60-11.80
Neutrophil Count, x10^9 sel/L	5.10 ± 3.08	4.14	1.06-19.40
Lymphocyte count, x10^9 sel/L	1.49 ± 0.58	1.43	0.33-4.07
NLR	3.70 ± 2.12	3.05	1.16-9.38
Serum albumin level, gr/dL	3.58 ± 0.48	3.60	2.10-4.40
ERI	7.37 ± 1.90	7.35	3.52-12.76

ERI = Erythropoetin resistence index; BMI = Body mass index; NLR = Neutrophil Limphocyte Ratio
SD = standard deviation

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Table 2. Bivariate correlation test of research variables

Study variables	Correlation value (r)	P Value
NLR vs Serum Albumin[a]	**-0.238**	**0.026***
NLR vs ERI[a]	0.081	0.257
Albumin vs ERI[a]	-0.013	0.459
IMT vs ERI[b]	**-0.560**	**< 0.01***

[a]Spearman correlation test; [b]Pearson correlation test; p Value < 0.05 = statistically significant correlation