

Correlation Between the Leukocyte Count with Neutrophil Lymphocyte Ratio in Hyperuricemia

Meri*, Rianti Nurpalah

Diploma III Study Program of Medical Laboratory Technology
Sekolah Tinggi Ilmu Kesehatan Bakti Tunas Husada

Tasikmalaya, Indonesia

*meri@stikes-bth.ac.id

Abstract— Hyperuricemia is a condition characterized by an increase in uric acid levels in the blood. It can cause inflammation. The sign of inflammation is to check the count of leukocyte and the parameter neutrophil-lymphocyte ratio (NLR). The condition of the number of leukocytes with NLR in hyperuricemia needs to be carried out research in order to know its use as a parameter of inflammation, especially for NLR parameter. The purpose of this study is to determine the correlation between the leukocytes counts with NLR in hyperuricemia, used a cross-sectional study design. The subject was male from 18 to 65 years, from 30 participants. The sampling technique used was purposive sampling that met the inclusion criteria: who was already, and participants who are sick or infected during the study. The results of the study with Spearman's test have a correlation coefficient value (r) between the number of leukocytes with NLR is 0,314, which means it has a sufficient correlation but not significant ($0,091 > 0,05$).

Keywords: leukocyte counts, NLR, hyperuricemia

I. INTRODUCTION

Hyperuricemia is a condition with elevated uric acid levels in the blood[1]. Uric acid acts as a danger signal that can be recognized by the immune system[2] Leukocytes are part of the immune system that will destroy material that is considered foreign by the body[3].

Uric acid comes from food intake and also cells that die in the body[4]. Excessive uric acid can cause various diseases, such as hypertension, cardiovascular disease, diabetes and kidney disorders [5]. Uric acid in the forming crystal usually sticks to the renal tubules and causes interference with the kidneys[6].

Disturbed kidneys are characterized by inflammation of the organ. Immune cells that play the first role in the responding to inflammation are neutrophil cells, then trigger the adaptive immune system in the event of regulation of the immune system and will involve the role of lymphocytes[7].

The leukocyte count is one of the parameters used to indicate inflammation[3]. Likewise, NLR according to some studies is a parameter that indicates inflammation. NLR is the result of calculations of absolute neutrophil counts with absolute lymphocyte counts[8].

Therefore, the correlation between the leukocyte count and NLR requires further inflammation. Researchers intend to look for the correlation.

II. METHOD

A. Study Population and design

The study design is cross-sectional study. Participants were recruited based on the following inclusion criteria: 18 to 65 years old; hyperuricemia (uric acid $> 7,0$ mg/dl) in the male population and not obese. The BMI of each subject was calculated using the measurement of weight and height Research subjects were obtained by 30 people. Conducted from March to June 2019 in Jasa Kartini Hospital and Prodia Laboratories West Java, Indonesia.

B. Material and Apparatus

The tools and materials used to conduct research include test tubes, tourniquet, syringes, cotton alcohol, plaster, blood sample tubes with anticoagulants K-3 EDTA, aquabidest, endpoint uric acid reagents (PT. Akurat Intan Madya (AIM), micropipette, centronorm easy touch digital, and uric acid sticks. The automated hematology analyzer MINDRAY BC 5300 was used to evaluate the results of blood routine examinations (including leukocytes count), and the photometer TC 3300 was used to perform uric acid tests.

C. Measurement Uric acid, Leukocyte Count and NLR

Uric acid in the blood is examined using a TC 3300 photometer. The principle is that the intensity of the color formed is the result of the reaction between the sample, and the reagent will be read at a wavelength of 546 nm[9]. The interpretation of the results is to compare with the normal value of 3,4-7,0 mg/dl.

Leukocyte count was examined using automatic hematoanalyzer (MINDRAY BC 5300) by sucking blood that contains anticoagulants and the results are read on the screen The interpretation of the results is to compare with the normal value of $4,0-10,0 \times 10^3 / \mu\text{l}$ (Jasa Kartini Hospital) [9].

NLR will be calculated from the number of absolute neutrophils divided by the number of absolute lymphocytes[8]. Indications for inflammation are > 5.

D. Statistical Analysis

We used descriptive statistical methods (mean, standard deviation, frequency, and percentage.) to assess the study data. The normality of distribution of the quantitative data was tested using the Kolmogorov-Smirnov. The data distribution was abnormal, so the Spearman ranks were tested. All the data were analyzed using SPSS 25.0, with $p > 0.05$ being regarded as statistically no significant. All the tests were 2-tailed.

III. RESULTS

The research sample was taken by purposive sampling. The number of participants was 30 men aged 18-65 years. The characteristics of the participants can be seen in table 1.

TABLE 1. CHARACTERISTICS OF PARTICIPANTS

Variabel	Mean(SD)	N
Age (Years Old)	42,60 (8,920)	30
Height (cm)	167,57 (5,752)	30
Weight (kg)	66,87 (10,301)	30
Body Mass Index (BMI)	24,00 (2,982)	30
Uric acid (mg/dl)	8,8633 (1,04864)	30
Leukocyte ($\times 10^3/\mu\text{l}$)	8,3007 (1,90146)	30
NLR	2,04 (1,252)	30

Based on table 1, it can be seen that participants are not obese (Mean of BMI is 24; SD=2,982), have uric acid levels of mean =8,863 mg/dl; SD=1,04864) have a normal number of leukocytes and NLR.

TABLE 2. RESULT OF THE CORRE OF LEUKOCYTE COUNT WITH NLR IN HYPERURICEMIA

Variable	Leukosit			TOTAL
	Normal	Abnormal		
RNL	Normal	(6) 92,9%	(2) 7,1%	(28) 100%
	abnormal	(0) 0%	(2) 100%	(2) 100%
	TOTAL	(26) 86,7%	(4) 13,3%	(30) 100%

Based on table 2, the number of normal leukocytes accompanied by normal NLR are six participants or 92,9%, while the number of leukocytes increases with NLR increases are two participant or 100%. In these conditions, there is a correlation. In other observations, it can be stated that the normal number of leukocytes accompanied by abnormal NLR is zero or 0%. Furthermore, the increased number of leukocytes accompanied by normal NLR are two participants or 7%.

TABLE 3. STATISTICAL RESULTS OF THE RELATIONSHIP OF LEUKOCYTE COUNTS WITH NLR IN HYPERURICEMIA

Variabel	coefisien correlation (r)	Sig. (2-Tailed)	$\alpha = 0,05$
Leukocyte count with NLR	0,314	0,091	$p > 0,05$

The normality test with Kolmogorov Smirnov shows the distribution is not normal, so it is followed by the Spearman Rank test. The result is a sufficient correlation $r = 0.314$, but not significant $p = 0.091$ ($p > 0.05$).

IV. DISCUSSION

Leukocyte count is an inflammatory parameter with NLR not having a significant relationship. The number of leukocytes is the sum of all cells leukocytes, namely neutrophils, lymphocytes, basophils, monocytes, and eosinophils. The combination of these cells becomes part of the total number of non-specific leukocytes directed at one of the cells. Not based on just one type of leukocyte cell. NLR is the value of the number of neutrophils divided by the number of lymphocytes. The NLR value is a value that specifically counts neutrophil cells and lymphocytes.

Thus, the abnormal number of leukocytes does not necessarily have an abnormal NLR. NLR can occur because the number of neutrophils is smaller than the number of lymphocytes. The state of lymphocyte number greater than the number of neutrophils indicates a good prognosis so that the total leukocyte count can be normal.

A high NLR value indicates inflammation, which is the ratio between neutrophils divided by the number of lymphocytes in excess of > 5. NLR is a combination of two main components in chronic inflammatory conditions (high neutrophils and low lymphocytes). A high neutrophil value indicates an ongoing non-specific inflammatory process. Low lymphocyte values show relatively inadequate immune regulation and immutable immunity pathways. Therefore, an increase in NLR can reveal the functional status of the immune system in the process of chronic inflammation. In addition, compared to other leukocyte parameters (eg neutrophils, lymphocytes, and total leukocyte count), NLR stability is less influenced by physiological, pathological, and physical factors[10]

V. CONCLUSION

Correlation of the leukocytes count with NLR in hyperuricemia showed a sufficient level of correlation ($r = 0.314$) wasn't significant ($p > 0.05$). The number of leukocytes is still influenced by physiological, pathological and physical properties compared to NLR values.

ACKNOWLEDGMENT

We would like to thank for the Laboratory of Diploma 3 Study Program at Bakti Tunas Husada Health Sciences College of High School, Jasa Kartini Tasikmalaya Hospital, and Prodia Laboratory for providing data.

REFERENCES

- [1] A. E. Manampiring, "Hiperurisemia dan respons imun," *J. Biomedik*, vol. 3, no. 2, pp. 102–110, 2011.
- [2] A. Ramadan, W. G. Land, and S. Paczesny, "Editorial: Danger signals triggering immune response and inflammation," *Front. Immunol.*, vol. 8, no. AUG, pp. 1–3, 2017.
- [3] J. Liu *et al.*, "White blood cell count and the incidence of hyperuricemia: insights from a community-based study," 2018.
- [4] C. Ruggiero *et al.*, "Uric acid and inflammatory markers," pp. 1174–1181, 2006.
- [5] N. O. Sevencan, A. E. Ozkan, and A. M. Sci, "Associations between neutrophil / lymphocyte ratio , platelet / lymphocyte ratio , albuminuria and uric acid and the estimated glomerular filtration rate in hypertensive patients with chronic kidney disease," 2018.
- [6] X. Jing *et al.*, "Soluble monosodium urate , but not its crystal , induces toll like receptor 4-dependent immune activation in renal mesangial cells," *Mol. Immunol.*, vol. 66, no. 2, pp. 310–318, 2015.
- [7] A. K. Abbas, A. h. Lichtman, and S. Pillai, *Basic Immunology; Functions and Disorders Of The Immune System*, Fifth Edit. Canada: Elsevier, 2016.
- [8] S. Balta *et al.*, "The Relation Between Atherosclerosis and the Neutrophil – Lymphocyte Ratio," 2016.
- [9] Meri and Y. Liswanti, "Jumlah Neutrofil Absolut , Cystatin-C , dan Hiperurisemia," Bandung: Sadari, 2019, pp. 1–111.
- [10] M. Lou *et al.*, "Relationship between neutrophil-lymphocyte ratio and insulin resistance in newly diagnosed type 2 diabetes mellitus patients," pp. 4–9, 2015.