DESCRIPTION OF THE RESULTS OF THE CLOTTING TIME EXAMINATION OF LEE AND WHITE METHOD IN DIABETES MELLITUS PATIENTS AT TOTO KABILA HOSPITAL

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ABSTRACT

In diabetes mellitus sufferers, there is a hypercoagulation state caused by hyperglycemia, hyperinsulinemia and insulin resistance. This can lead to changes in the components that play a role in the function of hemostasis, causing an increase in coagulation activity with a decrease in fibrinolytic activity. The purpose of this study was to determine the results of the blood clotting time using the Lee and White method in patients with Diabetes Mellitus.

This research uses descriptive quantitative research methods. The total sample used was 20 patients with accidental sampling technique. Using univariate data analysis techniques processed through the IBM SPSS Statistic V25.0 program.

The results of the study showed that 60.0% of patients with normal blood clotting time and 40.0% with prolonged clotting time. It is recommended for people with Diabetes Mellitus in addition to controlling blood glucose levels, it is also expected to check blood clotting time.

Keywords: diabetes mellitus, clotting time, hemostasis, hypercoagulation.

INTRODUCTION

Diabetes mellitus is a disease or chronic metabolic disorder with multiple etiologies characterized by high blood sugar levels accompanied by disorders of carbohydrate, lipid and protein metabolism as a result of insulin function insufficiency, which can be caused by disruption in insulin production by beta cells of the Langerhans caused by the body's cells less responsive to insulin [22].

Diabetes mellitus is a health problem that needs to be watched out by the whole world. This is because the number of people with Diabetes Mellitus has increased from year to year. There are approximately 463 million adults suffering from Diabetes Mellitus. In 2010 the global projection for people with diabetes mellitus in 2025 is 438 million, with more than 5 years remaining that prediction has been exceeded by 25 million. If there are no precautions, this number will continue to increase without decreasing. It is estimated that by 2030 it will increase to 538 million adults with Diabetes Mellitus and 700 million in 2045 [9].

Indonesia itself is listed as the fourth country with the highest burden of Diabetes Mellitus in the world. This is in line with the Basic Health Research (Riskesdas) which estimates an increase in the number of Diabetes Mellitus sufferers from 8.4 million in 2000 to around 21.3 million in 2030. Meanwhile, Gorontalo Province is included in the top 10 regions with a population suffered the most

Diabetes Mellitus in Indonesia with a percentage of 2.4% in 2018 [14].

The number of Diabetes Mellitus sufferers in Bone Bolango Regency occupies the third row in Gorontalo Province, reaching 209 people. Meanwhile, based on existing data in RSUD. Toto Kabila, Bone Bolango District, Diabetes Mellitus patients from 2018 to 2019 tended to increase, from 1208 cases to 1691 cases, meanwhile in 2020, data obtained from January to March 2020 were 265 cases. An increase in the number of Diabetes Mellitus sufferers from the data available at Toto Kabila Hospital is an indicator that the management and control of Diabetes Mellitus is not optimal in the community [7].

Various studies state that there is a hypercoagulation state in people with Diabetes Mellitus caused by a state of hyperglycemia, hyperinsulinemia and insulin resistance. This can lead to changes in the components that play a role in the function of hemostasis, causing an increase in coagulation activity with a decrease in fibrinolytic activity [5].

The hypercoagulation state in diabetes mellitus sufferers is associated with increased production of tissue factors, a potent procoagulant produced by endothelial cells, as well as increased activation of plasma coagulation factors such as factor VII. Hyperglycemia is also associated with decreased levels of natural anticoagulants such as antithrombin and protein C, impaired fibrinolytic function, and increased production of Plasminogen Activator Inhibitors (PAI-1) (American Diabetes Association: [1].

Hemostasis abnormalities that appear will facilitate the activation of the hemostasis process and cause the coagulation response that occurs excessively. The existence of this hypercoagulation state will cause diabetes mellitus sufferers to have an increased tendency to experience thrombosis compared to non-diabetes mellitus sufferers [10].

Changes in blood clotting power are one of the main factors that play a role in the pathophysiology of thrombosis. Hypercoagulated blood tends to clot more easily with a coagulation stimulus, and the clot that forms is more difficult to dissolve [11].

The blood clotting process begins when the platelets and other factors in the blood plasma come into contact with an unusual surface, such as a damaged or injured blood vessel. When there is a wound on the surface of the body, blood components, namely platelets, will immediately collect on the injured part and will clot so that it can clog and cover the wound [8].

In the clinical laboratory, blood clotting time can be measured by performing a Clotting Time (CT) examination, one of which is the Lee and White method. This test determines the length of time it takes for the blood to clot. The result is a measure of the activity of coagulation factors, particularly thromboplastin-forming factors and platelet-derived factors, as well as fibrinogen levels [8].

The Lee and White method of blood clotting time test is quite accurate. This test measures the time it takes for the complete blood to clot in the tube. The tube method uses 4 tubes each filled with 1 mL of complete blood, then the tube is slowly tilted every 30 seconds so that the blood comes into contact with the tube wall and at the same time sees a solid clot. Normal blood clots 5-15 minutes [8].

Based on the description above, the researcher is interested in conducting a study on the description of the results of the Lee and White method of Clotting Time in Diabetes Mellitus Patients at Toto Kabila Hospital.

Description of the Results of the Clotting Time Examination of Lee and White Method in Diabetes Mellitus Patients at Toto Kabila Hospital

RESEARCH METHODS

The type of research and research design used is descriptive research and the research design used in this study is a quantitative approach (quantitative method). The research was conducted at Toto Kabila Hospital from 8 October to 32 October 2020.

The number of respondents or samples in this study were still assumptions, namely 15 samples. The basis for making these assumptions is based on a non-statistical approach with the consideration of following the habits of other research and consulting with seniors who are at the research site[18].

The sampling technique used in this study was accidental sampling. Accidental sampling is accidental sampling by taking cases or respondents who are found and willing to be investigated [17]. So that in the sampling technique here, the researcher takes the respondents who were met during the research until they reach the desired sample size.

This study uses univariate data analysis techniques. Univariate is a data analysis technique for a variable and each analyzed variable cannot be associated with other variables [13].

Processed through the IBM SPSS Statistics V25.0 program. Then the data is presented in tabular form and reported as a percentage using the formula [17].

$$P = x \frac{f}{N} 100\%$$

RESEARCH RESULT

Based on examination of blood clotting time in Diabetes Mellitus patients at the Toto Kabila Regional General Hospital, which was carried out during October 2020, 20 samples were obtained, consisting of 9 men and 11 women who were Diabetes Mellitus patients.

The following is data that describes the characteristics of the respondents in general, including the group of respondents based on age, sex and blood glucose levels.

Table 1. Distribution of the frequency of respondents based on age in diabetes mellitus patients

Respondent Age	Frequency	%
17-25 years	1	5.0
26-35 years	1	5.0
36-45 years	2	10.0
46-55 years	8	40.0
56-65 years	6	30.0
> 65 years	2	10.0
amount	20	100.0

Source: Data processed (2020)

Based on table 1 Diabetes Mellitus patients are divided into 6 age groups, where at the age of 17-25 years (late adolescence) 1 patient with a percentage of 5.0%, at the age of 26-35 years (late adult) 1 patient with a percentage of 5, 0%, at the age of 36-45 years (late adults) as many as 2 patients with a percentage of 10.0%, at the age of 46-55 years (early elderly) as many as 8 patients with a percentage of 40.0%, at the age of 56-65 years (late elderly) as many as 6 patients with a percentage of 30.0% and lastly at the age> 65 years (elderly age) as many as 2 patients with a percentage of 10.0% [6].

Table 2. Frequency distribution of respondents based on gender in diabetes mellitus patients

Gender	Frequency	%
Male	9	45.0
Women	11	55.0
amount	20	100.0

Source: Data processed (2020)

Based on table 2, patients with Diabetes Mellitus were dominated by 11 patients with a female gender with a percentage of 55.0%, while 9 patients were male patients with a percentage of 45.0%.

Table 3. *The frequency distribution of respondents was based on blood glucose levels in diabetes mellitus patients*

Result	Frequency (n)	Percentage (%)
Low	0	0.0%
Normal	3	15.0%
High	17	85.0%
amount	20	100.0%

Source: Data processed (2020)

Based on table 4.3, the results of blood glucose examination in Diabetes Mellitus patients obtained the most high blood glucose levels or exceeding 200 mg / dl, namely 17 patients with a percentage of 85.0%, normal blood glucose levels 150-200 mg / dl, namely 3 patients. with a percentage of 15.0% and there were no patients with low sugar levels.

The following data are obtained from the results of blood clotting tests.

Table 4. *The frequency distribution of diabetes mellitus patients based on the results of blood clotting time*

Result	Frequency (n)	Percentage (%)
Normal	12	60.0%
Elongation	8	40.0%
amount	20	100.0%

Source: Data processed (2020)

Based on table 4.3 it can be seen that, patients with diabetes mellitus who have a normal blood clotting period are 12 samples with a percentage (60.0%) and patients with blood clotting time experience lengthening as many as 8 samples with a percentage (40.0%).

DISCUSSION

In this study, blood clotting time was examined in patients with Diabetes Mellitus. Clotting period examination is the simplest predictor of coagulation factor. Clotting time measures the time it takes from tissue factor exposure to platelet-mediated clot formation and fibrin formation. Interference with timing, clotting suggests a problem with coagulation factors [20].

Based on the age characteristics, the highest Diabetes Mellitus patients were aged 46-55 years (40.0%). In terms of age, it is known that in people with Diabetes Mellitus aged> 40 years there is glucose intolerance and an aging process which results in a lack of pancreatic beta cells in producing insulin, and at the age of> 45 years there will be a decrease in body function in metabolizing glucose [2].

Based on gender, it was found that female patients with diabetes mellitus were more dominant, namely about 11 patients (55.0%) while patients with male gender were 9 patients (45.0%). Women tend to be at greater risk of suffering from Diabetes Mellitus than men, this is related to the use of injectable hormonal contraceptives containing progesterone hormones. It is suspected that the hormone used can affect insulin action in sugar metabolism [16].

Insulin resistance that occurs causes the glucose levels that enter the body's cells to decrease as a result of which glucose remains in the blood vessels resulting in high glucose levels in the body [12].

From the results of examination of blood glucose levels, it was found that high blood glucose levels exceeding 200 mg / dl were obtained as many as 17 samples (%) and the rest had normal blood glucose levels of 150-200 mg / dl in 3 samples. These results are in line with the research of Kosasih (2017), in which the body is unable to produce enough insulin to compensate for excess calorie input and causes hyperglycemia which makes blood glucose levels high.

Based on research that has been conducted on 20 samples of Diabetes Mellitus patients in the hospital. Toto Kabila showed that the results obtained were 12 samples (60.0%) with normal blood clotting time, 8 samples (40.0%) with blood clotting times above normal values or an prolongation of the blood clotting time.

Diabetes mellitus can increase coagulation activity, causing hypercoagulation with chronic platelet

activation and decreased fibrinolysis. Hypercoagulation is a disorder of blood coagulation, ie a shift in the hemostatic balance due to an increase in procoagulant factors [3].

The state of hyperglycemia, hyperinsulinemia and insulin resistance causes changes to various components that play a role in the function of hemostasis. Diabetics tend to have hypersensitive platelets to aggregation stimuli, increased levels of fibrinogen and von willebrand factor, increased activity of factor VII and factor VIII, increased levels of PAI-1, decreased levels of t-PA and levels of PGI2 (prostacyclin). Changes that occur in these various factors cause an increase in coagulation activity and a decrease in fibrinolytic activity, so that diabetics experience a hypercoagulable state where blood is easier to clot or undergo thrombosis compared to normal physiological conditions [19].

From the results obtained, the abnormal condition on the examination of blood clots was caused by faal hemostasis disorders. In previous studies, research was conducted on the relationship between blood glucose levels and blood clotting time. The results obtained are that there is a relationship between blood glucose levels and blood clotting time in diabetes mellitus patients, which is about 20% experiencing hypercoagulation [15].

Based on the results of the study, 8 abnormal samples were obtained where the results of the blood clotting time were prolonged. The results of this study are not in line with previous studies. Due to endothelial dysfunction which will reduce coagulation factors V, VII, X, prothrombin and fibrinogen and there will be increased fibrinolysis activity and decreased fibrinogen levels which are usually caused by inhibitors of coagulation factors V, VII, X [4].

Clinically, there is a result of prolonged blood clotting time examination due to interference with one or more components that play a role in the blood clotting process, one of the components that can be disrupted by the blood clotting process and plays a role in the hemostasis process, namely platelets, because in primary hemostasis, platelets play a role. which is very important. Platelets form a platelet plug at the wound site and also produce thromboxane A2 and serotonin which cause local vessel constriction [21].

Hyperglycemic conditions will change the platelets by disrupting the calcium balance resulting in platelet hyperactivity and platelet aggregation including changes in platelet shape and release of various mediators [4].

The occurrence of prolongation at the time of blood clotting can also be caused by a history of other diseases such as kidney complications experienced by people with Diabetes Mellitus. In patients with Diabetes Mellitus with chronic renal failure, bleeding disorders occur due to the level of urea that is more than normal, guanidinosuxinic acid which stimulates the endothelium to release NO (Nitric Oxyde) which is an inhibitor of platelet function against exogenous ADP (Adenosine Diposphate), reduced epinephrine collagen. [4].

CONCLUSION

Based on the results of the study, it can be concluded that the results of blood clotting period in Diabetes Mellitus patients at Toto Kabila Hospital were 60.0% of patients with normal blood clotting time and 40.0% of patients with prolonged blood clotting time.

REFERENCES

[1] American Diabetes Association. 2003. Peripheral Arterial Disease in People with Diabetes. Diabetes Care. 26: 3333 - 41.

[2] Allorerung DL, Sekplin A, Wooford BJ. 2016. The Relationship Between Age, Gender and Education Level with Incidence of Type 2 Diabetes Mellitus at Ranotana Weru Health Center, Manado City. Journal of e-Biomedics (eBM).

[3] Aprijadi H, Sumantri R, Heri T. 2014. Hypercogulable State and Type 2 Diabetes Mellitus: Correlation between fibrinogen and HbA1c. MKB, 46 (1), pp 4-51.

[4] Astiawanti Prima. 2008. Differences in the pattern of hemostatic disorders between chronic kidney disease, prehemodialysis and diabetes mellitus and non-diabetes mellitus. Thesis. Semarang. Diponegoro University.

[5] Carr, ME. 2001. Diabetes Melitus A Hypercoagulable State. Journal of Diabetes and Its Complications. 15:44 – 54.

[6] MOH RI. (2009). National health system. http://www.depkes.go.id. accessed on 30 October 2020.

[7] Gorontalo Provincial Health Office. 2019. Government of Gorontalo Province. Health Service Posbindu Surveillance Report PTM. Gorontalo.

[8] Durachim and Astuti. 2018. Teaching Materials for Medical Laboratory Technology (TLM): Hemostasis. Jakarta. PPSDM. The Indonesian Ministry of Health's Human Resources Development and Empowerment Agency.

[9] IDF. 2019. IDF DIABETES ATLAS (9th ed.). BELGIUM: International Diabetes federation. https://www.diabetesatlas.org/en/resources/. Accessed on June 15, 2020.

[10] Kluft C, Jespersen J. 2002. Diabetes as a Procoagulant Condition. The British Journal of Diabetes and Vascular Disease. 2 (5): 358-362.

[11] Makin A, Silverman SH. 2002. Peripheral Vascular Disease and Virchow's Triad for Thrombogenesis. QJ Med. 95: 199 – 210.

[12] Nurrahmini U. 2012. Stop Diabetes. Yogyakarta: Familia Group Core Media Relation.

[13] Notoatmojo, S. 2018. Health Research Methodology. Third Print. Jakarta. PT Rineka Cipta.

[14] Indonesian Ministry of Health Center for Data and Information. 2018. World Diabetes Day 2018. Jakarta. Indonesian Ministry of Health Infodatin.

[15] Safitri NE, Sukeksi A, Ariyadi T. 2017. Relationship between blood glucose levels and the time of blood clotting in outpatient diabetes mellitus patients. Imliyah's Writing. Muhammadiyah University Semarang.

[16] Sari F and Mustika P. 2015. Comparative Study of Blood Glucose Levels at Combined Injectable and Progestin Family Planning Acceptors at Bpm Yosi Trihana, Klaten Regency, Central Java, 2015. Journal of Health Samodra Ilmu. Vol. 08 No. 01. Pages: 27-31.

[17] Sugiyono. 2014. Educational Research Methods with Quantitative Approaches, Qualitative, and R & D. Bandung. Alfabeta.

[18] Sunyoto Danang. 2013. Statistics For Paramedi. Bandung. Alfabeta.

[19] Tadjoedin H., 2014. Hypercoagulability Conditions. In: Setiati, S., Alwi, I., Sudoyo, A., Simadibrata, K., Setyohadi, B., Syam, AF, editor. Internal medicine textbook. 6th ed. Jakarta. Interna publishing.

[20] Versteeg, HH, Heemskerk, JWM, Levi, M. & Reitsma, PH, 2013. New fundamentals in hemostasis. Physiological reviews, 93 (1): 327–58.

[21] Yayuningsi D, Farihatun A and Fitria. 2015. Differences in Freezing Time

of Lee And White Method and Glass Object Method. Journal. Health Analyst Diploma III Study Program. STIKes Muhammadiyah Ciamis.

[22] WHO. 2016. World Health Organization. Epidemiological Situation. https://www.who.int/leishmaniasis/burden/en/. Accessed on June 15, 2020.