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Biochemical Assessment of Chronic Kidney Disease in Iraq Patients

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Abstract

Background: One major issue for global public health is chronic kidney disease (CKD). Morbidity and death are linked to several hematological and biochemical abnormalities that are connected with it. This study set out to assess biochemical markers in people with diabetes and chronic kidney disease. **Methods:** At the Al-Hussein Teaching Hospital in Karbala, Iraq, 75 patients with chronic renal disease participated in this prospective cross-sectional trial, which lasted a full year. In patients with chronic renal disease, biochemical markers like creatinine, calcium, urea, sodium, phosphorus, potassium, and count were assessed using conventional methods. Ten matched controls and the findings were compared with respect to age. SPSS 21 for Windows was used for the analysis of the findings. **Results:** When CKD patients were compared to controls, hemoglobin, total white blood cell count, platelet count, and red blood cell count all dropped and were statistically significant ($p < 0.05$). Regarding biochemical markers, there was a statistically significant ($p < 0.05$) rise in the serum levels of creatinine, urea, calcium, and phosphorus when compared to the control group. 55.22% of instances of chronic kidney disease (CKD) were caused by diabetes and hypertension together, with hypertension alone accounting for 35.65% of cases. **Conclusion:** Patients with chronic renal disease have imbalances in their hematological and biochemical limitations. The organization of these patients benefits from routine evaluation of these constraints.

Introduction

Patients and physicians commonly underreport chronic kidney disease (CKD), which affects 8% to 16% of the world's population [1]. Defined as having a glomerular filtration rate (GFR) of less than 60 mL/min/1.73 m2 or albuminuria of at least 30 mg per 24 hours. Renal damage is indicated by symptoms like hematuria or morphological abnormalities like polycystic or dysplastic kidneys that continue longer

than three months [2]. Chronic kidney disease (CKD) is more prevalent in low- and middle-income countries than in high-income ones. Six globally, the most common causes of chronic kidney disease (CKD) are diabetes and/or hypertension. However, infections, glomerulonephritis, and environmental exposures (to air pollution, pesticides, and herbal remedies) are also prevalent in Asia, sub-Saharan Africa, and many developing countries [3].

Chronic kidney disease (CKD) is becoming more commonplace worldwide, with an average annual increase of 8–16%, faster than the growth of the global population [4]. Diagnosis and monitoring are essential due to the considerable morbidity and mortality associated with kidney illness. It can be difficult to diagnose kidney disease since there are many different causes for it, even though assays can identify symptoms as soon as they appear. Intrinsic renal illness, such as diabetic nephropathy, pre-renal conditions like hypovolemia, and post-renal conditions such benign hyperplasia of the prostate are examples of obstructions [5]. Given this, a variety of biochemical markers, the majority of which are present in blood and urine, can be employed to identify renal injury or function. In order to assess how renal function affects pathophysiological processes in kidney disease, additional indicators may also be examined [6].

Diabetes, together with chronic kidney disease (CKD), raises the risk of atherosclerotic cardiovascular disease, heart failure, kidney failure, and early mortality [7]. People with diabetes are additional probable to develop chronic kidney disease (CKD), an expensive ailment.

The International Diabetes Federation projects that there will be 537 million diabetics globally in 2021; by 2045, that figure is expected to increase to 784 million [8]. According to estimates, around 25% of people with diabetes have CKD, and 40% of diabetics will eventually develop CKD. In line with the increase in the frequency of diabetes, the prevalence of CKD associated with it has increased [9]. According to subnational demographic predictions for England from 2012 [10], there will be almost 4 million people with stage 3–5 CKD by 2036 [11]. The rising incidence of CKD is attributed to a number of causes, including the aging population, which is also more prevalent than in the past, and risk factors for CKD, such as obesity, hypertension, type 2 diabetes (T2DM), and cardiovascular disease [12–14].Routine screening, urine examinations, serum chemical profiles, and unintentional detection are the usual methods used to identify chronic kidney disease (CKD). Less regularly, individuals may encounter symptoms like "foamy urine," which is a suggestion of albuminuria, nocturia, reduced urine flow, or gross hematuria.

If the illness progresses, patients may also experience changed mental status, pruritus, fatigue, decreased appetite, nausea, vomiting, metallic taste, unintentional weight loss, dyspnea, or peripheral edema [15]. Medical personnel should inquire about any additional symptoms, such as hemoptysis, rash, lymphadenopathy, hearing loss, and neuropathy, that could indicate a urinary obstruction or systemic etiology while evaluating a patient with established or suspected chronic kidney disease (CKD) [15]. A patient's family history of kidney disease, the presence of comorbidities (such as diabetes, hypertension, autoimmune disease, or chronic infections), the history of nephrolithiasis or recurrent UTIs, and other known genetic risk factors, such as sickle cell trait, should all be considered when evaluating a patient for kidney disease. Risk factors for patients must it comes from dietary creatine, which is commonly found in foods like meat and supplements, as well as from the patient's own natural metabolism of their muscles. The proximal tubule actively secretes it, even while the renal glomeruli filter it freely without reabsorption or renal metabolism. When compared to the gold standard method, inulin clearance, the 24-hour creatinine clearance method may overestimate the GFR by as much as 10–40% due to the significant influence this active secretion plays in the urine creatinine content [19]. Chronic kidney disease (CKD) and cardiovascular disease (CVD) are closely connected disorders that are spreading around the world.

Hypertension is a cause of the disease as well as an effect for the majority of CKD patients. For those with CKD, managing hypertension is essential since it reduces the risk of CVD and delays the disease's course. The guidelines' recommended blood pressure goals are currently unagreed up on [20].The etiology and definition of chronic renal disease impact its prevalence. The majority of CKD patients are identified by eGFR, so the factors that influence it will have an impact on the prevalence estimates of CKD. Most notably, aging increases eGFR independently of the other variables in the computation; hence, even in the event of a constant serum creatinine level, since it is believed that the loss of muscle mass will mask the GFR decline associated with aging, people who age may develop chronic kidney disease (CKD) [21]. According to the previously stated meta-analysis by [22], the prevalence of chronic kidney disease (CKD) stages 1-4 increased linearly with age, from 13.7% in the 30- to 40-year-old age group to 27.9% in patients over 70–80 years old.

Data from 2015 to 2016[23] showed that the frequency of CKD stages 1-4 was 4.4% among persons over 70 and 5.6% among those between the ages of 20 and 39 in the United States. Seven hundred million cases of chronic kidney disease (CKD) were estimated to exist worldwide.

girls and 12.3% in boys,[26] which is in line with the gender-based differences reported in the globally conducted study that was previously referenced [27]. These variants have unknown causes, but they are most likely complex. Even yet, the use of a single cutoff of less than 60 milliliters per minute per sex correction factor 1.73 m2 in GFR calculation formulas for CKD criteria may result in an over diagnosis of the disease in females [28].The body produces creatinine, which is created at a fairly consistent speed depending on the amount of muscle, by breaking down creatine phosphate in muscle [28]. One common substance used as a kidney function indicator is creatinine. Male creatinine clearance test valves typically vary from 110 to 150 ml/min, while female test valves range from 100 to 130 ml/min [29].

Chronic kidney disease is primarily brought on by obesity, diabetes mellitus, and hypertension. As CKD worsens, alterations in hematological and biochemical markers become increasingly noticeable [30]. These abnormalities could have severe consequences like artery calcification, problems with bones and minerals, muscle atrophy, and even death. Biochemical parameter derangements pertaining to sodium, potassium, calcium, magnesium, and chloride ought to be maintained within a physiological range due to their potential for fatality [31]. Hemoglobin (Hb), hematocrit, and other hematological markers are abnormal in chronic kidney disease (CKD).

Materials and Methods

Patients and control:

This prospective cross-sectional study, which ran from June 2023 to May 2024, involved 75 patients at Al-Hussein Teaching Hospital in Karbala, Iraq who had chronic kidney disease. The study comprised seventy-five patients, 25–80 years of age, both male and female. The study comprised 30 control volunteers whose ages (25–80 years) and genders were similar to those of the patients. Depending on the length of their treatment, patients were split into two study groups: the first group was for hemodialysis controlled for less than a year, and the second group was for hemodialysis controlled for more than a year. 25 participants between the ages of 25 and 70 made up the first group (mean age 50). fifty participants in the second group, ages 45 to 79 (mean age, 62) Ten milliliters of blood were drawn by venipuncture from each participant between 8.30 and 11.30 a.m. using a disposable syringe. The blood sample was administered into a plain tube and allowed to coagulate at room temperature (25°C) for approximately one hour. To separate the serum, it was centrifuged for ten minutes at 3000 rpm. The serum was separated into 50µl aliquots and stored in tubes until needed.

Determinations chronic kidney disease by Biochemical

Using a chemical analyzer (STAT Lab 300 Plus), the lipid profile (cholesterol, total lipid, HDL-C, LDL-C, and triglycerides) and renal profile (urea, creatinine, BUN, and uric acid) were assessed. Potassium,

chloride, and bicarbonate were measured using flame photometers (Jenway Clinical PFP7C), hemato-analyzers to provide hematological indices, and the electrolytes (sodium) in the serum. Twenty volunteers who looked healthy and did not smoke were selected at random to become patients with chronic renal illness [35, 36].

Statistical analysis

Using SPSS version 16.0, a common statistical program, and statistical analysis was carried out. The means ± SD are used to express all data. Additionally, the data were examined. Using the t-tests of the students, the significant level was established as $p < 0.05$.

Results

Table 1and figure1 presents the lipid profile characteristics. It shows that triglyceride levels (30%) are significantly higher in CKD patients ($p<0.0001$) when compared to normal controls. When CKD patients were compared to normal controls, there was no change in LDL-C levels, but there was a important decrease ($p>0.001$) in cholesterol concentration of roughly 15%. Meanwhile, there was a substantial fall in HDL-C levels (48%) in CKD patients. Additionally, it was discovered that CKD patients had considerably higher total lipid levels than the normal group.

Table 1: Lipid profile of chronic kidney disease patients with Controls groups

parameter	Cholesterol Mg/dl	HDL-C Mg/dl	LDL-C Mg/dl	TG Mg/dl	Total-Lipid Mg/dl
Control (n=30)	198.33+13.5	71.44+7.02	101.97+33.2	97.65+8.31	507.76+93.8
Samples (n=75)	172.66+36.01*	33.88+12.7*	105.45.2	132+57.8*	645.2+202.*
P values	0.0146	0.0001	0.9228	0.0045	0.0057

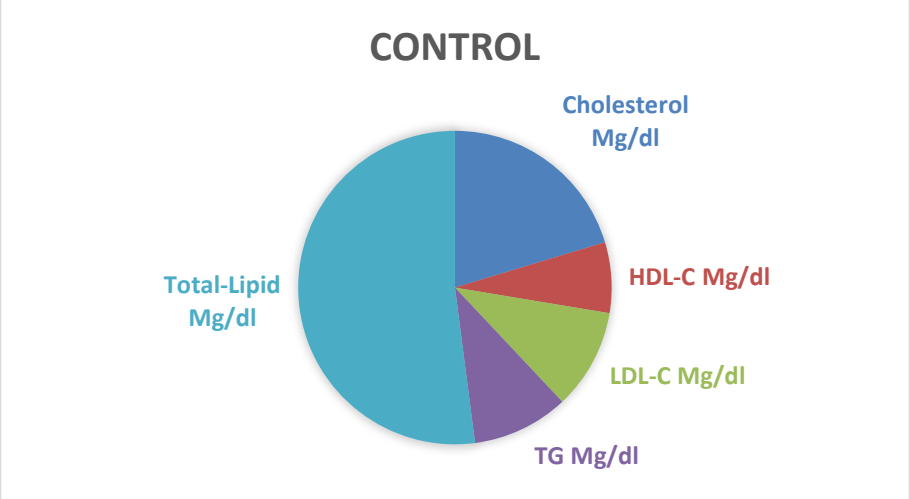

Figure 1: Individuals with persistent kidney illness and their lipid compositions within the Control cohorts

The renal profile, which is displayed in Table 2 and Figure 2, is the ratio of the concentrations of urea, creatinine, and electrolytes (sodium, potassium, chloride, and bicarbonate) in serum samples from patients with chronic kidney disease (CKD) to normal controls. The results show that patients with chronic kidney disease (CKD) had significantly higher serum urea and creatinine levels than normal controls ($p<0.0001$).

Nevertheless, there was also a minimal modest rise in sodium (0.81%) ions and minor but substantial ($p<0.025$, $p<0.0001$) alterations in potassium (9.8%) and chloride (5.51%). On the other hand, compared to normal controls, the concentration of serum bicarbonate (36.2%) was the only one in which patients with chronic renal disease had a substantial ($p<0.0001$) decrease.

Table 2: Renal profiles of individuals with chronic kidney disease compared to control groups

Parameter	**Creatinine** mg/dl	**Urea** mg/dl	**Potassium** mg/dl	**Sodium** mg/dl	**Bicarbonate** mg/dl
Control (n=30)	1.033+13.5	27.4+71	4.11.+0.392	143.6+4.31	25.16+3.80
Samples (n=75)	5.54+3.772*	74.68+42.67*	5.45+0.95*	140.4+5.78*	19.1+3.98
P values	0.0001	0.0001	0.0028	0.2235	0.0001

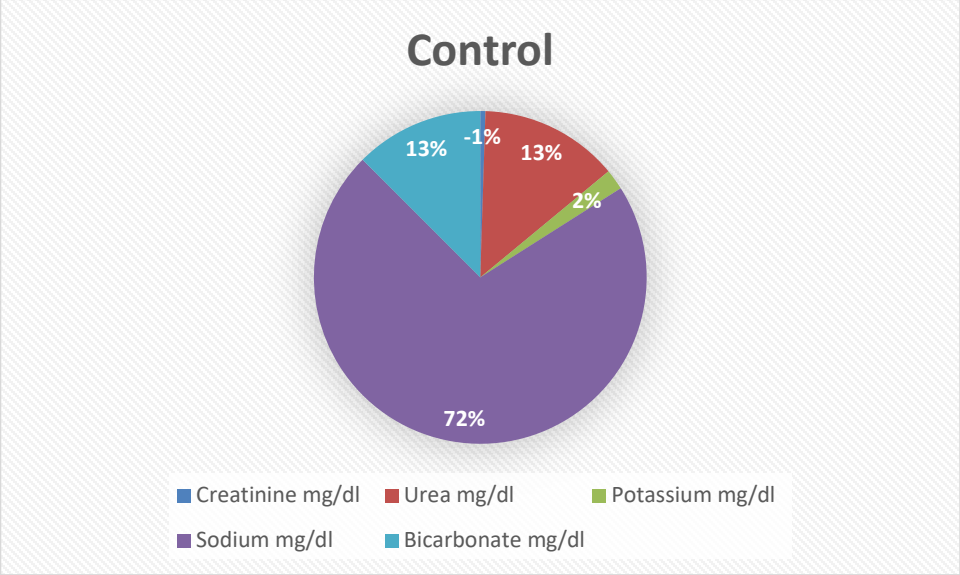

Figure 2: Renal profiles of individuals with chronic kidney disease compared to control groups

Discussion

Our findings indicate that the atherogenic lipid profile of patients with chronic renal illness is typified by elevated serum levels of total fat and triglycerides in comparison to healthy individuals (Table 1). This implies that down-regulation of lipoprotein lipase , hepatic lipase, very low low density lipoprotein receptor and density lipoprotein expression results in elevated triglyceride concentrations, which ultimately causes the primary dyslipidemia disturbance in these patients. Chronic glomerulonephritis, polycystic kidney disease, hypertension, and other disorders were found to be secondary risk factors for chronic kidney disease, following the combination of diabetes and hypertension. This result is in line with a study by [37], (1999), which discovered that the main cause of end-stage renal disease (ESRD) worldwide is diabetic nephropathy. As stated there were 1.28 men for every woman. In Iraq, the largest percentage of ESRD patients (565) were in the 51–60 age range (23.1%) [38].

The low estimated prevalence of CKD could increase if primary care patients with diabetes mellitus and hypertension were not promptly recognized and monitored for new cases of the disease. This should be taken into account because adult Iraqis experience a high prevalence of chronic health issues [39]. The results obtained via [40] Diabetic nephropathy accounted for 38% of CRF cases in our patients; chronic

glomerulonephritis (24%), hypertensive nephropathy (28%), (6%) obstructive uropathy, (2%) polycystic kidney disease and (2%) chronic pyelonephritis, in order of prevalence. According to their laboratory profiles, 90% of the patients showed anemia, 46% hypocalcemia, 34% hypoalbuminaemia, 78% pedal edema, and 76% oliguria. In 90% of instances and 92% of patients, there was elevated blood pressure.

Conclusion

We come to the conclusion that a number of factors, such as the regular use of contaminated water, unhealthy food (vegetables), ignorance, early detection of CKD, absence of preventive measures, etc., impart to the development of kidney illness in our society. These factors all eventually speed up the progression from mild, treatable CKD to total kidney failure. Not surprisingly, given the exorbitant expense of care, barely 10% of individuals with kidney failure receive any kind of renal replacement therapy. Prioritizing national and international initiatives to prevent and manage chronic kidney disease (CKD) in developing nations such as Iraq is imperative.

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