The Effect of Long Suffering Diabetes Mellitus on Blood Ureum Levels

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Abstract: Diabetes mellitus is a disease characterized by increasing blood sugar levels caused by defective insulin secretion or action. Increased levels of sugar in the blood have a direct impact on the blood vessels in the kidneys. Such as decreasing the function of the kidney, the disturbing kidney function will increase the level of urea in the blood. To find out whether there is an effect of long-suffering from Diabetes mellitus on blood urea levels. This research is *analytical observational* research with a cross-sectional approach. The samples used Diabetes mellitus patients with variations in length suffering of 1-3 years, 4-6 years, and > 6 years. Data were collected and analyzed using *Kruskal Wallis* non-parametric statistical test. The average blood urea level of Diabetes mellitus patients who suffer 1-3 years, 4-6 years, and > 6 years is 29.17 mg/dL, 53.25 mg/dL, and 118.11 mg/dL. The Kruskal Wallis test showed a significant value = 0.000 < 0.05 (Pα) which indicated that the duration of suffering from Diabetes mellitus affected increasing blood urea levels.

Keywords*: Blood Ureum; Diabetes Mellitus; Long Suffering.

Introduction

Diabetes mellitus is a group of metabolic diseases with hyperglycemia characteristics that occur due to abnormalities in insulin secretion, insulin work, or both (American Diabetes Association, 2017). Hyperglycemia occurs because the body cannot release or use insulin adequately. Insulin is a hormone released by the pancreas and is the main substance responsible for maintaining blood sugar levels in the body to remain in the cells so that they can produce energy or be stored as energy reserves (Rahmi, et.al., 2018; Nababan, et.al., 2018).

Diabetes mellitus (DM) has a high prevalence according to the *International Diabetes Mellitus Federation* (IDF) atlas in 2017 reported that the prevalence of Diabetes mellitus in Indonesia still shows an increasing trend. Indonesia is ranked sixth in the world after China, India, the United States, Brazil, and Mexico with the number of Diabetes mellitus sufferers aged 20-79 years around 10.3 million people (Adelia, 2018; Prasetyorini, et.al., 2022).

The number of people with Diabetes mellitus (DM) based on the results of Basic Health Research in 2018 has the highest number found in the DKI Jakarta area at 3.4% and the lowest in NTT at 0.9%, while in NTB at 1.6% (Ministry, 2018). Based on data from the Central Lombok District Health Office, the prevalence of Diabetes mellitus is 848 people, while in 2021 the number of people with Diabetes mellitus increased to 24,832 people (Central Lombok Praya Health Office, 2020). Based on data from the Praya Regional General Hospital, Central Lombok Regency in 2021, the number of people with Diabetes mellitus is 70 people.

Increased blood sugar levels have a direct impact on several blood vessels including blood vessels in the kidneys. The kidneys function to filter the waste material that we consume and dispose of in the form of urine where normally sugar is not found in the urine. Due to the kidney filtration process that allows reabsorption back into the blood vessels. One of the substances that come out through filtering in the kidneys is urea (Rahmi, et al., 2018; Zul Adhayani Arda & Ngobuto, 2019; Fatimah, 2017).

Ureum is the end product of protein metabolism and must be removed from the body through the kidneys. But when the kidneys cannot perform their main function, one of the waste metabolism is urea cannot be removed. So it will accumulate, and make ureal levels in the blood increase, causing problems in the body (Heriansyah, et.al., 2019; Rahayu, et.al., 2022).

Based on the results of research conducted that abnormalities that occur in the kidneys of people with Diabetes mellitus begin with the presence of microalbuminuria (Puspitaningrum, et.al., 2016). Uncontrolled microalbuminuria will progress to proteinuria clinically and proceed with decreased function of glomerular filtration rate. Diabetes mellitus patients who experience microalbuminuria will cause uremia which eventually causes ureal levels in the blood to increase. The duration of suffering from glucose will result in decreased kidney function. Thus allowing an increase in ureal levels in the blood (Aquarista, 2017; Imanuel Saputra, et.al., 2023; Mentari, et.al., 2013).

Based on the above background, researchers are interested in researching the effect of long-suffering Diabetes mellitus on blood ureal levels at the Praya Regional General Hospital, Central Lombok Regency . The general purpose of the study is to find out the effect of long-suffering from Diabetes mellitus on blood ureal levels (Fatma & Martsiningsih, 2019). The specific objectives are to determine the blood serum levels of respondents who have long suffered from Diabetes mellitus for 1-3 years, to know the blood serum levels of respondents who have long suffered from Diabetes mellitus for 4-6 years, to know the blood serum levels of respondents who have long suffered from Diabetes mellitus for > 6 years, to analyze the effect of long-suffering from Diabetes mellitus on blood ureal levels (Kinasih & Nasution, 2019; Sunita & Laksono, 2019; Ambad & Dhok, 2019).

Method

The type of research used is an *Analytical Observational* study that aims to determine the effect of long-suffering Diabetes mellitus on blood urea levels in the work area of Praya Hospital, the design of the study is C*ross-Sectional* where the variables of cause or risk and effect or cases that occur in the object of research are measured or collected simultaneously (in the same time) (Notoatmodjo, S., 2010). The sample collection technique in this study uses a non-random sample technique, namely *purposive sampling* is sampling with certain criteria. This method uses criteria that have been selected by researchers in selecting samples. Sample selection criteria are divided into inclusion criteria and exclusion criteria. The inclusion criteria are the sample criteria desired by researchers, namely respondents with a long time suffering from Diabetes mellitus (DM) for 1-3 years, 4-6 years, and > 6 years and checking blood ureal

levels in the laboratory of Praya Hospital. Exclusion criteria are characteristics of population members that cannot be sampled (Sugiyono, 2013; Schneider, 2016).

The type of data obtained is secondary data. Sugiyono (2013) stated that secondary data is a source of research data obtained by researchers indirectly providing data to data collectors, for example through other people or documents and intermediary media (obtained and recorded by other parties). Data were obtained from the medical record section, and adjusted to the inclusion criteria in the study. The data recapitulation was carried out at the Praya Regional General Hospital, Central Lombok Regency from February to March 2022.

The research data was analyzed statistically with the help of the SPSS (*Statistical Product and Science Service*) computer program. To determine the effect of long-suffering from Diabetes mellitus on blood ureal levels, hypothesis testing was carried out using a double correlation test (One-Way ANOVA). One-Way ANOVA analysis is a statistical test used to determine the relationship that occurs between the dependent variable (Variable Y) and the independent variable (X_1, X_2, X_3....X_n). The One-Way ANOVA test is used to determine whether there is an average difference between more than two sample groups and only lasts one way between treatments (Inspiration, 2013).

Result and Discussion

Research on the effect of long-suffering from Diabetes mellitus on blood ureal levels. Data collection or patient medical records are carried out at Praya Hospital. The study was conducted from February 21 to March 7, 2022. The samples used in this study amounted to 60 samples. The samples used were all taken from the medical records of patient data at Praya Hospital. Samples come from people with Diabetes mellitus who have met the inclusion and exclusion criteria. Examination of blood ureal levels at Praya Hospital using the Dialab Autolyzer tool. The data analysis was carried out using *the One Way Anova* test and data processing using a computer (Alam, 2021).

Characteristics of Respondents
Gender
The characteristics of respondents in the study of the effect of long-suffering from Diabetes mellitus on blood urea levels can be seen in Table 1. Based on Table 1 of the total 60 respondents, different numbers were obtained in male and female responses, namely men as many as 17 people (28.3%) and women as many as 43 people (71.7%) (Elfianti, et.al., 2022).

Table 1. Characteristics of respondents with Diabetes mellitus by gender.

Gender	Frequency	Percentage (%)
Man	17	28.3
Woman	43	71.7
Total	60	100

Age

The characteristics of respondents in the study of the effect of long-suffering from Diabetes mellitus on blood urea levels with age can be seen in Table 2.

Table 2. Characteristics of respondents with Diabetes mellitus by age.

Age	Frequency	Percentage (%)
21 – 30	4	6.8
31 – 40	8	13.3
41 – 50	14	23.3
51 – 60	14	23.3
61 – 70	14	23.3
71 – 80	6	10
Total	60	100

According to age group, most respondents were in the age range of 41-50 years, 51-60 years, and 61-70 years, each of which amounted to 14 people (23.3%). Then followed by the age group of 31-40 years which amounted to 8 people (13.3%). While the age of 71-80 years amounted to 6 people (10%). Finally, respondents with the age range of 21-30 years amounted to the least, as many as 4 people (6.8%) (Menke,et.al., 2016; Noviyanti, 2023).

Ureum Examination Results

The results of the examination of ureal levels from 60 samples of patients with Diabetes mellitus obtained varying results, ranging from normal to abnormal ureal levels. Variations in the results of blood urea level examination in patients with Diabetes mellitus can be seen in Table 3. Based on Table 3, it can be seen that from 60 samples of people with Diabetes mellitus who suffered from the disease for 1-3 years, there were 21 respondents with variations in blood ureal levels, which on average still included normal ureal levels (Swayze, et.al., 2021; Tandi, et.al., 2022).

Table 3. Results of examination of ureal levels in patients with Diabetes mellitus 1-3 years.

No	Long-suffering from Diabetes mellitus1-3 years	Ureal content (mg/dL)
1	Sample 1	23.6
2	Sample 2	26.6
3	Sample 3	31.3
4	Sample 4	19.4
5	Sample 5	28.3
6	Sample 6	23.8
7	Sample 7	27.5
8	Sample 8	26.4
9	Sample 9	16.5
10	Sample 10	35.1
11	Sample 11	20.1
12	Sample 12	23.4
13	Sample 13	28.2
14	Sample 14	25.3
15	Sample 15	27.8
16	Sample 16	38.2
17	Sample 17	40.1
18	Sample 18	42.8
19	Sample 19	29
20	Sample 20	37.1
21	Sample 21	42
	Average	29.17

The lowest ureal level was 16.5 mg/dL and the highest was 42.8 mg/dL. Blood ureal levels in respondents suffering from Diabetes mellitus within 4-6 years can be seen in Table 4.

Table 4. Results of examination of ureal levels in patients with Diabetes mellitus 4-6 years

No	Long-suffering from Diabetes mellitus4-6 years	Ureal content (mg/dL)
1	Sample 1	47.6
2	Sample 2	58
3	Sample 3	44.9
4	Sample 4	46.2
5	Sample 5	64.3
6	Sample 6	45.5
7	Sample 7	52.6
8	Sample 8	45
9	Sample 9	47.6
10	Sample 10	53
11	Sample 11	63
12	Sample 12	62.5
13	Sample 13	47.1
14	Sample 14	55.1
15	Sample 15	44.2
16	Sample 16	52.1
17	Sample 17	57.3
18	Sample 18	62.3
19	Sample 19	64.7
20	Sample 20	45.2
21	Sample 21	53
22	Sample 22	59.2
23	Sample 23	63.1
24	Sample 24	44.5
	Average	53.25

Based on Table 4, it can be seen that from 60 samples of people with Diabetes mellitus who suffered from the disease for 4-6 years, there were 24 respondents with variations in blood ureal levels that had exceeded normal limits. The lowest real level was 44.2 mg/dL and the highest was 64.7 mg/dL. Blood ureal levels in respondents suffering from Diabetes mellitus within a period of > 6 years can be seen in Table 5.

Table 5. Results of examination of ureal levels in patients with Diabetes mellitus > 6 years.

No	Long-suffering from Diabetes mellitus> 6 years	Ureal content (mg/dL)
1	Sample 1	130
2	Sample 2	201.2
3	Sample 3	139.7
4	Sample 4	199.8
5	Sample 5	77.9
6	Sample 6	132.3
7	Sample 7	79.3
8	Sample 8	75.1
9	Sample 9	96.3
10	Sample 10	78.2
11	Sample 11	80.8
12	Sample 12	151.9
13	Sample 13	95.2
14	Sample 14	98.2
15	Sample 15	102.8
	Average	115.91

Based on Table 5, it can be seen that from 60 samples of people with Diabetes mellitus who suffered from the disease for > 6 years, there were 15 respondents with variations in blood ureal levels that had exceeded normal limits. The lowest real level was 75.1 mg/dL and the highest was 201.2 mg/dL.
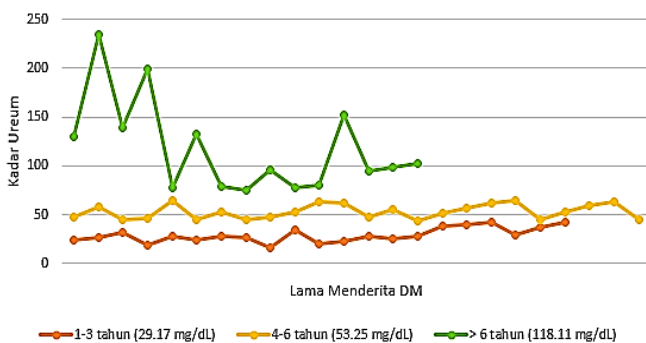

Figure 1. The results of the study examined blood ureal levels

Data Analysis of Statistical Test Results

To determine the effect of long-suffering from Diabetes mellitus on blood ureal levels, a normality test using *Shapiro-Wilk* and a homogeneity test using the *Levene Statistical Test* were first carried out. After normality and homogeneity tests, statistical tests were carried out with a confidence level of 95% (α = 0.05).

Normality and Homogeneity Test

Data from the examination of blood ureal levels in patients with Diabetes mellitus were carried out through statistical tests using the SPSS program which was analyzed using the *Shapiro-Wilk* Test at a confidence level of 95% (α = 0.05) which aimed to determine the results of the study were normally distributed or not before the *One Way Anova* test was carried out. While the homogeneity test *Levene-Statistical Test* aims to determine the homogeneity of variance. The results of

the normality and homogeneity test determine the type of statistical test to be used. The results of the *Shapiro-Wilk* normality test and the *Levene-Statistical Test* homogeneity test can be seen in the appendix.

Based on the results of the *Shapiro-Wilk* normality test for research data on the effect of long-suffering from Diabetes mellitus on blood ureal levels, evidenced by data whose Sig. value < 0.05. The data is not normally distributed because there is only 1 variable that has a probability value of more than the signification value of 0.05, while the other 2 variables have a probability value less than the signification value of 0.05. The data requirement is said to be normally distributed if the probability value of all variables exceeds the signification value of 0.05. Based on the results of the normality test and homogeneity test, the results are not normally distributed, so they use an alternative non-parametric statistical test, namely *Kruskal-Wallis*.

Kruskal-Wallis Statistical Test

The results of *the Kruskal Wallis* test to determine the effect of long-suffering from Diabetes mellitus on blood ureal levels can be seen in Appendix 6 of statistical test result data. Based on the results of research on the effect of long-suffering from Diabetes mellitus on blood ureal levels not normally distributed, the *Kruskal-Wallis* test was carried out using the SPSS program at a confidence level of 95%. The results of the *Kruskal-Wallis* test show that Sig.= (0.000) < (0.05) which means there is a long influence of suffering from Diabetes mellitus on blood ureal levels (Oktora & Butar Butar, 2022).

Diabetes mellitus (DM) is a disease caused by metabolic system disorders in the body, where there is an imbalance in the need for insulin intake. Diabetes mellitus is caused by increased levels of glucose in the blood that exceed normal limits (Adelia, 2018). Based on the results of the research data, it was found that there were more female respondents than men. The large number of female respondents suffering from Diabetes mellitus may be caused by women's activities and lifestyles that do not pay attention to health aspects (Dendup, et.al, 2018).

This is following the statement of states that women are more at risk of developing Diabetes mellitus because women have higher LDL or bad cholesterol than men and there are also differences in doing all activities and lifestyles daily which greatly affect the incidence of a disease (Dona Amelia & Dewi Kurniawati, 2018). In addition, the amount of fat in adult males on average ranges from 15-20% of total body weight, and in women about 20-25%. So, the increase in lipid levels (blood fats) in women is higher than in men, so the risk factor for Diabetes mellitus in women is 3-7 times higher than in men, which is 2-3 times (Jelantik & Haryati, 2017).

Based on the results of research using patient medical record data with variations in the length of time suffering from Diabetes mellitus 1-3 years, 4-6 years, and

> 6 years, results were obtained the longer the patient had Diabetes mellitus, the higher the blood ureal levels. Based on the results of the *Shapiro-Wilk* normality test where there are data with a significant value of < 0.05, the data requirement is said to be normally distributed if the probability value of all variables exceeds the signification value of 0.05. As for the results of the *Kruskal-Wallis* homogeneity test, it shows significant values = (0.000) < (0.05), which means that there is a long influence of suffering from Diabetes mellitus on blood ureal levels (Tilome, et.al., 2022).

High ureal levels of some respondents because in Diabetes mellitus patients insulin secretion is deficient or reduced biological effectiveness of insulin, due to lack of insulin, sugar cannot be converted into glycogen so blood sugar levels increase and hyperglycemia occurs, in this event will cause microvascular complications that are about small blood vessels in the kidneys can not filter and absorb a certain amount of sugar in the blood, One indicator of kidney function is to assess the *Glomerular Filtration Rate* (GFR). GFR provides information about the amount of kidney tissue that functions, if the GFR value decreases, blood ureal levels will increase (Hestiana, 2017).

Based on the results of the study using patient medical record data at Praya Hospital, several respondents with ureal levels exceeding normal values. Especially in respondents who suffer from DM > 6 years, as seen in samples number 2 and 4 which have blood ureal levels of 234.1 mg / dL and 199.8 mg / dL. For patients with DM, 4-6 years have begun to increase their ureal levels, in contrast to respondents who suffer from DM for 1-3 years their ureal levels are still within normal values. The high blood urea levels of respondents occurred due to complications from DM suffered and decreased kidney function, which also resulted in plasma urea levels due to decreased urea excretion in the urine (Rivandi & Yonata, 2015; Bellou, et.al., 2018).

The kidneys function to filter the waste material that we consume and dispose of in the form of urine where normally sugar is not found in the urine due to the kidney filtration process that allows reabsorption back into the blood vessels (Jasim & Jabbar, 2023). One of the substances that comes out through filtering in the kidneys is urea. But when the kidneys cannot perform their main function, one of the waste metabolism is that the area cannot be removed, so it will accumulate, and make real levels in the blood increase, causing problems in the body, such as glomerulosclerosis damage, which is damage to the filtering unit in the kidneys (Kamilah, et.al., 2021; Ratnasari, et.al., 2023).

Conclusion

Based on the research results, it was concluded that: (1) The average blood urea level of patients suffering from Diabetes mellitus for 1-3 years is 29.17 mg / dL; (2) The average blood urea level of patients suffering from Diabetes mellitus for 4-6 years is 53.25 mg / dL; (3) The average blood urea level of patients suffering from Diabetes mellitus for > 6 years is 118.11 mg / dL; (4) There is a long influence of suffering from Diabetes mellitus on the patient's blood ureal levels.

Conflicts of Interest
The author declares no conflict of interest

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