

Evaluation of the Relationship between Renal Dysfunction (Urea and Creatinine Levels) and Cardiac Pathology Indicators in Diabetic Patients

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Abstract: The current study was conducted in order to find out the elevated levels of urea and creatinine in the blood serum of diabetics are considered an indicator of cardiovascular disease. city. The study was designed on 60 person in August 2025 at Kirkuk City, 20 patients with diabetes without cardiovascular disease, 20 diabetic patients with cardiovascular disease who were hospitalized to Kirkuk General Hospital and 20 person as control. The patients were 30 men and 30 women, with ages ranging from 50 to 70. Information such as age, sex, weight, blood pressure, illness symptoms, smoking, and diet adherence were collected and entered into a questionnaire created specifically for this purpose. Tests for renal function (creatinine and urea) and fasting blood sugar were performed in the hospital lab. According to the findings, patients had higher than usual amounts of sugar, urea, and creatinine—all of which are markers of the risk of cardiovascular disease.

Keywords: Fasting Blood glucose, Creatinine, Diabetes mellitus, Urea, Cardiovascular disease.

Introduction :

Diabetic mellitus (DM) is a group of metabolic disorder of carbohydrate metabolism in which glucose is underused, producing hyperglycemia. Different statistics have led to diabetes being described as one of the main threat to human health in the 21st century .(1) DM is the major cause of renal morbidity and mortality.(2)

Measurement of the plasma urea and creatinine is widely regarded as a test of renal function.In addition to suggesting possible pathological alterations in the kidney, renal dysfunction may also have an impact on other organs and systems due to disruptions in body homeostasis.(3) One of the systems most impacted by renal function decline is the cardiovascular system.(4) Diabetes patients are susceptible to a number of problems that can lead to a reduced quality of life, incapacity, and early death. One cardiovascular consequence of diabetes mellitus is coronary artery disease CAD.(5)

A protein metabolic product, blood urea (BUN) is sensitive to variations in hemodynamic and renal perfusion and is influenced by external variables. Research has indicated a substantial correlation between BUN and death in heart failure patients.(6) Research has shown that there is a strong correlation between BUN level and cardiac output, as well as hydration status, suggesting BUN is associated with overall prognosis of CHF patients.(7) The glomerular filtration capacity is the primary determinant of serum creatinine (SCr). According to earlier meta-analyses, a compromised renal function, is linked to a higher chance of incident CAD.(8) Furthermore, recently, the blood urea nitrogen to creatinine ratio (UCR) has emerged as an independent predictor of adverse clinical outcomes in various population settings, such as acute kidney injury,(9) chronic heart failure,(10)

and ischemic stroke.(11) The current study was based on patients who visited Kirkuk General Hospital in Kirkuk City, had diabetes, and had cardiovascular disease, which led to their hospitalization. Following laboratory testing for kidney functions, we discovered that the majority of the patients had abnormal blood levels of creatinine and urea compared to normal levels, which suggests a correlation between the two conditions as indicators of cardiovascular disease.

Materials and Methods :

Blood samples were collected from 40 patients admitted to Kirkuk General Hospital in Kirkuk City during August 2025 in the cardiopulmonary resuscitation unit and the emergency unit. The patients' ages ranged between 50 and 60 years. Blood serum was separated, and blood glucose, urea, and creatinine were analyzed in the hospital laboratories for all samples. The results were recorded in two tables; the first included gender, age, and (S, U, Cr) tests for diabetics without cardiovascular disease. The second table included gender, age, and (S, U, Cr) tests for diabetics with cardiovascular disease. The results were statistically analyzed, by using Spss statistical software, and graphs were drawn.

Results :

The data were analyzed by extracting the arithmetic mean for all studied samples and distributing them in a table divided into three groups including fasting blood sugar, urea, and creatinine, for the groups: control, diabetics without symptoms of cardiovascular disease, and diabetics with cardiovascular disease, as shown below:

Result	fasting blood sugar(S)
74	Control group
209.4	Group of diabetic patients without cardiovascular symptoms
192.3	Group of diabetic patients with cardiovascular disease
Result	Urea(U)
34	Control group
40.54	Group of diabetic patients without cardiovascular symptoms
87.5	Group of diabetic patients with cardiovascular disease
Result	Creatinine (Cr)
0.7	Control group
0.9	Group of diabetic patients without cardiovascular symptoms
2.04	Group of diabetic patients with cardiovascular disease

Table (1) Blood sugar, urea and creatinine for the studied groups

- 1- As shown in the figure (1) Diabetic Patients with CVD: This group has the highest average fasting blood sugar level at 209.38 mg/dL. Diabetic Patients without CVD: This group also shows elevated levels, though slightly lower than the first group, with an average of 202.25 mg/dL. This still represents hyperglycemia and inadequate management of diabetes. Control Group: The control group has a normal, healthy fasting blood sugar level of 74 mg/dL, which falls well within the standard normal range (typically 70-100 mg/dL).

The most critical observation is that the diabetic group with cardiovascular disease has the highest average FBS. This strongly suggests a link between poor glycemic control and the development or progression of cardiovascular complications. The fact that both diabetic groups have severely elevated FBS levels (both >200 mg/dL) compared to the control group highlights that all diabetic individuals in this study are at high risk. Data from the National Heart

Association from 2012 shows 65% of people with diabetes will die from some sort of heart disease or stroke.(12)

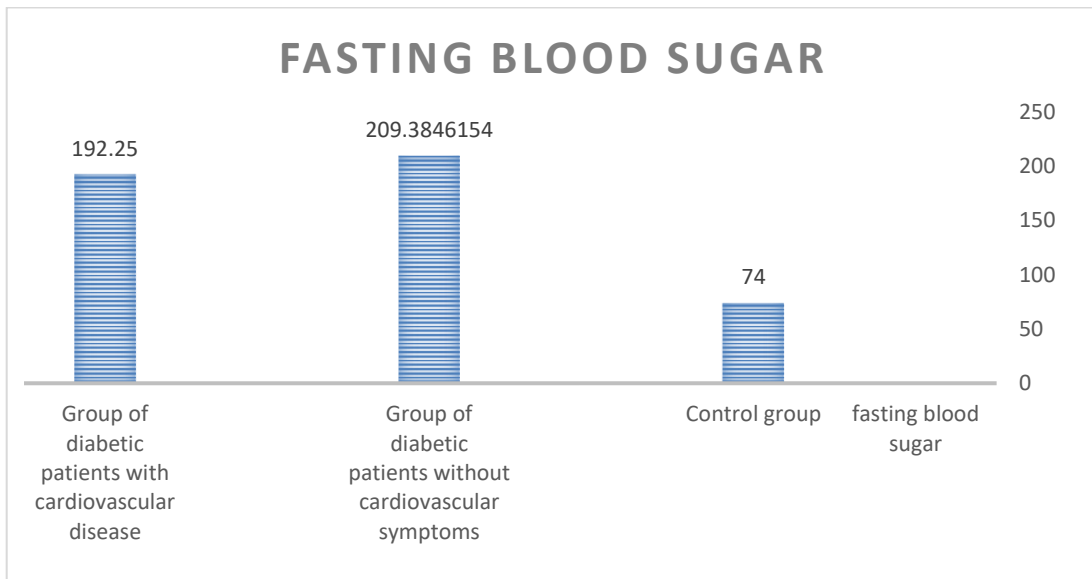


Figure (1) Chart of fasting blood sugar in the control group and the group of diabetic patients with and without cardiovascular disease.

2- In the chart below(figure (2)), The data presented reveals significant differences in serum urea levels among the three studied groups, Diabetic Patients with CVD group has by far the highest average serum urea level at 87.5 mg/dL. Diabetic Patients without CVD group also shows a marked elevation in urea compared to the control, with an average of 40.538 mg/dL. *in vitro* and *in vivo* studies have shown that uraemia modulates the smooth muscle cell's phenotype and induces the expression of pro-apoptotic BCL-2 family genes; this might explain the elevated apoptosis rate observed in the arterial wall in uraemic patients.(13) Furthermore, a high urea concentration in endothelial cell progenitor cultures has been associated with increased senescence and free radical formation.(14) In a study of nephrectomized mice, inhibition of the urea transporter was associated with reductions in hypertension and cardiac fibrosis and an improvement in cardiac function.(15) Other studies have shown that urea has an indirect toxic effect via protein carbamylation, which interferes with the proteins' molecular and cellular functions.(16)

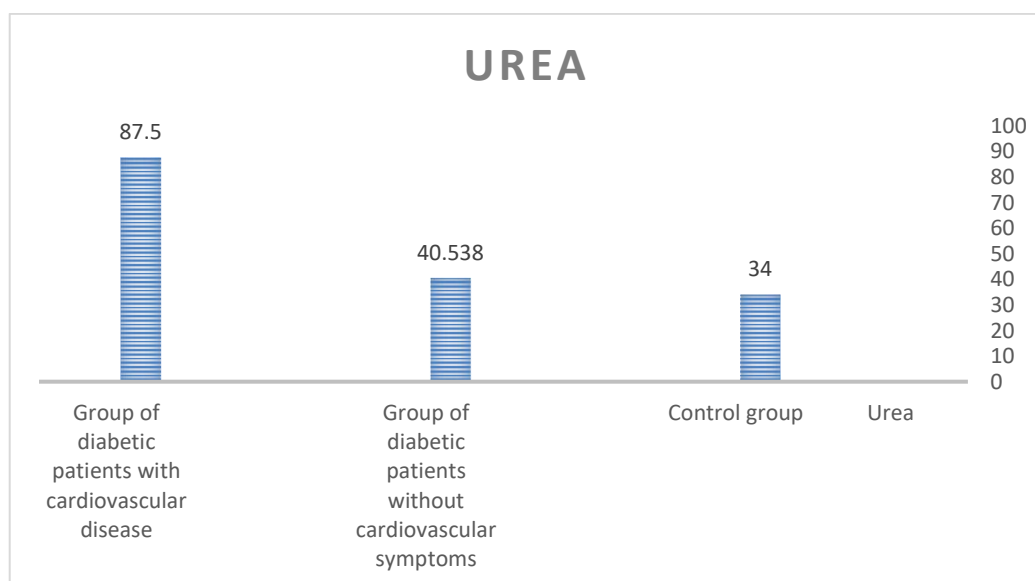


Figure (2) Chart of Blood Urea in the control group and the group of diabetic patients with and without cardiovascular disease.

- 3- The data on serum creatinine levels in figure(3) reveals in profound differences in kidney function among the three studied groups. Diabetic Patients with CVD group has a severely elevated average serum creatinine level of 2.04 mg/dL. This value is significantly above the normal range. Diabetic Patients without CVD group has a normal average serum creatinine level of 0.9 mg/dL. This falls within the typical normal range (approximately 0.7-1.3 mg/dL. A number of studies indicate that elevated serum creatinine may be an independent predictor of all-cause and of cardiovascular disease mortality.(17) Small changes in creatinine levels have been incrementally associated with increased risk for heart failure morbidity.(18) In one study has been associated with increased mortality in hypertensive persons, the elderly, and patients with myocardial infarction or stroke in whom cardiovascular disease is the major cause of death. an elevated serum creatinine concentration may be a marker for subtle renal damage consequent to raised blood pressure.(19)

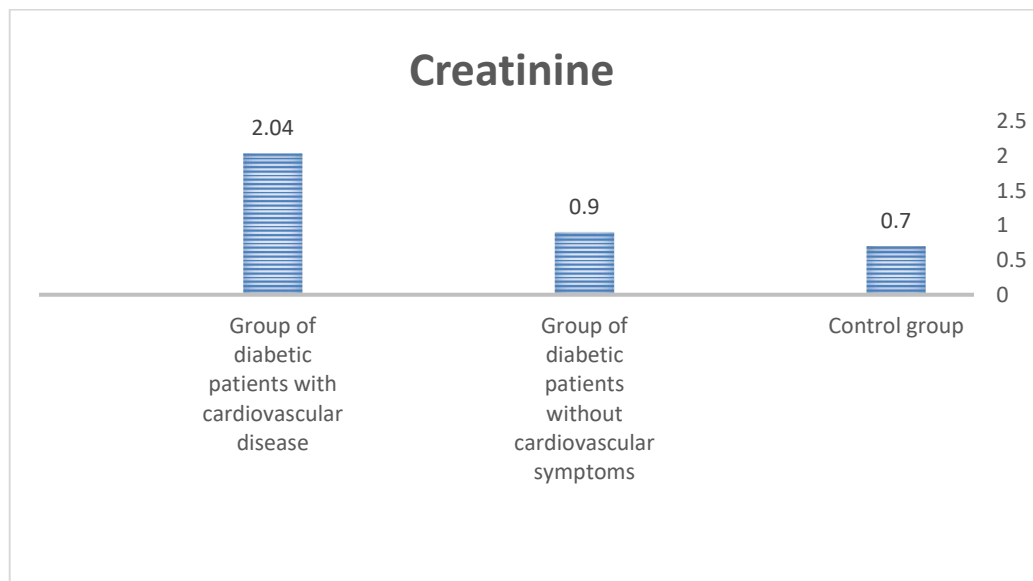


Figure (3) Chart of Blood creatinine in the control group and the group of diabetic patients with and without cardiovascular disease.

Discussion:

Measuring blood urea and creatinine is a common measure for assessing kidney function, especially in diabetics. Good control of blood sugar, along with urea and creatinine levels, is a good factor in preventing diabetes complications on body systems, particularly the cardiovascular system. Kidney function is well known to be impaired in diabetics, and controlling the resulting damage to the heart is achieved by early detection of urea and creatinine levels and maintaining their normal levels in the blood.

Study limitations

This analysis is a non-randomized, and it is possible that both identified and unidentified confounders may have influenced the outcomes. Strict enrollment criteria are used in clinical trials, and the results observed herein may not be applicable to all patients in clinical practice.

Conclusion:

Monitoring renal function through tests like serum urea is not only crucial for assessing kidney health but also serves as an important prognostic marker for cardiovascular risk in diabetic patients. Effective management must therefore focus on comprehensive care that addresses glycemic control, blood pressure, and kidney function to mitigate the risk of both renal and cardiovascular complications. The serum creatinine data provides the most direct evidence yet of serious organ damage. The extremely elevated level in diabetic patients confirms advanced diabetic nephropathy.

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