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Neutrophil Lymphocyte Ratio (NLR) Value As Inflammation Marker In Ulcer Diabetic Patients With Variation Of Blood Glucose

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ABSTRACT

Ulcer diabetic are chronic wounds under the ankles of people with diabetes mellitus. Inflammation in ulcer diabetic which accompanied by hyperglycemia and poor wound care can inhibit wound healing, aggravate the wound and have high risk of amputation. The Neutrophil Lymphocyte Ratio (NLR) as one of inflammatory markers can be used to monitor wound treatment and care as well as a predictor of healing in ulcer diabetic. This study aims to determine the value of NLR as a marker of inflammation in ulcer diabetic patients with various blood glucose levels. The research was a descriptive study with a cross sectional where the researcher collected secondary data on blood glucose levels from results of the Traditional Medicine examination and the researchers examined the neutrophil cell count and the lymphocyte cell count at UPTD LABKESDA Nganjuk. This research approach conducted in January-April 2021. There are 18 samples of patients who met the inclusion criteria with 10 female respondents and 8 male respondents. The result showed that the average NLR value in ulcer diabetic patients was 3.62% which exceeded the normal value. It can be concluded that there is inflammation of ulcer diabetic patients in Traditional Medicine in Pilangkenceng Subdistrict of Madiun Regency

Keywords: ulcer diabetic; neutrophil lymphocyte ratio; inflammation; blood glucose levels

INTRODUCTION

Diabetes mellitus is a metabolic disease characterized by increased blood glucose levels and suffered by 10.7 million adults in Indonesia in 2019 (International Diabetes Federation, 2019). Diabetes mellitus is chronic and can cause complications. Ulcer diabetic are complications characterized by chronic open wounds under the ankles. These wounds are caused by peripheral arterial disease, peripheral neuropathy or a combination of the two (Soelistijo et al., 2019)

Hyperglycemia in ulcer diabetic patients can inhibit wound healing due to disturbances in blood vessels and is a good environment for the development of anaerobic bacteria (Veranita et al., 2016). Long duration of ulcers and inappropriate ulcer care in ulcer diabetic patients can be at risk of causing amputation (Ratnasari et al., 2019). The act of amputation can lead to feelings of inferiority, loss of productivity, increased dependence on others and hampered family economy.

Ulcer diabetic management needs to be done to reduce the risk of amputation. Inflammation and infection control is used in wound control in ulcer diabetic patients which can be done by laboratory examination of complete blood count (Rahman, 2019).

On examination of complete blood count, there are parameters of neutrophils and lymphocytes. Neutrophils and lymphocytes are the body's first defense against foreign substances or pathogens that enter. Neutrophils in the blood phagocytize pathogens and elicit an acute inflammatory response. Lymphocytes play a role in the chronic inflammatory response due to an unrelieved inflammatory response (Playfar & Chain, 2019).

The comparison between the neutrophil count and the lymphocyte count is known as the Neutrophil Lymphocyte Ratio (NLR) which can be used as a marker of inflammation (Liu et al., 2019). In ulcer diabetic patients, NLR can be used as a predictor of amputation (Bahri, 2016). Patients with ulcer diabetic with high NLR values have a higher risk of amputation (Altay et al., 2019). A high NLR value also indicates a higher probability of not recovering so that the NLR value can be used as a predictor of non-healing (Nasibeh, 2017).

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Based on the initial survey, it was found that ulcer diabetic patients were patients without NLR examination in traditional medicine in Krapyak, Purworejo Village, Pilangkenceng Sub-district of Madiun Regency so that researchers were interested in conducting research on the value of the Neutrophil Lymphocyte Ratio (NLR) as a marker of inflammation in ulcer diabetic patients with various blood glucose levels

METHODS

This study was a descriptive study with a cross sectional approach to determine the value of the Neutrophil Lymphocyte Ratio (NLR) as a marker of inflammation in ulcer diabetic patients with various blood glucose levels. This research was conducted on January - April 2021

The population of sample were patients of traditional medicine in Purworejo Village. The sampling technique used purposive sampling. There were 18 samples of ulcer diabetic patients who agreed the informed consent.

The stages of the research consisted of selecting respondents by ulcer or non-ulcer diabetes patients and informed consent, preparing tools and materials, taking venous blood, examining the percentage of neutrophil and lymphocyte then calculating the value of the Neutrophil Lymphocyte Ratio (NLR).

The researcher examined of neutrophil and lymphocyte percentage by Complete Blood Count used Hematology Analyzer conducted at Regional Health Laboratory of Nganjuk Regency (UPTD LABKESDA Nganjuk). The variable of blood glucose levels was Random Blood Glucose obtained from secondary data from the traditional medicine where respondents get treatment

The Neutrophil Lymphocyte Ratio (NLR) value was measured by calculating the percentage of neutrophil divided by the percentage of lymphocyte then compared with normal value 0,78-3,53% from the previous research by Liu et al. in 2019.

The data analysis was carried out using descriptive statistical methods expressed in percentages. The average of NLR result then compare with normal value of inflammation. All the information and identity of respondents will be kept and only used for the research. This research also had a certificate of ethical exemption from Health Research Ethics Committee of Health Polytechnic Surabaya.

RESULTS

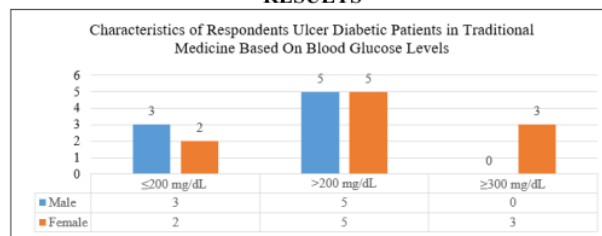


Figure 1. Characteristic of Respondents Ulcer Diabetic Patients in Traditional Medicine Based On Blood Glucose Levels

Based on the figure 1, the characteristic of respondents showed that 13 respondents have blood glucose levels more than 200mg/dL and only 5 respondents have blood glucose levels less than equal to 200mg/dL. There are 5 men have high blood glucose levels and there are 8 women have high blood glucose levels.

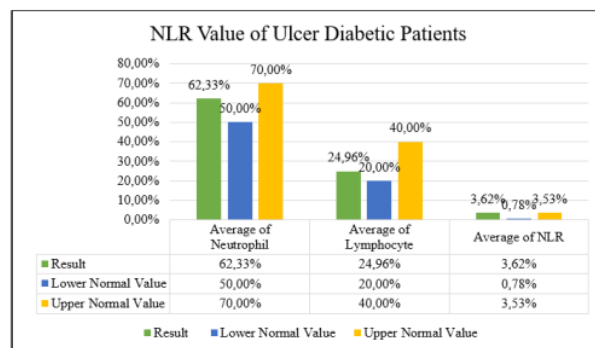


Figure 2. NLR Value in Ulcer Diabetic Patients

Based on the figure 2, the average of NLR value from the 18 respondents is 3.62% higher than normal value. The average of neutrophil percentage is 62.33% and the average of lymphocyte percentage is 24.96% still in the normal value range but there is an increase.

DISCUSSION

There are 18 respondents with the majority are women, as many as 10 people while the other 8 respondents are men, so this shows that women are more at risk of developing diabetes mellitus, especially with complications of ulcer diabetic than men. Women are more at risk of developing diabetes and ulcer diabetic because of a decrease in the production of the hormone estrogen and insulin resistance as women age (Fitria et al., 2017).

The hormone estrogen plays a role in preventing atherosclerosis. Atherosclerosis or blockage of blood vessels can cause a decrease in the amount of oxygen delivered to the tissues, resulting in ischemia and leading to or worsening of ulcers.

Based on Figure 1, it can be seen that respondents with ulcer diabetic have varying blood glucose levels. The majority of patients experienced hyperglycemia, as many as 10 respondents have blood glucose levels high than 200 mg/dL and 3 respondents had blood glucose levels high than equal to 300 mg/dL while 5 respondents had blood glucose levels less than equal to 200 mg/dL. Differences in blood glucose can be caused by controlling blood glucose levels and the time of consumption of glucose because this research used secondary data from random blood glucose examination.

Based on Figure 2, there are 18 respondents with various blood glucose levels showed an abnormal increase in the Neutrophil Lymphocyte Ratio (NLR) with a value of 3.62% which indicated inflammation.

An increase in the Neutrophil Lymphocyte Ratio (NLR) may occur due to hyperglycemia. The condition of hyperglycemia in ulcer diabetic patients can cause wounds to be difficult to heal (Lede et al., 2018).

In conditions of hyperglycemia, disruption of blood vessels occurs and is a good environment for the development of anaerobic bacteria which results in slowed blood flow, reduced oxygen supply and inhibits wound healing (Veranita et al., 2016)

An increase in NLR can also occur due to sepsis which is characterized by the presence of pus on the feet of some ulcer diabetic patients due to aerobic and anaerobic bacterial infections. Sepsis can also be a cause of mortality in ulcer diabetic patients (Darwis et al., 2020).

Therefore, it is necessary to control blood glucose levels and wound care accompanied by monitoring inflammation to determine the progress of wound healing. One of the inflammatory markers that can be used is the Neutrophil Lymphocyte Ratio (NLR). A high value of Neutrophil Lymphocyte Ratio (NLR) was significantly associated with a high rate of wound healing in ulcer diabetic patients (Nasibeh, 2017).

At a high value of the Neutrophil Lymphocyte Ratio (NLR), there is an increase in the number of neutrophils and a decrease in the number of lymphocytes. The increase in neutrophils is caused by neutrophils that have been apoptotic and cannot be completely cleared which results in long-lasting inflammation and can also trigger inflammation again (Raharjo et al., 2020).

The decrease in lymphocyte levels occurs due to an increase in oxidative stress which results in an increase in lymphocyte apoptosis. Increased apoptosis of T lymphocytes can inhibit wound healing in ulcer diabetic patients (Tandian, 2017).

Based on the figure 2, There are increase of average neutrophil precentage and average lymphocyte percentage but still in normal value, this indicates that occurred inflammation but patient start to recovery because of good management of ulcer diabetic

CONCLUSION

The average value of the Neutrophil Lymphocyte Ratio (NLR) in ulcer diabetic patients is 3.62% which indicates inflammation occurs so that the Neutrophil Lymphocyte Ratio (NLR) can be used as a marker of inflammation for monitoring wound healing

In this regard, more several patients and better blood glucose levels examination are needed to see the correlation between NLR value and blood glucose levels. For the next research, researchers can determine the NLR value on the other diabetes mellitus complication.

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