Ministry of Higher Education & Scientific Research
Erbil Polytechnic University
Shaqlawa Technical College
Department Medical Laboratory Technology

Relationship Between Hyperglycemia and each of Urea and Creatinine

Graduate project

A research submitted to the council of the Erbil Technical health college at Erbil Polytechnic University in partial fulfillment of the requirements for the bachelor technology degree in medical laboratory technology for the academic year 2022 – 2023

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Certification of the supervisors

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Examining committee certification

We are, the member of the examination committee certify that, after reading this thesis and examining the students (Relationship Between Hyperglycemia and each of Urea and Creatinine) in its contents, it is adequate for the award of the degree of diploma of technology

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Contents

Abstract

Each kidney is made up of millions of tiny filters called nephrons. Over time, high blood sugar from diabetes can damage blood vessels in the kidneys as well as nephrons so they don't work as well as they should. **Methodology:**We made an official contact with Rizgary hospital in Erbil city for collecting data. Creatinine, urea and glucose recorded from about 19 male and 19 female patients. Several devices used for the testing these parameters such as, Cobas e 411, Cobas e 311 and Kenza 450 TX. **Results:** Our results in this study showing that there was a moderate significant positive correlation between glucose and each of creatinine and urea in male patients (r=0.4653, *P* value=0.0447 and r=0.4629, *P* value=0.0460) respectively. For female patients also there was a moderate significant positive correlation between glucose and each of creatinine and urea (r=5453, *P* value=0.0157 and r=5511, *P* value=0.0145) respectively. **Conclusions:** According to our results and previous studies glucose can make an elevation of each creatinine and urea.

Keywords; hyperglycemia, urea and creatinine

Chapter one

Introduction

Each kidney is made up of millions of tiny filters called nephrons. Over time, high blood sugar from diabetes can damage blood vessels in the kidneys as well as nephrons so they don't work as well as they should (Centers for Disease Control and Prevention [CDC], 2022).

In diabetes, the kidney contributes to the development of diabetic hyperglycemia by increasing glucose reabsorption from the primary urine1 and by enhancing glucose production via gluconeogenesis (Ansermet *et al.*, 2022). However, long-term elevation of blood glucose levels may, in turn, cause diabetic nephropathy, one of the most serious complications of diabetes, characterized by glomerular, tubular, and vascular damage in the kidney. Although metabolic stress is the primary factor involved in pathogenesis and progression of DN, hyperglycemia alone does not lead to kidney insufficiency in most diabetic patients (Luo *et al.*, 2021). This suggests that combination with an intercurrent illness or presence of environmental, genetic, or epigenetic "second hits" may be required for initiation and/or accelerated progression of DN (Ansermet *et al.*, 2022).

Aim of study

The aim of this study is finding relationship between hyperglycemia and each of urea and creatinine.

Chapter two

Materials and methods

Sample collection

We made an official contact with Rizgary hospital in Erbil city for collecting data. Creatinine, urea and glucose recorded from about 19 male and 19 female patients. Several devicesused for the testing these parameters such as, Cobas e 411, Cobas e 311 and Kenza 450 TX.

Statistical analysis

Person correlation analysis was performed for each group of males and females between glucose and each ofcreatinine and urea. Using Graphpad prism 8 software. *P* value >0.05 considered as significant.

Chapter three

Result and discussion

Our results in this study showing that there was a moderate significant positive correlation between glucose and each of creatinine and urea in male patients (r=0.4653, *P* value=0.0447 and r=0.4629, *P* value=0.0460) respectively, figure 3.1. For female patients also there was a moderate significant positive correlation between glucose and each of creatinine and urea (r=5453, *P* value=0.0157 and r=5511, *P* value=0.0145) respectively,figure 3.2.

Males		Females	
Glucose+Urea	Glucose+Creatinine	Glucose+Urea	Glucose+Creatinine
0.4629*	0.4653*	0.5511*	0.5453*

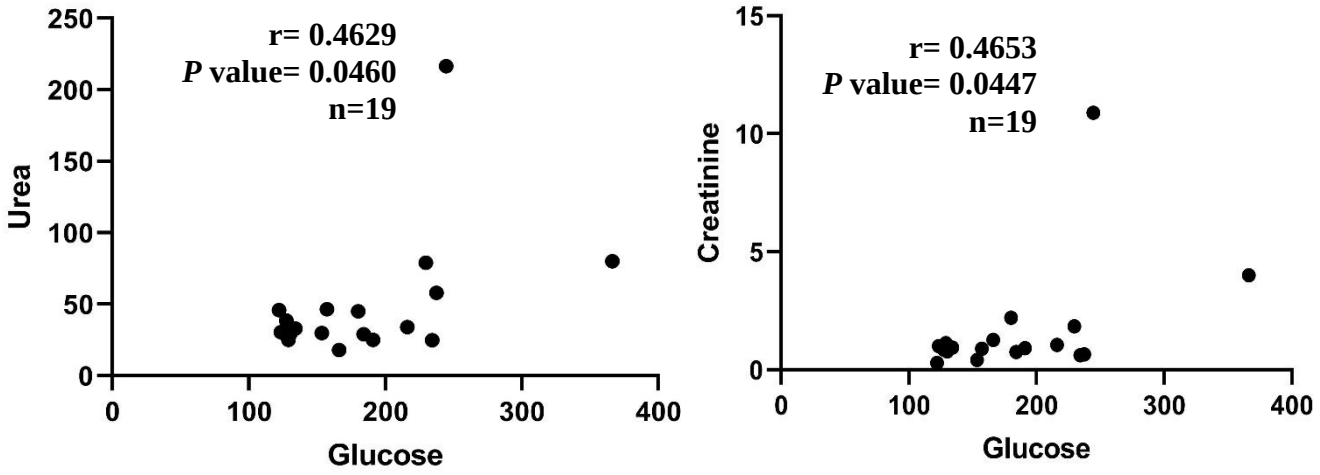

Figure 3.1: Pearson correlation between glucose, urea and creatinine in males. r: Pearson correlation, P value <0.05 considered significance and n: number of samples

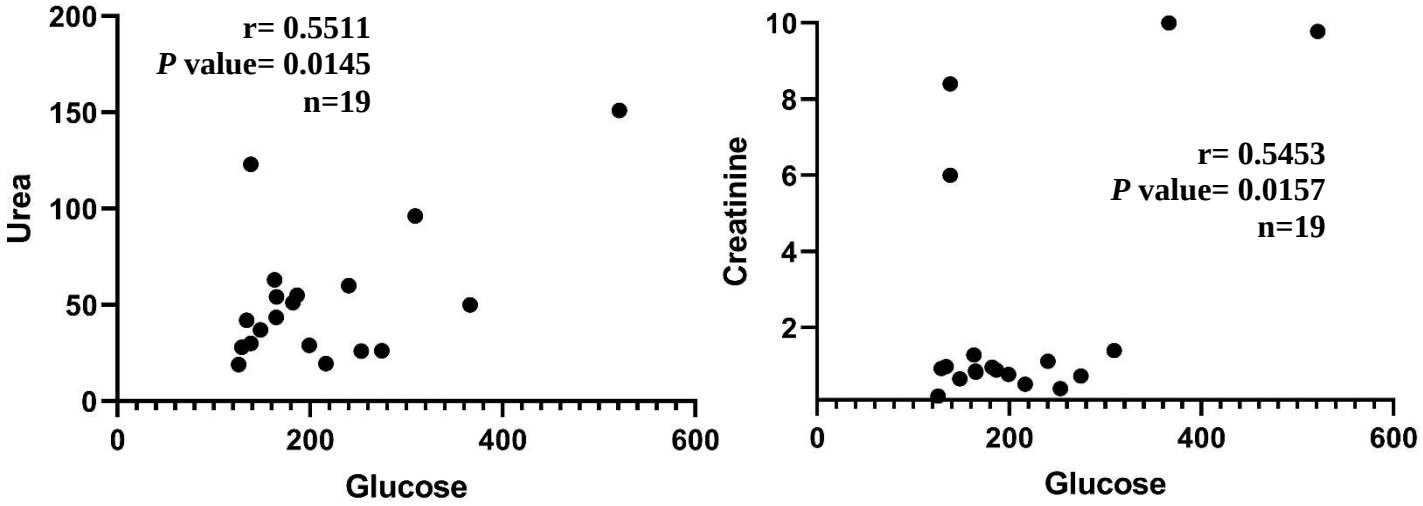

Figure 3.2: Pearson correlation between glucose, urea and creatinine in females. r: Pearson correlation, P value <0.05 considered significance and n: number of samples

The kidneys continuously filter large quantities of glucose. Glucose is a valuable energy substrate and the tubular system ofthe kidney, particularly the proximal tubule, has evolved to reabsorb and retain basically all the filtered glucose. As a consequence, the urine in a healthy individual is nearly free ofglucose. This may change in patients with diabetes mellitus, when hyperglycemia may enhance filtered glucose and overwhelm the tubular transport capacity for glucose(Vallon, 2020).

Creatinine (2-amino-1-methyl-2-imidazoline-4-one), an end product of creatine metabolism (Narayanan and Appleton, 1980;Coresh *et al.*, 2003;Gao *et al.*, 2010), is an important diagnostics index for the glomerular filtration rate (Khadro *et al.*, 2010). The creatinine concentration in human blood or urine increases with kidney problems, muscular disorders, and thyroid malfunction (Mohabbati-Kalejahi *et al.*, 2012). While The urea cycle is a process in which waste (ammonia) is removed from the body. When you eat proteins, the body breaks them down into amino acids. Ammonia is produced from leftover amino acids, and it must be removed from the body.The liver produces several chemicals (enzymes) that change ammonia into a form called urea, which the body can remove in the urine (Luo *et al.*, 2021).

Both urea and creatinine elevation within the blood are affected by hyperglycemia and insulin secretion (Hamberg and Vilstrup, 1994;Luo *et al.*, 2021). Besides that, studied revealed that in patients with type 2 diabetes, sodium glucose cotransporter 2 (SGLT2) inhibitors reportedly decrease levels of blood glucose and hemoglobin A1c (HbA1c) by inhibiting this cotransporter, which is located in the proximal convoluted tubule of the nephron, increasing urinary glucose excretion independent of insulin (List *et al.*, 2009;Liu *et al.*, 2012;Abdul-Ghani *et al.*, 2013;Bolinder *et al.*, 2014;Mima, 2021).

Conclusion

According to our results and previous studies glucose can make an elevation of each creatinine and urea.

Recommendation

More studies required with taking more data for both males and females, measuring insulin and other kidney failure parameters.

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