OVERVIEW OF NEUTROPHIL LYMPHOCYTE RATIO (NLR) BASED ON THE LENGTH OF TREATMENT BY PULMONARY TUBERCULOSIS PATIENTS IN JAMBI CITY

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ABSTRACT

Background: Pulmonary tuberculosis (pulmonary TB) is still a global public health problem in the world. Pulmonary TB is a chronic caused by the bacterium Mycobacterium tuberculosis (M.TB). Most TB bacteria are often found infecting the lung parenchyma. Infection due to pulmonary TB disease causes an active immune system in the body which is characterized by an increase in the number of neutrophils (neutrophilia). This infection also causes a decrease in the number of lymphocytes (lymphocytopenia). This study aims to determine the picture of NLR examination results based on the length of treatment undertaken by pulmonary TB patients in Jambi City.
Method: The study used descriptive methods with convinience sampling technique. The samples of this study were 40 Pulmonary TB patients from several health centers in Jambi City including the Simpang IV sipin health center, Pakuan baru, Simpang kawat, Rawasari, and Putri ayu. NLR examination in blood was carried out in February-June 2023 at the Hematology Laboratory, majoring in Medical Laboratory Technology using a Hematology analyzer.
Result: The results showed the average number of NLR in pulmonary TB patients with a treatment duration of ≤ 2 months, which is 3.68 and in patients with a treatment duration of > 2 months the average was 2.41, p value = 0.023.
Conclusion: it can be concluded that the average number of NLR was greatest in pulmonary TB patients with treatment duration ≤ 2 months.

Keywords: Pulmonary TB; Neutrophils; Lymphocytes; NLR; Length of Treatment

INTRODUCTION

Pulmonary tuberculosis (pulmonary TB) is still a public health problem in the world (Kementerian Kesehatan RI, 2016). Pulmonary TB is caused by the bacteria Mycobacterium tuberculosis (M.TB). The main spread of this disease is through the air when pulmonary TB patients cough, sneeze or saliva (WHO 2023). Indonesia is currently in second place with the highest number of pulmonary TB patients in the world after India. The number of pulmonary TB patients is estimated at 969,000 (WHO 2022). Basic health research, the prevalence of pulmonary TB in Jambi Province was 0.27% (Kemenkes RI, 2018). Based on data from the Jambi City Health Service, in 2021 the number of pulmonary TB patients in Jambi City will be 828 people (Dinkes 2021). Although this disease can be prevent and cure, every year 10 million people are identified as pulmonary TB patients and 1.5 million people die from pulmonary TB. This makes pulmonary TB the top infectious killer in the world (WHO 2023).

Prevention and cure of pulmonary TB disease can be done through treatment with anti-tuberculosis drugs (OAT) namely Isoniazid, Rifampicin, Pyrazinamide, Ethambutol, and Streptomycin. This treatment is carried out in two stages, namely the initial stage and the advanced stage. The initial stage of treatment is implement for two months and the advanced stage of treatment is carried out for four months (Kementerian Kesehatan RI 2019).

Infection due to pulmonary TB causes the activation of the immune system in the body, which is characterized by an increase in the number of neutrophils (neutrophilia). This is because neutrophils act as the first defense system to eliminate or phagocytose M.TB bacteria with independent oxygen pathways (lysozyme enzymes, lactoferrin, reactive oxygen intermediates, proteolytic enzymes, cathepsin G, and cationic proteins) and oxygen dependent pathways. In addition, neutrophils also play a role in the activation of pro-inflammatory (Azab, Camacho-Rivera, and Taioli 2014; Baratawidjaja and Rengganis 2014; Hilda et al. 2020). This infection also causes a decrease in the number of lymphocytes (lymphocytopenia) because lymphocytes have specific receptors to recognize foreign antigens and then eliminate them. So normally there will be a decrease in lymphocytes when inflammation occurs due to the cleaning process (Azab et al. 2014; Simanjuntak, Dhea, and Nursyahbani 2022; Simanjuntak and Hanum 2022).The results of the comparison between neutrophils and lymphocytes are more sensitive in the incidence of bacterial infection when compared with the total white blood cell count. The ratio of neutrophils and lymphocytes is called the Neutrophil Lymphocyte Ratio (NLR). NLR is a laboratory examination used to evaluate inflammation or can be used as a marker of inflammation (Aura Alya Mulyani 2022;Kristiani and Hendrianingtyas 2017).

Research conducted by (Cahyadi and Steffanus 2018) showed that the average value of NLR in patients before carrying out intensive phase therapy was 2.77. Whereas after carrying out therapy the average NLR value in patients decreased to 2.00. Ciptasari, et al (Ciptasari, Steffanus, and Lembar 2018) reported the same fact in decreasing value of NLR after undergoing intensive therapy. Constatary it is inversely proportional to research conducted by (Iqbal, Ahmed, and Khan 2015) which showed an increase in NLR with the length of treatment time. This increase in NLR was influenced by the condition of anemia experienced by 78% of respondents.

The research data above still shows differences in NLR results in pulmonary TB patients undergoing treatment. Several studies stated that the NLR decreased significantly after treatment and there were also studies which stated that there was an increase in NLR in pulmonary TB patients with the duration of treatment. This condition underlies the research to be conducted, which aims to look at the description of NLR in pulmonary TB patients based on the length of treatment.

METHODS

This research is a study with a cross sectional design. Sampling using convenience sampling techniques was carried out on pulmonary TB patients at several community health centers in the city of Jambi. The number of samples in this study was 40 samples with the case population being pulmonary TB patients in several health centers in Jambi City. The patient filled out and signed the consent form as a research respondent prior to the interview. Next, take a venous blood specimen from the patient. Specimens were examined using a Hematology analyzer. Data statistically analyzed by independent T test with Medcalc statistical software. This research has received ethical approval from Ethics Committee of the Health Polytechnic of Jambi.

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RESULTS AND DISCUSSION

In this study, observations were made on examination data from 40 pulmonary TB patient respondents. The characteristics of the respondents involved can be seen in table 1 below.

Table 1. Respondent characteristic table

Charecteristic		Frequency	Percentage
Gender	Male	21	52,5%
	Famele	19	47,5%
Age group	18-65 years	33	82,5%
	>65 years	7	17,5%
Smoking habit	Smoking	8	20%
	No smoking	32	80%
Length of treatment	≤ 2 months	12	30%
	> 2 months	28	70%

The results of the analysis of the characteristics of respondents based on gender, namely, the number of male respondents was more (21 people) than female respondents (19 people). Based on age, respondents with an average age of 18-65 years were 33 people and respondents with age> 65 years were 7 people.

Based on their smoking habits, most of the respondents did not smoke (32 people) and a few had smoking habits (8 people). Based on the length of treatment, there were more respondents with treatment duration > 2 months (70%) than respondents with treatment duration ≤ 2 months (30%).

Table 2. Neutrophils to lympocyte ratio based on length of treatment

Variabel	NLR			P. value
	N	Mean	Std. Deviation	
≤ 2 months	12	3,68	2,76	**0,023**
> 2 months	28	2,41	1,20	

Based on the table above, it can be seen that respondents whose treatment duration was ≤ 2 months had the highest average NLR (3.68%). The results were analyzed with the Independent T test and obtained p = 0.023. The p value is smaller than alpha (α) 0.05, so it can be concluded that there is a significant difference between the number of NLR in pulmonary TB patients based on the length of treatment as indicated by a decrease in NLR after the initial phase of treatment.

NLR is a laboratory examination used to evaluate inflammation and as a predictor of survival in various clinical situations ranging from oncology to cardiovascular disease, so NLR can be considered as an alternative marker of inflammation. The results of research that has been carried out on NLR values, where in the characteristics of the length of treatment the average NLR in pulmonary TB patients who have been treated for ≤ 2 months is higher, namely 3.68 with a p value < 0.05, which means there is a significant difference between NLR based on duration of treatment. Based on the results above, it can be seen that NLR has a role as a more specific marker of inflammation compared to neutrophilia or lymphocytopenia.

As one of the inflammatory marker parameters, the NLR value in pulmonary TB patients would be influenced by the length of treatment for the patient. Previous researchs (Ciptasari et al. 2018, Cahyadi and Steffanus 2018) also showed a decrease in the average NLR from before and after carrying out intensive therapy.

The results above are in line with studies that have been conducted where there was a decrease in NLR in pulmonary TB patients after ≤ 2 months of treatment from an average NLR of 3.68 to 2.41. This condition can transpire due to an improvement in the patient's immune response by administering OAT in the early phase of treatment. Where consumption of OAT can suppress the growth and development of bacteria and eliminate them. The less M.TB bacteria in the body, the less inflammation that occurs. This condition has an impact on neutrophil cells (decreased) and lymphocyte cells (increased) so that they return to normal numbers in the blood.

However, different research results were obtained by (Iqbal et al. 2015) which shows an increase in NLR with the length of treatment. This increase in NLR was influenced by the condition of anemia experienced by 78% of research respondents. This difference in the condition of the respondents is what causes differences in the results of research that has been conducted with previous research.

CONCLUSION

The results of the research that has been done regarding NLR examinations in pulmonary TB patients based on length of treatment, it can be concluded that there is a significant difference between NLR in pulmonary TB patients based on length of treatment. Future researchers are advised to continue research with samples of pulmonary TB patients before and after several months of taking OAT, in order to obtain the data be more variety and cover a wider research area so that they can describe the population evenly.

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CONFLICT OF INTEREST

The author declares there is no conflict of interest.

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