Ureum and Creatinine Health Study in Patients Diabetes Mellitus

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Abstract

Diabetes mellitus is a metabolic disease that is marked by an increase in blood glucose levels exceeds normal limits. One of the effects of diabetes mellitus is kidney function disorder. Many researches about diabetes mellitus found that patients have uncontrolled levels of urea and creatinine. The purpose of this study was to determine urea and creatinine levels in patients with diabetes mellitus. The research method uses a descriptive approach to determine urea and creatinine levels among diabetes mellitus patients. The results of this study based on the participant characteristics were 47.3% male respondents and 52.7% female respondents, then based on diabetic aged >45 years was 90.95% and <45 years 9.1%. Based on disease duration, illness for five years was 65.5%, 6-10 years 16.3% and >10 years was 18.2%. The overall creatinine and urea levels were normal. The conclusion of this study is a general description of urea and creatinine levels in the study sample within normal limits. However, the age factor of patients less than 45 years and the duration of illness from 6 to 10 years has a risk of increased levels of urea and creatinine in the blood.

Keywords
Diabetes mellitus, urea, creatinine, age

INTRODUCTION

Metabolic diseases are medical disorders that affect the production of energy in the human body cells. Generally, genetic disorders result in disruption of metabolism, so the enzymes that play a role in cell metabolism processes are lost or damaged. A degenerative disease that needs to be our concern recently is Diabetes mellitus because it is one of a severe health problem worldwide. After all, there tends to be an increase case number in future. Diabetes mellitus is a metabolic disease characterized by an increase in blood glucose levels exceeding the normal. The cause is impaired insulin secretion or insulin action; therefore, it happens to result in metabolic disorders of fats, and protein failure of various microvascular organs, especially that eyes,

kidneys, nerves, and complications including heart disease and stroke (1,2).

Data from the World Health Organization (WHO) stated that from various types of Diabetes Mellitus. Diabetes Mellitus Type 2 (DMT2) is a type that has the highest percentage (90–95%). 80% of DMT2 patients are in low-income countries or medium with an age range of 40–59 (3). The prevalence of DMT2 in several countries developing due to increased prosperity in the country. According to the data released there are known to be 415 million people in the world suffering from Diabetes Mellitus (4). Based on the 2019 International Diabetes Federation (IDF), 10,7 million people are living with Diabetes Mellitus in Indonesia. Henceforth, the predicted prevalence of diabetes mellitus in Indonesia during the year 2030 and 2045 will reach 13.7 and 16,6 million (4).

Changes in lifestyle that hit most of Indonesian resulted in an increase of some diseases such as obesity, Dyslipidemia and Diabetes Mellitus. According to *PERKENI* (Endocrinology Society of Indonesia), a person with Diabetes if the blood sugar levels when ≥200 mg/dL, fasting blood sugar levels ≥126 mg/dL and blood sugar levels postprandial which is a continuation of the fasting blood sugar test ≥ 200 mg/dL (5).

Diabetic nephropathy (microvascular complications) is a disorder that occurs in the kidney caused by diabetes mellitus (6). This kidney function disorder characterized by decreased Glomerolus Filtrate Rate (GFR) followed with an increase in urea and creatinine. Diabetic nephropathy is a condition kidney that not only experiences disposal failure but lost large amounts of protein, specifically albumin. Albumin is the resulting metabolism of proteins stored in the blood.

Laboratory tests related to diabetes mellitus as a diagnostic examination is when blood sugar, fasting blood sugar, blood sugar postprandial, blood sugar tolerance test and HbA1C. Fasting blood sugar, i.e. examination of sugar levels when the patient is fasting 12 hours before examination (7,8). HbA1c is the specific glycated haemoglobin as a result addition of glucose to the N-terminal valine in the Beta chain haemoglobin (B-N [1-deoxy] fructosyl-Hb). The concentration of HbA1c depends on blood glucose concentrations and erythrocyte life span. HbA1C describes the average patient's long-term blood glucose for 2–3 months with good control value (HbA1C level <6,5%), moderate control (HbA1C level 6,5%–8%), and poor control (HbA1C level >8%). The most HbA1C examination widely used and is a gold standard for glycemic monitoring as well as inhibits inflammation that often occurs (9). HbA1C is checking with using blood ingredients, to obtain information on blood sugar levels in

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fact, because the patient cannot control the test results, in a period time 2–3 months. This test is useful for measuring the level of sugar bonds in haemoglobin A (A1C) throughout the life of red blood cells (120 days) (9).

The laboratory test to know and prevent complications in the kidneys is urea and creatinine. Urea is the result of protein metabolism. It came from the amino acids that the ammonia has transferred in the liver and reach the kidneys, and excreted an average of 30 grams a day. Normal blood urea level is 20–40 mg per 100 mL of blood, but this depends on the amount of normal protein that is eaten and liver function in urea formation. Creatinine is a waste product from the creatine phosphate repairment that occurs in muscle, excreted through the kidneys. (10,11,12).

According to medical record data of outpatients, 9600 patients are with diabetes mellitus. Outpatients are mostly patients from the Social Security Administrator for Health (*Badan Penyelenggaraan Jaminan Sosial Kesehatan/BPJS Kesehatan*) and they do not do kidney examination since the beginning because of the limited examination fees provided by the BPJS Kesehatan. Based on the background above, the researcher is interested in determining the description of Ureum and Creatinine in Patients with Diabetes Mellitus.

MATERIALS AND METHODS

The tools used in this study include equipment blood sampling (syringes, non-anticoagulant vacuum tubes, alcohol swabs, plasters, tourniquet, label), chemistry analyzer (Pentra 400), centrifuge and micropipette. The ingredients used in this study include serum blood; Ureum ABX reagents; ABX creatinine reagents; Multical and Normal controls calibrator.

This research was conducted in the laboratory of the Qadr Hospital and used descriptive research type. The primary purpose of this research was giving a description or description of urea and creatinine in patients with diabetes mellitus. The source of data used in this study is primary data. The populations in this study were diabetics who carried out blood sugar control to the laboratory. The sampling technique in this study was Simple Random Sampling, which is a simple sampling, where each element of the population has an equal chance of being selected as a subject. The sample in this study was diabetic patients as many as 55 respondents. This study approved by Qadr Hospital Ethical Commission with the letter of Ethical Approval Number 016/RSQ/E.P/I/2018. Microsoft Excel used for data collection and the data analysis used IBM SPSS 25. Data analysis included test the frequency data for respondent characteristics based on sex, age, creatinine level, and urea level. The

description testing for urea levels and creatinine levels of respondents used the bar graphs.

RESULTS

The results of research conducted at the Laboratory of Qadr Hospital obtained from 52.7% of female patients and 47.3% male patients. Based on the age characteristic, patients aged ≥45 years was 90.9%. The respondent's characteristics; previous urea and creatinine levels showed in Table 1.

Table 1. Characteristics of diabetes mellitus patients

No	Parameter	%	N (number)
1	**Gender**		
	Male	47.3	26
	Female	52.7	29
2	**Age**		
	< 45 Years	9.1	5
	≥ 45 Years	90.9	50
3	**Long been sick**		
	≤5 Years	65.5	36
	6–10 Years	16.3	9
	>10 Years	18.2	10
4	**Urea levels (mg/dL)**		
	≤40	80	44
	> 40	20	11
5	**Creatinine levels (mg/dL)**		
	≤ 1.5	83.6	46
	> 1.5	16.4	9

Table 2. Creatinine Quality Control

Name	Unit
TV	40.0
Average	39.9
SD Pabrik	2
SD	1.84
CV %	4.61
d%	-0.32
Min	37
Max	43
Normal value of male	8–24 mg/dL
Normal value of female	6–21 mg/dL

Table 3. Ureum Quality Control

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Table 2 and Table 3 described the quality control of creatinine and urea. The objective of the quality control is that the inspection

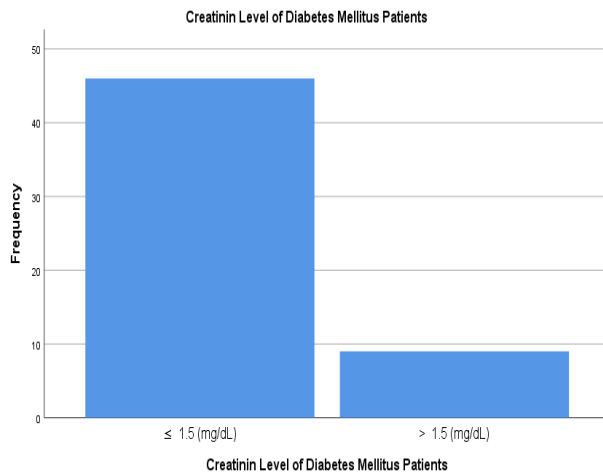quality complies with Westgard standards and the results are valid.

Fig 1. Creatinine level

Fig 2. Urea level
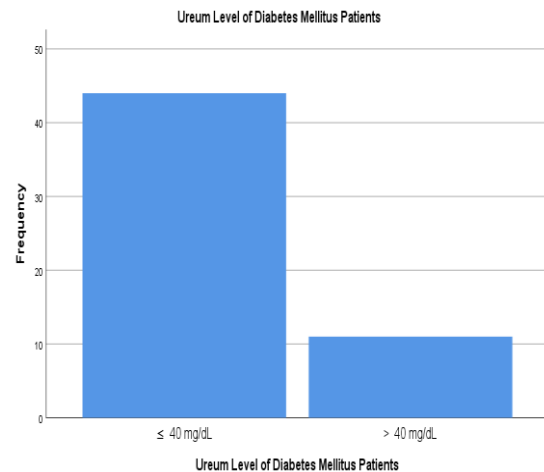
Based on the Figure 1, the urea level <40 mg/dL was 80% (44 people) and> 40 mg / dL was 20% (11 people). In addition, creatinine levels <1.5 mg / dL was 83.6% (46 people) and >1.5 mg/dL which was 16.4% (9 people) (Figure 2). Based on data, urea and creatinine levels are still within normal limits for patients with diabetes mellitus

DISCUSSION

One of the effects of diabetes mellitus is impaired kidney function, where urea and creatinine levels rise above the normal (11). In this study, patients with Diabetes Mellitus in patients at Qadr Hospital were determined based on the doctor's diagnosis and recorded on the patient's Medical Record status. The examination of urea and creatinine levels was usual examination requested by doctors at

Qadr Hospital to see impaired kidney function. Not all diabetics who control blood sugar also do urea and creatinine checks, so people with diabetes do not know the state of their kidney function at that time.

Based on Table 2 and 3, the mean value of creatinine and urea level is 39.9%, the standard deviation is 1.84, Variation coefficient 2.1%, limit d% 3 and limit CV 5. Valid accuracy of conclusion, accurate results of precision and also the precise distribution of numbers generated nothing exceeds the rating limit Westgard rules. The results of research on quality control are the same, the value of the limit d% 5 and the CV 3 limit according to the Westgard method. Precision and accuracy are both as a result of the examination (13).

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The description obtained by researchers on the sex characteristics in Table 1 showed that female is suffering from diabetes mellitus more than male. This result is in line with the results of the Basic Health Research (*Riset Kesehatan Dasar/Riskesdas*). Riskesdas result in 2013 showed that there is an increase in women by 7.7% and men by 5.6% in the number of patients with diabetes mellitus. Diabetes mellitus in women cause by less physical activity than men moreover women's habits consume foods containing chocolate, sugar and fast food snacks (14). This little physical activity makes the body do not use a lot of carbohydrates or glucose and trigger the occurrence of metabolic diseases such as diabetes.

The results of research in patients with diabetes mellitus aged $\geq$45 years is more than 90%. This evidence is in line with the data obtained from IDF that most diabetics have an average age of 40-59 years. In this age range, the ability of pancreatic β-cells to produce insulin begins to decline according to the ageing process in humans. But that cannot be cured, only reduce the severity of diabetes mellitus (2).

The results of the research based on the duration of diabetes mellitus (Table 1), showed more than 65% of respondents have diabetes mellitus for more than five (5) years. The period of diabetes mellitus sufferers up to 10 years shows the success of patients with good control of blood sugar levels. It is

possible because of the influence of various factors, namely adherence of patients taking medication, adherence to checking their blood sugar levels to the laboratory or compliance of patients with maintaining their lifestyle and diet.

In theory, diabetes mellitus can cause kidney dysfunction (8). Based on the study result in Table 1, showed that more than 80% urea levels of diabetic respondents were at a normal level (≤40 g/dL). The average urea level was 34.54 mg/dL in the age group ≥45 years or still within normal limits. This result showed that people with diabetes mellitus still have normal kidney function therefore it is possible that people with diabetes mellitus success in controlling blood sugar levels.

The parameters of kidney function are creatinine levels. The result of this research obtained that 83.6% of creatinine levels of patients were within the normal range (≤ 1.5 mg/dL). The highest creatinine level (2.48 mg/dL) was in the age group of more than 45 years. This evidence shows that the kidney function of patients with diabetes mellitus is still normal. However, the level of creatinine significantly increased in patients aged <45 years. As long as the length of patients has diabetes mellitus, the level of urea and creatinine will increase in the range of 6 to 10 years.

The average condition of kidney function in patients with diabetes mellitus is in good condition. However, there is a tendency for

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an increase in urea and creatinine levels the age of <45 years or the range of illness in 6-10 years. That evidence is almost in line with the results of a study of 35–45% of people with diabetes mellitus experiencing complications of diabetic nephropathy, which results in kidney failure. Although the risk factors that influence are not examined (15)

CONCLUSIONS

This study concludes that urea and creatinine levels in the study sample were within normal limits. However, the age factor of patients less than 45 years and the duration

of illness from 6 to 10 years has a risk of increased levels of urea and creatinine in the blood. Further research needs to be done with a focus on Type-2 Diabetes Mellitus using a different research design, especially at the age of <45 years with a length of 6–10 years.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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