University of Thi-Qar Journal of Science (UTJsci)
ISSN Onlin:2709-0256, ISSN Print: 1991-8690 Volume (9), No.2, Dec. 2022

Fasting sugar, blood pressure and uric acid are factors related to positive Kidney disease and an impaired GFR

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Abstract: **The purpose of this study is to determine the association between fasting sugar level, urea, creatinine, uric acid, blood pressure, and glomerular filtration rate (GFR) in renal disease patients.**
The current study found that men patients had lower blood sugar, fasting blood glucose, and serum creatinine levels than women patients. however, there was no significant difference between groups of blood urea, uric acid, Glumoular filter, and blood pressure. Also, there is no significant difference in patients based on age in the current study, and there is a very strong positive link between random glucose level and fasting glucose level.

Key words: Blood Sugar , Blood pressure, glomerular filtration rate and Kidney disease

I. INTRODUCTION

Chronic kidney disease (CKD) is a progressive reduction in renal function (Venktapathy *et al*., 2014) it is a condition in which the kidney lose their normal function , particularly excretory and regulatory function, which can be caused by infection, autoimmune diseases, diabetes, hypertension, cancer, and toxic chemicals (Abdulla *et al.*, 2012)

Hypertension (HT) is a primary cause and consequence of chronic kidney disease (CKD) affecting more than 80% of CKD patients (Yamagata *et al*., 2007). Furthermore, HT is a conventional risk factor for cardiovascular events and may contribute to a vicious cycle of cardio-renal illness in CKD patients (Sarafidis *et al.*, 2008). As a result, the significance of blood pressure (BP) control in slowing the progression of renal disease and cardiovascular disease (CVD) is well recognized. The incidence and severity of hypertension rise when the glomerular filtration rate (eGFR) decreases (Muntner *et al.*, 2010). Furthermore, hypertension and CKD are both independent risk factors for cardiovascular disease. When both occur, the chances of CVD morbidity and death are significantly elevated (Gansevoort *et al*., 2013). The risk of mortality from CVD is greater than the chance of progression to end-stage renal disease. Diabetes mellitus is related to dyslipidemia, hypertension, and visceral obesity, all of which raise the risk of developing chronic kidney disease (Whaley *et al*., 2009).Clinic blood pressure (CBP) has long been used in clinical settings to monitor blood pressure. However, due to the circadian rhythm issue, it is possible to underestimate the real BP. On the other hand, ambulatory blood pressure (BP) monitoring may offer more exact BP information and has been shown to have better clinical correlations with various organ damage, including the kidney (Agarwal, 2007). Recently, evidence accumulated that, continuous HT was an independent risk factor for developing CKD and CVD.

Diabetes mellitus is frequently associated with high blood pressure and visceral obesity, which can lead to chronic renal illness and cardiovascular disease (Whaley *et al.*, 2009). Diabetes is one of the most common causes of renal failure (The United States Renal Data System., 2007). Type 2 diabetes develops as a result of insufficient insulin production by pancreatic beta cells or when peripheral receptors in muscles, liver and adipose tissue do not respond to normal insulin levels, a condition known as insulin resistance (Shoback *et al.*, 2010).

Biochemical indicators play a significant role in correct diagnosis, risk assessment, and therapy selection to enhance clinical outcomes. Serum measurement of renal function indicators such as urea, creatinine, uric acid, and electrolytes is utilized frequently instead of urine analysis, which is somewhat uncomfortable for patients (Gowda *et al.*, 2010). Blood tests for blood urea nitrogen are a significant nitrogenous waste (Kamal,

https://doi.org/10.32792/utq/utjsci/v9i2.904

2014). Plasma urea and creatinine levels are often used to assess renal function, while serum albumin levels were found to be an independent risk factor in individuals with end-stage renal disease (William *et al*., 2003).

Early-onset diabetics have a higher level of GFR, which makes them an appropriate group for studying a gradual loss of kidney function (Rosing *et al*., 2004). The parameters used to diagnose kidney function include urea and creatinine. Changes in blood creatinine concentrations reflect changes in GFR more accurately than changes in serum urea concentrations. Creatinine is produced spontaneously at a steady rate from creatinine, and blood concentrations are virtually entirely determined by GFR. A variety of variables impact urea production, including liver function, protein consumption, and protein catabolism rate (Griffin *et al.*, 2008)

However, few studies have been conducted to investigate the relationship of some factors with glomerular filtration in chronic kidney disease patients.

II. AIM OF WORK

The aim of this study: The purpose of this study was to explore the relationship of some factors with glomerular filtration in chronic kidney disease patients .

III. METHOD AND MATERIALS

The current research for chronic kidney disease was conducted at Al-Hussein Teaching Hospital in Thi-Qar province and lasted from February until July/2021, (40) blood samples were collected from chronic kidney patients include (24) men and (16) women ranging in age from (27-85) years, and (40) blood samples were collected from healthy subjects. After allowing the blood to clot, the serum was separated and centrifuged for 5-10 minutes before being divided into three tubes and stored at -20°C until used for quantification of biochemical parameters. Biochemical parameters (Blood urea, Serum creatinine, blood sugar) were measured. samples of blood from all participants of the two groups were taken for measurement of fasting blood sugar FBS(mg/dl), These measurements were carried out by the usage of a full automatic clinical chemistry analyzer belonging to the medical laboratories techniques.

The normal range of creatinine was considered between 0.8 to 1.4 mg/dL. Females usually have a lower creatinine (0.6 - 1.2mg/dL) than males because they usually have less muscle mass. For a urea normal range was considered of 10- 45mg/dl. The results gained from those investigations were analyzed and expressed as mean ± SD. The comparison was done by a student t-test. $P \leq 0.05$ was deemed significant, Fasting blood glucose was estimated by GOD-POD enzymatic method by using spectrophotometer (Systronics). Glycosylated hemoglobin was measured by the method of resin ion exchange method. Estimation of serum urea was done by DAM colorimetric method. Serum creatinine was estimated by alkaline .

IV. Results

Result of current study shows the male patients percentage were less than female percentage in blood sugar , fasting blood glucose, and serum creatinine levels .while the male patients and female percentage were no significant different between groups of Blood urea,Uric Acid, Glumoular filter and Blood Pressure according to sex as shown in table (1).

TABLE I. TABLE (1) COMPARISON OF BLOOD UREA ,S. CREATININE,URIC ACID AND GLOMULAR FILTER AND B-PRESSURE ACCORDING TO GENDER IN STUDY GROUPS

Parameters	***Mean ± SD***		***T. test P. value***
	Men / 24	***Women / 16***	
RBS mg/dl	123.6 ± 37.6	169.8 ± 48.8	< 0.05
FBS mg/dl	101.4 ± 30.6	135.3 ± 42.5	< 0.05
B. Urea mg/dl	140.7 ± 34.4	133.1 ± 36.2	> 0.05
S. Creatinine mg/dl	6.36 ± 1.96	4.91 ± 1.27	< 0.05
Uric Acid mg/dl	4.40 ± 1.49	4.75 ± 1.81	> 0.05
GFR ml/min/1.73m2	9.03 ± 2.06	8.83 ± 1.4	> 0.05
B-Pressure mmHg	169.5 ± 21.8	163.7 ± 21.0	> 0.05

Result of current study shows the least mean value of Blood Sugar parameters was for period (27-46 year) and highest mean value was for period (67- 86 year) with non-significant different (P>0.05) among patients age. So, least mean value of blood pressure and uric acid parameters were for period (27-46 year) and highest mean value was for period (>67 year) with no significant different (P>0.05) between patients age. Also, least mean value of serum creatinine parameters ,blood urea and glomerular filtre were for period (27- 46 year) and highest mean value was for period 67-86 year) with non-significant difference (P<0.05) among patients age as shown on the table (2).

TABLE-2: COMPARISON OF FASTING BLOOD GLUCOSE , B. PRESSURE AND URIC ACID LEVELS IN PATIENTS.

Age Group	*Mean ± SD*			
	RBS mg/dl	*FBS mg/dl*	*B-Pressure mmHg*	*Uric Acid mg/dl*
27-46 Y	145.0 ± 41.0	115.8 ± 39.6	167.1 ± 18.9	4.72 ± 1.47
47-66 Y	140.9 ± 42.2	113.7 ± 35.8	167.0 ± 25.7	4.40 ± 1.26
67-86 Y	140.2 ± 39.6	115.2 ± 32.3	167.5 ± 21.5	4.47 ± 1.61
P. value	> 0.05	> 0.05	> 0.05	> 0.05
LSD	Non-Sig	Non-Sig	Non-Sig	Non-Sig

TABLE-3: COMPARISON OF BLOOD UREA ,S. CREATININE AND GLOMULAR FILTER RENAL LEVELS IN PATIENTS.

Age Group	*Mean ± SD*		
	B. Urea mg/dl	*S. Creatinine mg/dl*	*GFR ml/min/1.73m2*
27-46 Y	135.3 ± 36.3	5.85 ± 1.28	9.25 ± 1.89
47-66 Y	150.2 ± 40.8	6.32 ± 1.31	8.27 ± 2.31
67-86 Y	129.2 ± 26.9	5.24 ± 1.87	9.24 ± 2.63
P. value	> 0.05	> 0.05	> 0.05
LSD	Non-Sig	Non-Sig	Non-Sig

The results of the current study, through the use of spearman's law of correlation, showed that:

There was a very strong positive correlation between random glucose level and fasting glucose level , as for blood urea level and creatinine level there was a weak direct relationship between them .Also there was a weak direct relationship between urea level and high blood pressure .also noticed there was a strong inverse relationship between creatinine and glomerular filtration rate .The correlation ,showed There was strong positive correlation between creatinine and high blood pressure and there was a strong inverse relationship between glomerular filtration rate and blood pressure.

TABLE-4: CORRELATION BETWEEN THE PARAMETERS OF THE CURRENT STUDY

RBS	r	.942**	-.272	-.113	-.103	-.119	.040
P. value		< .01	.089	.489	.527	.463	.805
FBS	r		-.302	-.156	-.072	-.096	-.017
P. value			.058	.335	.661	.556	.916
B. Urea	r			.329*	-.015	-.297	.371*
P. value				< .05	.929	.062	< .05
S. Creatinine	r				-.094	-.746**	.789**
P. value					.563	< .01	< .01
Uric Acid	r					.086	-.142
P. value						.599	.380
GFR		**. Correlation is significant at the 0.01 level (2-tailed).					-.724**
P. value		*. Correlation is significant at the 0.05 level (2-tailed).					< .01

V. DISCUSSION

The present study describes the relationship of Blood sugar ,serum creatinine serum uric acid levels , BP levels and Glomular filter in the patients of kidney disease . The results indicate that in the studied population, Blood sugar and Fasting blood sugar and creatinine serum as were associated with difference of gender , gender and the effects of biological sex causing many diseases, including representational disorders such diabetes diet. Diabetes is more prevalent in men than in women in most parts of the world, particularly in middle-aged populations where males were more affected by obesity , insulin resistance and hyperglycemia compared to females. (Blandine *et al.*, 2020).

For women, insulin sensitivity is higher, Those who also have higher insulin-secreting capacities and incretin responses than men; Despite these sex benefits all go to pieces when glucose tolerance towards diabetes deteriorates. Differences in lifestyle associated with sex may lead to differences in the risk of diabetes, and thus to differences in the prevalence of this situation among women and men (BeLue *et al.*, 2009). Experimental studies have reported that hyperuricemia induces systemic hypertension and renal injury via activation of the renin angiotensin system, and direct entry of uric acid into both endothelial and vascular smooth muscle cells, resulting in local inhibition of endothelial nitric oxide levels, stimulation of vascular smooth muscle cell proliferation, and stimulation of vasoactive and inflammatory mediators (Mazzali *et al*., 2001- Johnson *et al* ., 2003).

Hypertension can lead to hyaline arteriolosclerosis. Arterial hypertension leads to hyaline accumulation in the walls of small arteries and arterioles, which thickens the walls and narrows the lumina. The damage to glomeruli caused by hyaline arteriolosclerosis results in impaired glomerular filtration and an increase in protein filtration.(Keane and Eknoyan, 1999; Luft, 2000) Previous studies found that hypertension is related to

CKD, and similarly, we found that blood pressure was related to positive uric acid and an impaired eGFR in this study. This result supports the hypothesis that controlling blood pressure can decrease damage to renal function.

This study supported that there was a significant linear relationship between serum urea and creatinine levels respectively. The correlation coefficient for serum urea and which is statistically low significant . Comparison of results In our study we observed an increase in levels of fasting blood glucose, serum urea and serum creatinine patients. In addition to increased blood glucose level in patients, serum creatinine levels also significantly increased in female .High blood sugar levels damage millions of nephrons resulting in inability of kidneys to maintain fluid and electrolyte homeostasis (Anjaneyulu *et al.*,2004)..

Increase in serum creatinine and serum urea levels with the increase of fasting blood sugar levels clearly indicate that the increased fasting blood sugar levels cause renal dysfunction2.Good control of fasting blood glucose level is absolute requirement to prevent progressive renal impairment(Deep *et al.*,2011) Creatinine is anhydrous form of creatine form in muscles and enters blood, from where it is eliminated by kidneys. If the kidneys are unable to function normally, the serum creatinine increases abnormally. Serum creatinine and urea are well established markers for measurement of Glomerular Filtration Rate (GFR)(Sirwal *et al.*, 2004). Creatinine is a perfect filtration marker and more sensitive index of kidney function compared to blood urea level (Perrone *et al*.,2011). Creatinine is filtered by glomerulus and thus, serum creatinine level is considered as an indirect measure of glomerular filtration. Diminishing of glomerular filtration rate results in rise of plasma concentrations of serum creatinine and urea. This rise indicates progression of kidney disease and thus serum creatinine has greater prognostic ability compared with urea for predicting the adverse outcomes (Mittal *et al.*,2010) . An elevated serum creatinine level is also a late sign of renal damage in essential hypertension with frankly elevated serum creatinine values predict a poor prognosis in patients with hypertension (Schillaci.*et al.*, 2001)

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