BLOOD SUGAR LEVELS WITH NEUTROPHIL-LYMPHOCYTE RATIO AS A MARKER OF DIABETES MELLITUS IN ELDERLY

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ABSTRACT

Introduction: Diabetes mellitus is a chronic metabolic disease, characterized by high blood sugar levels due to abnormal insulin secretion by the pancreas, insulin action, or both. Based on the Basic Health Research results in 2018, the elderly group dominates patients with diabetes mellitus. The diagnosis of diabetes mellitus requires an expensive examination that is not available in all laboratories, especially primary care facilities. Some research suggested that the neutrophil-lymphocyte ratio can be an alternative marker for establishing a diagnosis of diabetes mellitus.

Purpose: To determine the correlation between blood sugar levels and lymphocyte ratio as a marker of diabetes mellitus in the elderly.

Method: This study was an observational analytic study with a cross-sectional approach. Data was collected by conducting interviews, physical examinations, and laboratory examinations. Hypothesis testing in this study used the Spearman correlation test.

Results: A total of 53 respondents were included in this study, with a proportion of 32 female subjects (60.4%). The mean age of respondents was 76.0 ± 7.29 years. An insignificant correlation was obtained between fasting blood sugar levels and the ratio of neutrophil lymphocytes in the elderly ($p = 0.161$; $r = 0.195$). An insignificant correlation was found between blood glucose levels after two hours of postprandial with the neutrophil-lymphocyte ratio in the elderly ($p = 0.595$; $r = 0.075$). HbA1c level and the lymphocyte ratio in the elderly also showed a non-significant correlation ($p = 0.873$; $r = -0.023$).

Conclusion: There is no significant correlation between blood sugar level and neutrophil-lymphocyte ratio as a marker of diabetes mellitus in the elderly.

Keywords: ratio of neutrophil-lymphocytes, diabetes mellitus, elderly.

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INTRODUCTION

Diabetes Mellitus (DM) is a chronic metabolic disease characterized by high blood sugar levels from defects in insulin secretion by the pancreas, insulin action, or both.¹ Based on the results of the Riset Kesehatan Dasar (Riskesdas) in 2018, DM patient in Indonesia is dominated by the elderly group. According to Law No. 13/1998 concerning Elderly Welfare, the elderly is a person who has aged 60 years and over. The prevalence of DM at Riskesdas in 2018 was dominated by patients age 55-64 years, 6.3%, followed by ages 65-74 years, which is 6.0%, and age of ≥ 75 years, which is 3.3%.² This is because there is a functional decrease in organ systems that occurs in the elderly group representing a reduction of peripheral cell tolerance to the effects of insulin (insulin resistance). There are also secondary factors, namely lifestyle and other comorbidities.³

International Diabetes Federation (IDF) states that Indonesia is a country with the 7th most DM sufferers in the world, amounting to 8.5 million sufferers.⁴ The incidence of DM, according to Riskesdas in 2018, shows that there was an increase from 1.5% in 2013 to 2.0% in 2018 in the population aged ≥ 15 years. DM sufferers in the Province of East Nusa Tenggara (NTT) rank lastly at 0.9%.² It is also known that the proportion of routine

blood sugar levels checked in the population aged ≥ 15 years in NTT ranks lowest at 0.5%.² This finding is assumed because the community has not done routine blood sugar level checks, so the prevalence of DM in NTT seems to be classified as low. One of the causes of the problem is limited resources, namely the limited number of health workers carrying out routine checks and inadequate laboratory facilities, as well as the distance to the health service. Based on data from the Sikka District Health Office, the number of elderly who suffer from DM in 2018 is 236 people out of 31,164 older people or around 0.008%, both those who live with their families or who live in Panti Jompo.

Although the recorded incidence of DM in NTT is low, the number of DM complications in the elderly, namely hypertension, cerebrovascular accident (CVA), and coronary heart disease (CHD), is quite high as many as 1,274 people, 241 people, and 35 people respectively. The diagnosis of DM requires an expensive examination and is not available in all laboratories, especially in primary care facilities. Some studies suggested that the Neutrophil Lymphocyte Ratio (NLR) can be used as an alternative marker for DM diagnosis.^{5,6}

RNL, in recent years, has become a potential new marker for chronic inflammation. In chronic inflammation, the neutrophil count will increase, and the lymphocyte count will decrease.⁶ RNL examination can be done in all level 1 health facilities and clinics that have simple laboratory facilities. It is hoped that this examination can be an alternative for the initial screening of patients with diabetes, especially in the elderly.

Based on the above background, the researcher is interested in researching one of the Panti Jompo in the City of Maumere, NTT, specifically the Panti Jompo Padu Wau. Screening of diabetes mellitus in this Panti Jompo had never been done using standard parameters such as blood sugar or HbA1c. By doing this research, it is hoped that it can increase contributions to the health data of the elderly in Indonesia, particularly in Maumere, NTT.

METHOD

This research was an observational analytic study with a cross-sectional approach.

In this research, the population used was all the elderly who live in the Panti Jompo Padu Wau Maumere.

The sample in this research was all the elderly in Panti Jompo Padu Wau, who met the inclusion and exclusion criteria

within the research period, which began in July, for two days, 21 and 22 July 2019.

The sampling technique in this research used a consecutive sampling method. All subjects who came and met the inclusion and exclusion sampling criteria were included in the research until the required sample size was met. The inclusion criteria for this research were the elderly who are in Panti Jompo Padu Wau, aged 60-80 years, and willing to be the subject of research by signing informed consent. The exclusion criteria were elderly with fever, known through axillary temperature measurements $> 37.5^{\circ}\text{C}$, elderly who consume antibiotics, and consume corticosteroids, and elderly with ulcers. In this research, some samples were dropped due to incomplete data.

This study's procedure was that measured respondents' blood sugar levels (with fasting prerequisites), postprandial blood sugar for two hours, HbA1c, and complete blood tests.

RESULTS

The study results based on the essential characteristics of the study subjects consisted of gender, marital status, age, blood pressure, waist circumference, and body weight. Based on gender, female respondents dominated the research, with 32 people (60.4%). In the measurement of blood pressure, systolic and diastolic

pressure of the elderly were still within normal limits, namely 139.3 ± 22.69 mmHg and 80.2 ± 14.20 mmHg. According to waist circumference, the mean waist circumference was still within the normal range, which is 84.7 ± 11.29 cm. Based on body weight, an average of 45.7 ± 9.42 kg was obtained.

From the examination of capillary and venous blood sugar profiles, the subjects' average fasting blood sugar were 98.2 mg/dL. Meanwhile, the examination of two-hours postprandial blood sugar levels showed an average of 136.5 mg/dL. the results of the HbA1c examination showed an average of 5.4%.

On a complete blood examination, the respondents showed that the mean (average) WBC level was $8542.1 \times 10^6 / L$, and the mean Hb level was 12.6 g/ dL. Also, Neutrophil levels were found to be 61.6%, while Lymphocyte levels were found to be 30.6%. Based on the Hb group, it was found that respondents with the Hb group ≥ 11 g / dL were higher, which was 43 (81%) compared to the Hb group < 11 g / dL, which is ten people (19%).

Characteristics of respondents based on the HbA1c group were known that the mean neutrophil levels in respondents with the HbA1c group $\geq 6.5\%$ were higher than the HbA1c group $< 6.5\%$, which was $69.2 \pm 8.69\%$. While the mean lymphocyte levels in respondents with the HbA1c

group $\geq 6.5\%$ were lower than the HbA1c group $< 6.5\%$, which is $21.0 \pm 4.17\%$. Also, the mean neutrophil-lymphocyte ratio in respondents with the HbA1c group $\geq 6.5\%$ was higher than the HbA1c group $< 6.5\%$, which was $3.3 \pm 0.94\%$.

Respondents on fasting blood sugar (GDP) group test yielded mean neutrophil levels ≥ 126 mg / dL higher than the GDP group < 126 mg / dL, which was $65.8 \pm 10.60\%$. While the mean lymphocyte level in respondents with a GDP group ≥ 126 mg / dL is lower than the GDP group < 126 mg / dL which is $26.3 \pm 3.60\%$. In addition, the mean neutrophil lymphocyte ratio in respondents with a GDP group ≥ 126 mg / dL is lower than the GDP group < 126 mg / dL which is $2.5 \pm 0.75\%$.

In the blood group 2 hours postprandial (GD2jPP), the mean neutrophil level was found in respondents with the GD2jPP group ≥ 200 mg / dL higher than the GD2jPP group < 200 mg / dL which was $68.9 \pm 6.30\%$. While the mean lymphocyte levels in respondents with the GD2jPP group ≥ 200 mg / dL were lower than the GD2jPP group < 200 mg / dL, which was $25.3 \pm 2.20\%$. The mean level of neutrophil-lymphocyte ratio in respondents with the GD2jPP group ≥ 200 mg / dL was higher than the GD2jPP group < 200 mg / dL, which was $2.7 \pm 0.50\%$.

Correlation analysis of blood sugar levels with lymphocyte neutrophil ratio as a marker of diabetes mellitus in the elderly using the Spearman Correlation test showed that between fasting blood sugar levels with neutrophil-lymphocyte ratios in the elderly, there was a non-significant, very weak positive correlation ($p = 0.161$; $r = 0.195$). between the blood sugar levels 2 hours postprandial with ratio of neutrophil lymphocytes in the elderly, there was non-significant, very weak positive correlation ($p = 0.595$; $r = 0.075$). Whereas between HbA1c levels with lymphocyte ratios in the elderly, there was non-significant, very weak negative correlation ($p = 0.873$; $r = -0.023$).

DISCUSSION

Several studies have shown that the ratio of neutrophil lymphocytes will increase in people with DM who have chronic inflammation.^{5,6} In contrast the results of this study, found insignificant correlation between the ratio of neutrophil lymphocytes with blood sugar levels as a marker of diabetes mellitus in the elderly. A study conducted by Shiny A. et al. in 2013 showed an association between an increase in leukocyte count and the incidence of type 2 diabetes in elderly.⁶ According to said study, epidemiological reports showed that the prevalence of DM increases with age, settling before it finally

declines. From WHO data it is found that after 30 years, blood sugar levels will rise 1-2 mg/year during fasting and will rise by 5.6-13 mg% / year at 2 hours postprandial.^{5,7}

Research conducted at Panti Jompo Padu Wau Maumere showed insignificant results, which was thought to be related to the examination of HbA1c levels. Examination of HbA1c levels is the standard gold examination for the diagnosis of DM, which can be affected by conditions such as those found in this study, relating to high incidence of anemia and history of malaria that were not examined.^{8,9} other factors, such as genetic variation of each different respondent, are difficult to eliminate. Therefore, the suggestion for further research is to conduct an HbA1c examination in patients who are not anemic or have a history of malaria^{10,11,12}.

CONCLUSION

Based on the results, it can be concluded that there was no significant correlation between fasting blood sugar levels with neutrophil-lymphocyte ratio in the elderly. There was also no significant correlation between blood sugar levels in the two-hours postprandial with the ratio of neutrophil-lymphocytes in the elderly, and there was an insignificant correlation between the levels of HbA1c with the ratio

of neutrophil-lymphocytes in the elderly in Panti Jompo Padu Wau Maumere. These results have not been able to support alternative marker for the diagnosis of diabetes mellitus.

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