

Evaluation of Some Biochemical Parameters in Iraqi Patients with Chronic Kidney Disease

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Abstract :

Kidney diseases are widespread in the city of Fallujah, Anbar Governorate, Iraq. Chronic kidney disease (CKD) is a slowly progressing kidney disease that causes a progressive loss of kidney function leading to a general deterioration in the physiological and biochemical functions of other organs. The aim of our research was to evaluate biochemical parameters related to CKD in Iraqi patients. A case control study included 110 cases male and female (60 patients and 50 control), the patients with CKD and without any known thyroid illness history. The study was conducted at Fallujah General Hospital, from March 2021 to August 2021. The mean age of the patients was 59.35 ± 7.8 . Plasma T3, T4 and TSH were measured immediately by automated enzyme-linked fluorescence immunoassay (ELFA), while albumin, blood urea, serum creatinine, and uric acid by Spectrophotometer. The mean body mass index (BMI) of the patients was overweight. When CKD patients were compared to controls, urea, creatinine, and uric acid all exhibited significant increases ($P < 0.05$). Results for albumin, T3 and T4 in the patients group were significantly lower ($P < 0.05$) than in the control groups, while the TSH values did not reveal any statistically significant differences. We concluded that the results of urea, creatinine, and uric acid in the patient group were significantly higher. Low levels of albumin and thyroid hormones in the blood of Iraqi patients are indicators of CKD, as are high levels of urea, creatinine, and uric acid. No effect on the level of TSH.

Keywords: Biochemical parameters, Chronic kidney disease, Thyroid function tests, Fallujah-Iraq.

تقييم بعض المعايير الكيميائية الحيوية

لدى المرضى العراقيين المصابين بمرض الكلى المزمن

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مستخلص:

تنتشر أمراض الكلى في مدينة الفلوجة بمحافظة الأنبار بالعراق. مرض الكلى المزمن (CKD) هو مرض كلوي يتطور ببطء ويسبب فقداناً تدريجياً لوظائف الكلى مما يؤدي إلى تدهور عام في الوظائف الفسيولوجية والكيميائية الحيوية للأعضاء الأخرى. كان الهدف من دراستنا هو تقييم المعايير البيوكيميائية المتعلقة بمرض الكلى المزمن لدى المرضى العراقيين. أجريت الدراسة على 110 شخص من الذكور والإناث (60 مريضاً و50 شخصاً من مجموعة السيطرة)، والمرضى ليس لديهم أي تاريخ معروف لمرض الغدة الدرقية. أجريت الدراسة في مستشفى الفلوجة العام في الفترة من مارس 2021 إلى أغسطس 2021. وكان متوسط عمر المرضى 59.35 ± 7.8 . تم قياس TSH, T4, T3 في مصل الدم على الفور بواسطة المقاييس المناعية الآلية المرتبطة بالإنزيم (ELFA)، في حين تم قياس الألبومين اليوريا والكرياتينين وحمض البوليك بواسطة مقياس الطيف الضوئي. وكان متوسط مؤشر كتلة الجسم (BMI) للمرضى يشير إلى زيادة في الوزن. عندما تمت مقارنة المرضى مع مجموعة السيطرة، أظهرت اليوريا والكرياتينين وحمض البوليك زيادات كبيرة ($P < 0.05$). وكانت نتائج الألبومين، T3 وT4 في مجموعة المرضى أقل بشكل ملحوظ ($P < 0.05$) عنها في مجموعة السيطرة، بينما لم تظهر قيم TSH أي فروق ذات دلالة إحصائية. واستنتجنا أن نتائج اليوريا والكرياتينين وحمض البوليك في مجموعة المرضى كانت أعلى بكثير. انخفاض مستويات الألبومين وهرمونات الغدة الدرقية في دم المرضى العراقيين هي علامات مرتبطة بمرض الكلى المزمن، ولا يوجد أي تأثير على مستوى TSH. مستل من اطروحة الماجستير للباحث الأول.

Introduction

One of the main causes of death and illness worldwide is kidney disease. Chronic kidney disease (CKD) has a major impact on global health. The term “kidney” should be used in medical publications to refer to kidney illness and kidney health rather than “renal” or “nephro,” according to recently published nomenclature by the “Kidney Disease Improving Global Outcomes” (KDIGO) Consensus Conference.¹ Kidney function is gradually lost in CKD, commonly known as chronic kidney failure. Estimated glomerular filtration rate < 60 mL/min/1.73 m² and/or urine albumin creatinine ratio ≥ 30 mg/g were used to characterize CKD.^{2,3} Kidney failure is more common in patients whose GFR is significantly reduced. End-stage kidney disease, which necessitates kidney replacement treatment, is associated with CKD. Furthermore, CKD is associated with a number of comorbidities that negatively affect CKD patients prognosis and quality of life, such as cardiovascular illness, abnormalities of the bones, muscular atrophy, and cognitive dysfunction.^{3,4,5} Both isch-

emic and hemorrhagic stroke are more common in patients with CKD.⁶

Numerous factors can contribute to the development of CKD, such as diabetes, hypertension, glomerulonephritis, pyelonephritis, anti-inflammatory drugs, autoimmune diseases, polycystic kidney disease (PKD), Alport syndrome, congenital abnormalities, and prolonged acute renal disease.^{7,8} Obesity is the scourge of our day, with a predicted 30% increase in cases by 2030. It is a dangerous long-term condition that increases the chance of developing CKD. At least in part, an increase in the prevalence of chronic kidney disease is anticipated, because the rates of obesity are consistently rising.^{9,10}

The GFR classifies CKD into five stages, while albuminuria classifies it into three stages. Aside from GFR and albuminuria, the prognosis estimate should take into account the source of the kidney illness and other variables (such age, sex, race, cholesterol, smoking, and so on).¹¹

The epidemiology of CKD in countries differs from each other. For example, the epidemiology of CKD in India differs from that in the West; patients

there were on average five to twenty years younger.¹² Increased oxidative stress markers, systemic inflammation, raised levels of uremic toxins, and alterations in gut microbiota composition are all characteristics of CKD.¹³

In addition to controlling other hormone functions, thyroid hormones are crucial for controlling metabolism, development, and protein synthesis. Pituitary-thyroid axis function and peripheral thyroid hormone metabolism have been linked to CKD.¹⁴ Several studies have highlighted and evaluated various endocrine abnormalities in patients with CKD.¹⁴

Normally, the kidney is involved in the metabolism, breakdown, and excretion of various thyroid hormones. Thus, it is not unexpected that abnormal thyroid physiology results from kidney dysfunction. Thyroid problems and kidney diseases are correlated, according to a substantial amount of research.^{2,15,16}

Low albumin was strongly associated with a bad prognosis for the kidneys and a deterioration in renal function, when albumin was less than 4.1 g/dL. In patients with CKD, low serum albumin levels were linked to a higher risk

of death within a year and a decreased risk of cardiovascular problems.^{17,18}

The purpose of the current study is to assess the correlation between thyroid hormones and some biochemical parameters in patients suffering from chronic kidney disease in the city of Fallujah, Anbar Governorate in Iraq.

Materials and Methods:

The present investigation was carried out at Fallujah General Hospital's department of Urology and nephrology consultant in the AL-Anbar governorate, Iraq. The laboratory work was carried out in the department of Biochemistry's laboratories between March 2021 and August 2021.

In a patient-control study, 110 cases—60 patients (40 males and 20 females).and 50 controls (30 males and 20 females) —with CKD were included. The patients and controls were between the ages of 45 and 75 years. The body mass index (BMI) was determined by dividing the weight (kg) by the square of the height (meters).

The urologist made the diagnosis of CKD in each patient based on the patient's medical history, physical examination, and laboratory results. Patients

had no previous thyroid disease when they were diagnosed with CKD.

All the samples were taken from the unit of Urology and nephrology consultant, via venous puncture, five milliliters (5 mL) of venous blood were taken from each case.

Thyroid function tests (T3, T4, and TSH) was determined using the mini VIDAS system, which was supplied by the French company Biomerieux. T3, T4, and TSH levels are measured using the Enzyme Linked Fluorescent Assay (ELFA).

Blood urea, serum creatinine, serum uric acid and serum albumin were determined by spectrophotometry, using

kits of SPINREACT company.

Statistics Analysis

The Statistical Analysis System (SAS) (2019) application was utilized to determine the impact of multiple elements in research parameters.

Results:

The research group comprised 110 participants with 60 CKD patients and 50 control. The mean age of the study population is 60 years. The mean \pm standard deviation of patient group was overweight (27.00 ± 2.66 kg/m²). The results of urea, creatinine, uric acid, and albumin for the patients and control groups was computed and showed in table 1.

Table 1. Results of urea, creatinine, uric acid, and albumin in patients and control groups.

Parameters	Mean \pm SD			
	B. Urea (mg/dL)	S. Creatinine (mg/dL)	S. Uric Acid (mg/dL)	S. albumin (g/dL)
Patients Group	137.68 \pm 19.70	7.88 \pm 0.88	7.36 \pm 0.79	2.57 \pm 0.42
Control Group	24.72 \pm 7.01	0.69 \pm 0.23	5.29 \pm 6.67	4.47 \pm 0.68
T-test	41.380 **	60.46 **	2.378*	-17.23 **
P-value	0.0001	0.0001	0.019	0.0001
* (P \leq 0.05), ** (P \leq 0.01). NS: Non-Significant.				

The blood urea findings indicated a significant difference (P \leq 0.05) between the patient group (137.68 ± 19.70 mg/

dL) and control group (24.72 ± 7.01 mg/dL), with a considerable rise. A greater significant difference (P \leq 0.05)

was observed in the serum creatinine result between the patient group (7.88 ± 0.88 mg/dL) and the control group (0.69 ± 0.23 mg/dL). A higher significant difference ($P \leq 0.05$) in serum uric acid levels was seen between the patient group (7.36 ± 0.79 mg/dL) and control group (5.29 ± 6.67 mg/dL). In comparison to the control group ($4.47 \pm$

0.68 g/dL), the albumin result showed a decrease in the significant difference ($P < 0.05$) with the patient group (2.57 ± 0.42 g/dL).

The results of plasma thyroid hormones (T3 and T4) and TSH (with no previous thyroid disease) / mwas computed and showed in table 2 .

Table 2. Results of triiodothyronine (T3), thyroxin (T4), and thyroid stimulating hormone (TSH) in patients and control groups

Parameters	Mean \pm SD		
	T3 (nmol/L)	T4 (nmol/L)	TSH (μ IU/mL)
Patients Group	0.85 ± 0.09	57.82 ± 2.67	2.60 ± 0.51
Control Group	1.25 ± 0.34	82.47 ± 8.03	2.43 ± 0.59
T-test	-7.909 **	-20.764 **	3.779**
P-value	0.0001	0.0001	0.126
* ($P \leq 0.05$), ** ($P \leq 0.01$). NS: Non-Significant.			

The T3 result revealed a decline in the significant difference ($P \leq 0.05$) between the control group (1.25 ± 0.34 nmol/L) and patient group (0.85 ± 0.09 nmol/L). In T4, the patient group significant difference ($P \leq 0.05$) from the control group (82.47 ± 8.03 nmol/L) was found to have decreased to 57.82 ± 2.67 nmol/L. The TSH results showed that there were no statistically significant changes between the con-

trol group (2.43 ± 0.59 μ IU/mL) and patient group (2.60 ± 0.51 μ IU/ml).

Discussion:

Chronic kidney disease is spreading all over the world, including Iraq, and it is increasing in prevalence, especially in the city of Fallujah - Iraq. It is necessary to know its effect on the organs of the human body in order to treat and control it. Obesity plays a major role in

the development of the disease.¹⁹ The patients with CKD, who were studied, were of overweigh (27.00 ± 2.66 kg/m²). In CKD, the rate of glomerular filtration remains low, so the kidneys lose their ability to remove nitrogenous waste from the blood, resulting in high levels of urea and creatinine.^{20,21} Our results are consistent with these studies^{20,21}, as we observed a significant increase in blood urea and serum creatinine levels in patients with CKD compared to the control group.

Hyperuricemia is often linked to the onset and advancement of heart and kidney disease, and research has demonstrated a relationship between it and mortality.²² The reason for the rise in uric acid levels in CKD patients is due to a malfunction in the kidneys' ability to operate, which raises the concentration of uric acid in the blood. These findings concurred with the previous studies.^{22,23,24}

In CKD patients, serum albumin has been shown to be a reliable indicator of death. Low glomerular filtration rate is associated with low serum albumin concentration, and individuals with chronic morbidity have low albumin concentrations due to low glomerular

filtration rates. Our findings corroborated with other studies.^{25,26}

Thyroid dysfunction coexisted with kidney diseases. Because these hormone axis dysfunctions may not be immediately apparent, thorough clinical and laboratory evaluations are necessary.²⁷ Normative data for thyroid hormones vary in different populations around the world depending on age, sex, weight, race, and genetic heritage.^{27,28} Our results of thyroid hormones (T3 and T4) in Iraqi patients with chronic kidney disease showed a significant decrease compared to the control group, while there was no change in the results of TSH between the two groups. Thyroid hormone levels are significantly altered by CKD, a steady decline in eGFR corresponds with an increase in the severity of thyroid dysfunction.²⁹ TSH levels in the high-normal (≥ 3.0 mIU/L) and lower (< 0.5 mIU/L) ranges were linked to initial CKD or the advancement of CKD in a nationally representative sample.³⁰ In Iraqi studies, Patients with CRF did not exhibit significantly reduced serum concentrations of FT3, FT4, or TSH when compared to the control group.³¹ In another Iraqi study, there were very

significant increases in urea, creatinine, and uric acid levels, while thyroid hormone revealed that patients with CKD had very significant increases in TSH levels and very significant decreases in T3 and T4 levels.³² Our study agreed with the Iraqi studies in the presence of a significant decrease in thyroid hormones (T3 and T4) in the patient with CKD and did not agree with the results of TSH.^{32,33} In India, it was shown that one in four CKD patients had low FT4 levels, whereas nine out of ten had low FT3 levels.³⁴ There is no global consensus and also diverse findings on the relationship between subclinical thyroid dysfunction and chronic kidney disease in adults.³⁵

In general, regular thyroid function testing is crucial for patients with renal failure since early detection of thyroid abnormalities will improve these patients' outcomes.

Conclusion: The results of the current research showed: 1. A significant decrease in the levels of albumin and thyroid hormones in the blood of Iraqi patients suffering from chronic kidney disease. 2. A significant increase in the levels of urea, creatinine, and uric acid. 3. The TSH level is not affected.

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