

Comparison of Ureum Plasma Level between Controlled Type 2 Diabetes Mellitus and Uncontrolled Type 2 Diabetes Mellitus

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Abstract Diabetes mellitus is characterized by chronic hyperglycemia, Diabetes mellitus is associated with absolute or relative deficiencies in insulin secretion, insulin action or both. Diabetic nephropathy occur in approximately in one third type 2 diabetic patients which are uncontrolled. In diabetic nephropathy, bio-markers such as serum urea and creatinine are known to be raised with hyperglycemia and usually correlate with severity of kidney damage. Urea and creatinine are good indicators of a normal functioning kidney and increase in the serum are indications of kidney dysfunction. Objective of this study is to compare ureum plasma level between controlled type 2 diabetes mellitus (CT2DM) and uncontrolled type 2 diabetes mellitus (UCT2DM). This study is descriptive analytic research method with across-sectional design. It involved 40 patients, sample population is all of type 2 diabetic patients in the Primary Health Care in Binjai city of North Sumatera Indonesia in accordance with the inclusion criteria. Subjects divided into two groups each group consisted of 20 subjects the two groups are UCT2DM patients and CT2DM. Estimation of ureum level was done by the modified Berthelot's method with spectrophotometry. t-test was used to compare the ureum level. The average ureum level of the UCT2DM patients is 28.05 mg/dl, the CT2DM patients is 27.58 mg/dl. This study showed that there was significant difference between CT2DM and UCT2DM ($p < 0.005$). This findings showed that good control of blood glucose level is absolute requirement to prevent progressive renal impairment.

1 INTRODUCTION

Diabetes mellitus (DM) is classified based on chronic hyperglycemia the increasing of blood glucose level that is caused by misarrangement in metabolism of fat, carbohydrate, and protein. DM is connected relatively or absolutely with decreasing in insulin secretion or/ and insulin action (Kanwar et al., 2015). DM affects above 170 million people in the world and keep increasing up to 370 million in 2030 according to the World Health Organization (WHO) (Wild et al., 2004., Mehta, 2006). At the present time, around 217 million people live with DM, above 350 million people will live in that condition by 2030 (Smyth and Heron, 2006., Yach et al., 2006). The data from regional International Diabetes Federation (IDF) demonstrates that Southeast Asia ranked second in the world 3 and the number of diabetics in Indonesia was ranked seventh in the world in 2013 (Riskesdas, 2013). Type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM) are clear diseases due to

either disfunction of pancreatic to synthesize insulin or ineffectiveness of insulin maintaining blood glucose level that is still in the physiologic range (Karla, 2012). The risk factors for T2DM are obesity, poor diet, sedentary lifestyle, increased age, family history and metabolic syndrome (Kasper et al., 2005). Diabetic nephropathy occur on the order of one third T2DM patients which are uncontrolled (Rehman et al., 2005). Diabetic nephropathy is classified based on albuminuria above 300 mg/24-hour urine collection and disfunction of renal as shown by the increasing of creatinine serum level and urea serum level. Diabetic nephropathy Clinically, is diagnosed based on proteinuria and, decreasing of glomerular function rate (GFR), (Melmed, 2016). In diabetic nephropathy, bio-markers like serum urea and creatinine are known to be increased with hyperglycemia and usually associate with severity of kidney damage (Melmed, 2016., Zimmet et al., 2001). The good indicators to determine whether kidney is in normal function are urea serum level and creatinine serum level. The

increasing of these serum indicates dysfunction of the kidney (Kamal, 2014). Blood tests for Blood Urea Nitrogen (BUN) which is a major nitrogenous end product of protein and amino acid catabolism and creatinine which is a breakdown product of creatine phosphate in muscle are excreted by kidneys are used routinely instead of urine analysis which is discomforting for patients (Kamal, 2014., Gowda et al, 2010). The aim of this study is to compare ureum plasma level between controlled type 2 diabetes mellitus (CT2DM) and uncontrolled type 2 diabetes mellitus (UCT2DM).

2 METHODS

This is a descriptive analytic research study with cross-sectional design. 40 patients included, in this research consecutive sampling method used to enroll the subjects, population of the sample is all of the patients in the Primary Health Care in Binjai city of North Sumatera Indonesia that is diagnosed as type 2 diabetes mellitus then the subjects divided in to two groups the first one is the group of UCT2DM 20 subjects and the second one is the group of CT2DM included 20 subjects, it separated based on clinical laboratory test of Hba1c. the value of Hba1c 6.5-8% was classified as CT2DM and the value of Hba1c > 8% was classified as UCT2DM. The inclusion criteria were, aged > 40 years old, have a will to join this research and cooperative and exclusion criteria were, in the middle of cancer and diuretic therapy. The approval of this research was obtained from Health Research Ethical Committee, Medical Faculty of University Sumatera Utara /H.Adam Malik General Hospital number 591/TGL/KEPK FK USU-RSUP HAM 2018. We examined each sample by their weight, height, abdominal circumference, blood pressure, and we did the clinical laboratory tests such as fasting blood sugar levels and Hba1c and ureum plasma levels as well by using secondary data, we estimated the ureum levels by Berthelot's method that is modified. We collected plasma using standart protocol with EDTA then we add urease and incubated for 20 minutes in 37°C then we add reagen 1 and 2, incubated for next 20 minutes in 37°C and we did the spectrophotometry with wavelength 546±548 nm. The measurement of Hba1c was done in Thamrin clinical laboratory. The informed consent were given to all subjects. The data were analyzed using T-Test and p value<0.005 was considered as significant.

3 RESULT AND DISCUSSION

Table 1. Baseline characteristic of 40 subjects.

	UCT2DM	CT2DM
Age (yo)	56.2±9.2	60.6±7.3
BMI (kg/m ²)	26.5±3.5	25.7±4.1
waist size (cm)	92.4±5.2	93.1±9.0
FBS (mg/dl)	219.1±92.4	155.6±45.2
Hba1C (%)	9.7±1.0	8.0±1.8
Ureum (mg/dl)	28.05±7.45	27.58±7.20
Systole(mmHg)	124.9±18.2	144±30.6
Diatole(mmHg)	77.6±7.3	89.1±17.3

Between 40 patients of T2DM, the male were 30.4% and the female were 69.6%. Baseline characteristic of the samples are shown in table 1. In this research the average age of the uncontrolled T2DM patients is 56.2 years old, the controlled T2DM patients is 60.6 years old. The average BMI of the uncontrolled T2DM patients is 26.5 kg/m², the controlled T2DM patients is 25.7 kg/m². The average waist size of the uncontrolled T2DM patients is 92.4 cm, the controlled T2DM patients is 93.1cm. The average FBS of the uncontrolled T2DM patients is 219.1 mg/dl, the controlled T2DM patients is 155.6 mg/dl. The average Hba1C of the uncontrolled T2DM patients is 9.7%, the controlled T2DM patients is 8.0%. The average ureum level of the uncontrolled T2DM patients is 28.05 mg/dl, the controlled T2DM patients is 27.58 mg/dl. The average systole of the uncontrolled T2DM patients is 124.9 mmHg, the controlled T2DM patients is 144mmHg. The average diastole of the uncontrolled T2DM patients is 77.6 mmHg, the controlled T2DM patients is 89.1 mmHg. All of the group samples showed the above normal of ureum levels, which the normal value is 7-20mg/dl. We have already known that the ureum plasma value demonstrated the function of the renal. The aim of this study is to compare ureum plasma level between CT2DM and UCT2DM. So we used the T-test statistical analysis to analyze the value of both groups sample. This study showed that there was significant difference between CT2DM and UCT2DM (p<0.005). When there is a damage in kidney or it does not work properly an increase in urea level will be seen. Increasing of blood sugar level followed by increasing blood urea level clearly indicates that there is a damage in the kidney. Research conducted by Anjaneyulu *et al.*, 2004 had found that increase urea and serum creatinine in diabetic rats indicates

progressive renal damage (Anjaneyulu et al., 2004). In our study, the increasing in serum urea levels associated with the severity of diabetes, this finding is in accordance with the fact that serum creatinine and urea are used as important markers of Glomerular Filtration Rate (GFR) (Deepa et al., 2011). Our study is inline as well with the study that was conducted by Sugam S *et al* that found that diabetic patients have higher serum urea in compare to non-diabetic patients. They reported that 18 out of 103 diabetes samples have high urea level. An another study also showed that the increase in mean values of serum urea $136.03 \pm SD 74.6$ mg/dl in kidney disease patients with Diabetes mellitus (Mittal et al, 2010). The increasing levels of serum urea is one of the important measures of a damage in glomerular which can, in no way be reversed by intensive treatment plan of lowering glucose level in diabetic patients. The only way to control the progressiveness of glomerular damage and thereby increasing levels of serum urea is the early detection and intervention.

4 CONCLUSION

The major cause of renal morbidity and mortality in DM, and diabetic nephropathy is one of the major cause of chronic kidney failure. One of the indicator that is widely used to examine the renal function failure is blood urea and creatinine levels, it is simple and useful biomarkers that can be a predictor test to examine kidney functions (nephropathy) in DM patients. Blood glucose levels that is in good control helps to prevent the progressiveness of renal impairment and one of major cause of chronic renal failure which is diabetic nephropathy. The good control of blood glucose level is the most important requirement in preventing the progressiveness of renal impairment. In order to monitor the control of blood glucose level along with blood sugar blood urea can also be important parameter as we found that there is strong correlation of blood sugar and urea level.

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