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ASSESSMENT OF BIOCHEMICAL PARAMETERS OF CHRONIC KIDNEY DISEASE (CKD) PATIENTS IN DIFFERENT CITIES OF PAKISTAN.

Qamar Yasmeen[1], Summaira Yasmeen[2], Nauman Khursheed[3]

ABSTRACT:
BACKGROUND: A disorder known as chronic kidney disease affects the kidneys' normal filtration, reabsorption, secretion, and other functions. **OBJECTIVE:** This study was designed for assessment of biochemical parameters of chronic kidney disease (CKD) of non dialysis patients in different cities of Pakistan. **METHODOLOGY:** A total of 135 patients who were diagnosed with different stages of chronic kidney disease (CKD) and age above 40 years were enrolled in a cross-sectional observational questionnaire and laboratory base study. Their demographic and disease-related biochemical parameters were recorded and analyzed. Descriptive statistics was applied with frequency, percentage and Mean ± SD for all variables. **RESULTS:** All the CKD patients had elevated creatinine, uric acid and urea levels. The factors independently associated with CKD were older age, hypertension, diabetes, elevated systolic blood pressure, low hemoglobin levels, elevated ESR and history of coronary heart disease. The incidence of hypertension, diabetes, CHD and arthritis was 51.6%, 38.2, 21% and 28% respectively. Among electrolyte disorders, Hyperphosphatemia (5.5±2.2), hypocalcemia (7.5±1.8), and hyperkalemia (5.1±1.9) were found to be more prevalent in CKD patients. **CONCLUSION:** Biochemical and hematological parameters are deranged in patients with chronic kidney disease. Routine evaluation of these parameters is useful in the management of these patients.
KEY WORDS: CKD, Creatinine, Biochemical parameter, Pakistan

1. Assistant prof. (Biochemistry) Independent medical college (IMC), Faisalabad
2. Postdoctoral Research Associate, Berlin Institute of Health at Charité- Universitätsmedizin Berlin
3. Consultant Nephrologist, Nawaz Medicare Hospital, Faisalabad

For correspondence*:* Qamar Yasmeen[1] Assistant prof. (Biochemistry) Independent medical college (IMC), Faisalabad

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INTRODUCTION

A disorder known as chronic kidney disease affects the kidneys' normal filtration, reabsorption, secretion, and other functions. One of the most significant chronic non-communicable disease epidemics in the world, including Pakistan, is chronic kidney disease (CKD). Chronic kidney disease is an asymptomatic life threatening disease. Ratio of this disease has been found more in patients of Arthritis, hypertension, cardiovascular disease and arthritis. For at least 3 months either a decreased glomerular filtration rate (GFR) of less than 60 mL/min/1.73 m^2 or kidney damage are guidelines for CKD [1]. The ratio of this disease is seen high with increasing age. Many etiologies play an important role in prevalence of chronic kidney disease (CKD), which includes obesity, hypertension (HTN), anemia, cardiovascular diseases (CVS), lung infection, diabetes, high blood pressure, arthritis, unhealthy life style and poor diet [2]. For assessment of different stages of chronic kidney disease (CKD), different biochemical parameters are measured in which serum urea and creatinines are important biomarkers for assessment of glomerular filtration rate (GFR) of kidneys [3]. For the maintenance of human body metabolism acid base balance and electrolytes homeostasis is a critical factor in which kidneys play a very crucial role. Due to kidneys dysfunction in CKD patients there has been disproportion in electrolytes levels in body which creates pH changes and acid base imbalance. So for assessment of renal physiology in kidney patients, Na+, K+, Ca++, HCO3-, and PO_4^{3-} are also important biochemical biomarkers [4]. With progress of kidney disease kidneys capacity to excrete/clear phosphate and absorb calcium get decreased [5].

Peritubular cells of the kidney produce a glycoprotein hormone Erythropoietin (EPO) whose function is to stimulate red blood cell production. RBC, production gets lowered because of deficiency of Erythropoietin (EPO) due to kidney dysfunction/damage in CKD patients which causes anemia and low hemoglobin levels among kidney patients [6]. In chronic renal patients chances of infection gets high because of inflammation/damage due to which kidney become unable to remove toxin from body. This causes lower level of platelets count and higher serum levels of WBC and ESR [7]. The people who are suffering from gout and chronic rheumatoid, osteoarthritis, have hyperuricemia. Uric acid can be secondary predictor of kidney damage/disease in these patients. In these patients if disease progresses, eGFR gets rapidly declined due to hyperuricemia, which can lead to asymptomatic chronic kidney disease [8]. Increased serum uric acid is linked to elevated blood pressure (BP), hypertension, diabetes, and renal diseases even though uric acid isn't thought to be the primary cause. Chronic hyperuricemia is also strongly associated with chronic tubulointerstitial disease, and many of these patients have deteriorated kidney function [9]. The objective of this study was to determine the biochemical characteristics of CKD patients in different cities of Pakistan by measuring and analyzing key biochemical parameters of non-dialysis definite CKD patients.

METHODOLOGY

The current retrospective, cross-sectional study was designed to evaluate the biochemical parameters in patients with chronic kidney disease (n= 135) who had been diagnosed with the condition by certified urologists and nephrologists at clinics and hospitals for kidney and urology in Joharabad, Khushab, Sargodha, and Faisalabad (Pakistan) for a period of six months. Before starting the study an

informed consent was already taken from patients who were willing to participate. A thorough history, including demographic information, was obtained by a standardized questionnaire (age, gender, BMI, hypertension, history of cardiovascular disease, arthritis, diabetes). Important biochemical markers, including urea, creatinine, uric acid, ESR, hemoglobin, calcium, phosphorus, sodium, potassium, chloride, and bicarbonate were assessed in the CKD patient's serum samples. SPSS version was used to collect, record, and evaluate the data. Descriptive statistics was applied with frequency, percentage and Mean ± SD for all variables.

RESULTS

Table 1 represents the demographic and clinical profiles of CKD patients. According to the table majority (52%) of patients were belonging to age group 51-60 years of which 54.2 % were male and 45.8% were female patients. Hypertension, BMI, coronary heart disease (CHD), Arthritis, diabetes, higher SBP, and diabetes were the sociodemographic and clinical variables that were independently linked with the occurrence of CKD. Serum Creatinine, urea, and uric acid were examined as renal function indicators in CKD patients (**Table 2**). Renal biomarkers urea (126±51.2) creatinine (6.66±3.2) uric acid (7.2±2.5) levels were found to be elevated in all male and female patients with CKD, regardless of age group. CKD patients were also evaluated (**Table 2**) for disturbances in serum electrolytes (potassium, Sodium phosphorus, calcium, chloride and bicarbonate). Hyperphosphatemia (5.5±2.2), hypocalcemia (7.5±1.8), and hyperkalemia (5.1±1.9) was observed in CKD male and female patients. Also, patients who had altered electrolytemia were more likely to be females than male. Slight decrease was observed in sodium (132±3.9) levels. The mean value of hemoglobin (8.2±1.6) was not up to the mark in CKD patients with high erythrocyte sedimentation rate (44±21.9) which indicates inflammation/infection of kidneys among patients

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Table 1 Socio-demographic and clinical characteristics of CKD patients

Characteristics	Frequency (%) or Mean ± SD
Age (Years)	
40-50	8 (4.62)
51-60	90 (52)
61-70	60 (34.6)
≥ 71	15 (8.67)
Gender	
Male	94 (54.2)
Female	79 (45.8)
Hypertension (%)	89 (51.6)
Diabetes Mellitus (%)	66 (38.2)
CHD (%)	36 (21)
Arthritis (%)	48 (28)
BMI, mean ± SD	23.8 ± 4.2
Systolic BP, mean ± SD	151 ± 25
Diastolic BP, mean ± SD	86 ± 10
CKD = Chronic Kidney Disease; CHD = Coronary Heart Disease; BP = Blood Pressure;	

Table 2: Biochemical parameters in CKD patients

Parameters	CKD patients (Mean)
Creatinine (mg/dl)	**6.66±3.2**
Urea (mg/dl)	**126±51.2**
Uric acid (mg/dl)	**7.2±2.5**
Hemoglobin (gm/dl)	**8.2±1.6**
ESR (mm/h)	**44±21.9**
Potassium (mmol/l)	**5.1±1.9**
Sodium (mmol/l)	**132±3.9**
Phosphorus (mg/dl)	**5.5±2.2**
Calcium (mg/dl)	**7.5±1.8**
Chloride	**100.5±8.8**
Bicarbonate	**22.5±4.7**
ESR = erythrocyte sedimentation rate	

DISCUSSION

Age, hypertension, CHD, diabetes, high SBP, elevated fasting plasma glucose, elevated triglyceride levels, and a history of stroke were all found to be independently linked with CKD [10]. CKD is still undertreated; despite a high proportion of co-morbidities, according to KDIGO 2012 Clinical Practice guidelines, less than 10% and 20% of patients had their blood pressure regulated to objectives of 130/80 mm Hg and 140/90 mm Hg, respectively [11]. The high frequency of main CKD risk factors in South Asia does not come as a surprise given the high prevalence of CKD. In this cohort, end-stage renal disease is independently linked to the known risk factors for diseases, BMI, CHD, arthritis and diabetes. According to findings from national surveys, diabetes and hypertension afflict 1 in 5 and 1 in 3 persons in Pakistan, respectively. Major CKD risk factors have been more prevalent over the past 20 years, according to Pakistan's 2010 Global Burden of Disease assessment [12].

Low levels of hemoglobin indicated anemia in our results for CKD patients. In another study on was observed that Erythropoietin deficiency is the main cause of anemia, which is a prevalent consequence of chronic renal disease [13]. The crucial kidney function is called mineral homeostasis. Disturbed kidney function is linked to abnormalities in serum electrolytes, including potassium, calcium, sodium, chloride, bicarbonate, and phosphorus, which can cause some very serious problems in CKD patients [14]. In the current study, more CKD patients were discovered to have hyperphosphatemia (hyperelectrolytemia) for phosphorus and hyperelectrolytemia for calcium (hypocalcaemia). In another study hyperkalemia hypocalcemia, hyperphosphatemia and hypomagnesemia was present in CKD patients in Lahore, Pakistan [15]. In this study mean levels of urea, creatinine and uric acid which are main CKD indicators were high pointing to possible associations with inflammatory and nutritional conditions. As seen in a high percentage of people with CKD, this rise in creatinine, urea, and uric acid concentrations could cause high ESR levels, low hemoglobin levels and renal failure [16].

LIMITATION

The fact that this study was restricted to a small cohort of CKD patients may have an

impact on how generalizable its findings are to all CKD patients nationwide.

CONCLUSION

In conclusion, the current investigation has shown that all serum biochemical profile in CKD patients had substantial derangements. The most frequent serum electrolyte abnormalities were hyperphosphatemia and hypocalcemia. Statistically significant risk factors for CKD include hyperuricemia, low creatinine clearance, uremia, mineral derangements, high ESR, and low hemoglobin levels.

ETHICS APPROVAL: The ERC gave ethical review approval

CONSENT TO PARTICIPATE: written and verbal consent was taken from subjects and next of kin

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