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A Study of Some Parameters Related to Chronic Renal Failure Patients in Hemodialysis Unit

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ABSTRACT

Chronic renal failure is an irreversible and longtime condition of decrease kidney ability to filter waste and fluid of the body. Patients must be diagnosed and treated as early as possible, in order to prevent further complications. This study were conducted in the hospitals of Wasit province aiming to evaluate some parameters changes for patients with renal failure who are subjected to hemodialysis during the period between 1/9/2019 until 15/2/2020. The 45 patients with chronic kidney failure were compared to same number of control healthy persons. This study included the follow-up results of different variables including hemoglobin concentration, platelets counts, white blood cells (WBC), and biochemical variables such as triglycerides and cholesterol, as well as the kidney functions test. The statistical results showed a significant decrease (P-value <0.05) in concentration of hemoglobin and platelets in patients with chronic renal failure compared with the healthy group. While rising significantly (P-value < 0.05) for the number of white blood cells in the blood of chronic renal failure patients compared with the healthy group. In addition to significant increases in triglycerides and cholesterol levels in the chronic renal failure patients. As well as the presence of significant increase (P-value <0.05) in the concentration of both urea and creatinine, uric acid, Ka, and K. This study found a negative effect of chronic renal disease in most of the variables hematological and biochemical parameters compared to control.

Keywords: renal failure, chronic renal failure, hemodialysis

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INTRODUCTION

Renal Failure (RF) is generally defined as a failure of the kidneys and their normal functions in filtering blood from waste and secondary body products (1, 2) which leads to the accumulation of waste and fluids in the body (3; 4). As a result of this a general imbalance in the human body shows kidney failure in two main forms: acute Renal Failure (ARF) and chronic renal failure (CRF) (5).

Acute renal failure is the failure of the kidneys from working suddenly and quickly, in which the kidneys fail to remove the final waste products from blood and extra fluids. Kidneys also fail to keep fluid balance outside the cells (PH) which leads to chemical imbalance due to the accumulation of toxic substances and fluids in the body (3; 6; 7). A lot of reasons are behind acute kidney failure (8 ; 9;10) and most of them are not related to the kidneys defect- in other wards- the kidneys are healthy, but the failure results from a lack of blood nutrition for them. This condition often known as acute renal failure before the kidney. The most important examples of these conditions are major surgeries, external bleeding, fractures, hemorrhoids, heart failure, and severe burns (11; 1; 12). In addition to some cases of diarrhea and severe vomiting, especially in children, and this is also called a pre renal failure (14; 15).

Other type is an intrinsic or intra-renal failure - as in acute glomerulonephritis, acute tubular necrosis (16) and taking some medications that have toxic effects on the kidney (17). Post renal failure result from a blockage in the urinary tracts due to the presence of stones or a tumor or masses or prostate enlargement.

The chronic kidney failure in another hand is a global disease. So, the World Health Organization (WHO) and other health agenesis have warned from the noticeable outbreak and the remarkable increase of this disease in recent years. The total number of patients with failure diseases is about 100,000 patients, with a proximity of 450 patients per each million people (18)

In recent times in Iraq, there is high and remarkable increase in the number of renal disease patients who conducting a hemodialysis, and this number expected to rise to up to 7667 patients at the end of year 2020.

Due to the lack of available studies on the physiological and biochemical variables for patients with renal failure in Iraq, which is not commensurate with the seriousness of the disease and its rapid spread observed in recent years, so the study was conducted to evaluate some physiological and biochemical changes for patients with chronic renal failure.

MATERIALS AND METHODS

This comparative study was conducted on patients with renal failure, at hemodialysis unit in Wasit province during the period from 1-9-2019 to 15-2-2020.

The study included 45 patients (17 males and 18 females) with chronic kidney failure, in compared to a total of 45 healthy people who not subjected to any other diseases.

Collection of blood

After the participants were informed about the aim of the study and obtaining of a verbal consent from them, about 10 ml of venous blood were withdrawn from each of the selected samples using sterile medical syringes. Samples were transferred by special tubes containing anti-clotting material (Aladieta) to measure wanted hematological variables, while other part of blood was kept in special tubes free from any material and left at laboratory temperature for (10-30 minutes) and then discarded by centrifugation speed 3000 rev/ min device for a period of (10) minutes to separate

blood serum .The serum then was saved at a temperature of -20 ° C until the analysis for biochemical measurement.

The study included measurement of the following criteria

Hematological variables: measurement included the following criteria:

1 Total Leucocytes Count and total white blood cell count: The blood cell counter and dilution solution was used (for the calculation of Turks Fluid)[19] to calculate the total white blood cell count.

2. Hemoglobin meter: A hemoglobin (Hb) meter and a draken solution were used as a dilution solution to estimate hemoglobin concentration in the blood sample [20].

3. A total platelets count: A blood cell counter and ammonium oxalate solution were used to calculate the number of platelets. [20]

Biochemical variables:

The measurement included the following criteria:.

A. Total serum cholesterol estimate: The enzymatic method Siedel and his group [21] used to estimate serum total cholesterol.

B. Determination of serum triglycerides: the enzymatic method described by Prenci and Fassati was used [22]

C. Estimation of serum urea level: Determined using urease enzyme [23].

D. Estimate the level of uric acid in the blood serum: Determined according to the Fossatti method [24].

E .Estimated serum creatinine level: Determined without protein precipitation [25]

F. Estimation of the level of sodium and potassium ions in the serum was estimated according to Maruna & Trinde [26]

Statistical analysis:

The data obtained was analyze using the SPSS statistical program version 20. The mean and standard deviation of the continuous variables included in the study were used. The independent sample T test was used to compare the mean of the two-study population. α – level is considered a significance if it is equal or less than 5%. (P -value <0.05) (27)

RESULTS

After conducting the statistical analysis of blood and biochemical variables in patients with chronic kidney failure, the following results were revealed

First: Hematological variables

The results of the statistical analysis showed a significant decrease in hemoglobin concentration (Hb) and platelets in the group of patients with chronic renal failure compared with the healthy group as in (table 1, figures 1, and 2). The current results also indicated a significant rise in the number of white blood cells (WBC) for patients with chronic renal failure compared to the healthy group as in (table 1 and figure 3)

Table 1: Hematological changes for patients with kidney failure and healthy people.

Variables	Patients Mean ± S.D	Healthy group Mean ± S.D
Hb g/dl	10.6±0.34*	13.9±.29
Platelets	169±0.46*	246.7±2.1
WBC	8.3±0.27*	6.8±0.27

- Have significant difference at the level of significance p-value <0.001

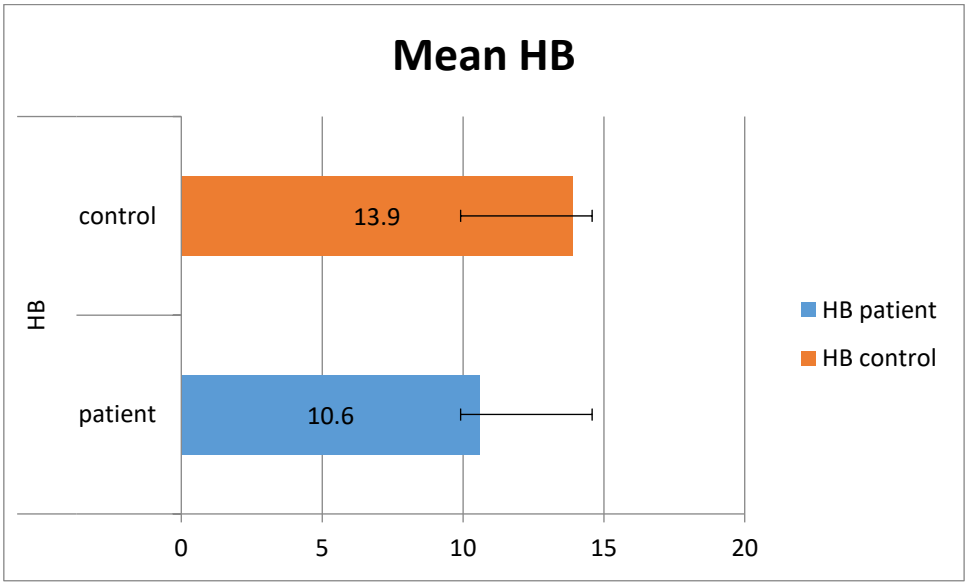

Figure 1: Changes in the mean hemoglobin level in the blood for kidney failure patients.

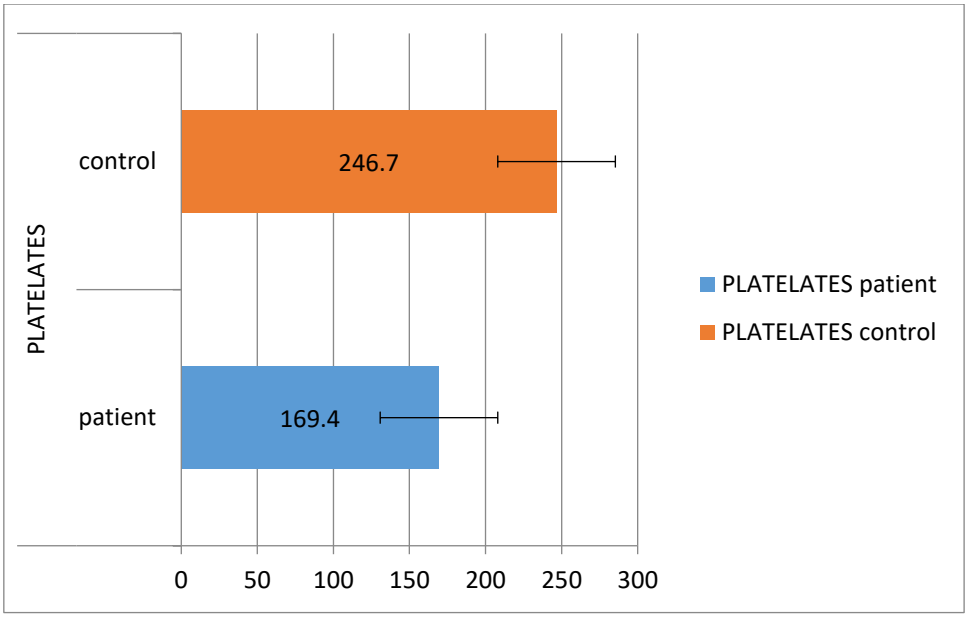

Figure 2: Changes in the mean platelets counts between patients of renal failure and healthy.

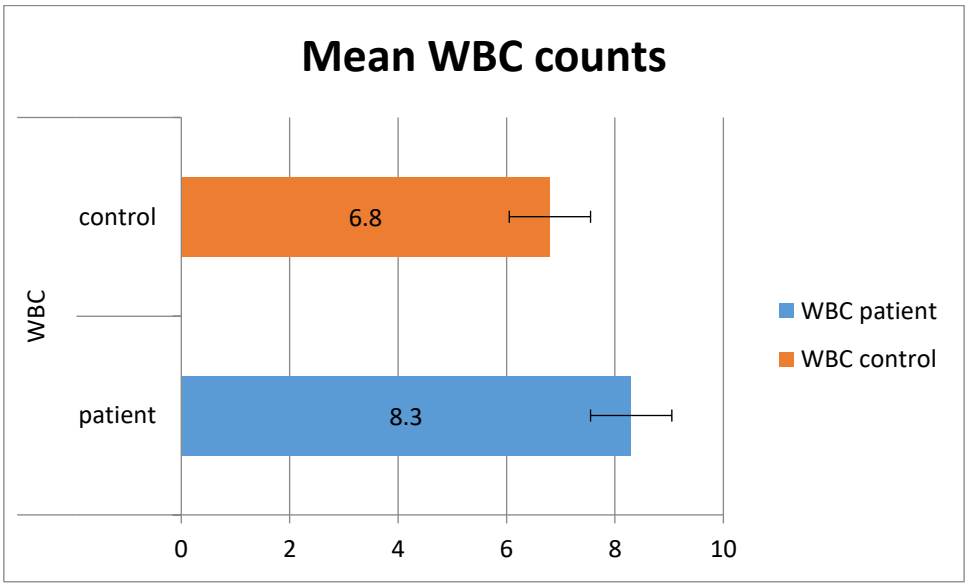

Figure 3: Changes in mean white blood cells counts for kidney failure patients in relation to healthy peoples.

Second: Biochemical variables

A - Metabolic variables: The results of the current study showed a significant increase in the levels of the concentration of triglycerides and cholesterol among patients with chronic kidney failure compared to the healthy group as shown in table 2 and Figures 5-4.

Table 2: Metabolic changes for patients with kidney failure

Variables	Patients Mean ± S.D	Healthy group Mean ± S.D
CHOLESTEROL	136.2 ±0.97*	178.7±0.98
TRIGLYSERIDE	143.3±0.71*	86.6± 0.7

* Have significant difference at the level of significance p-value <0.001

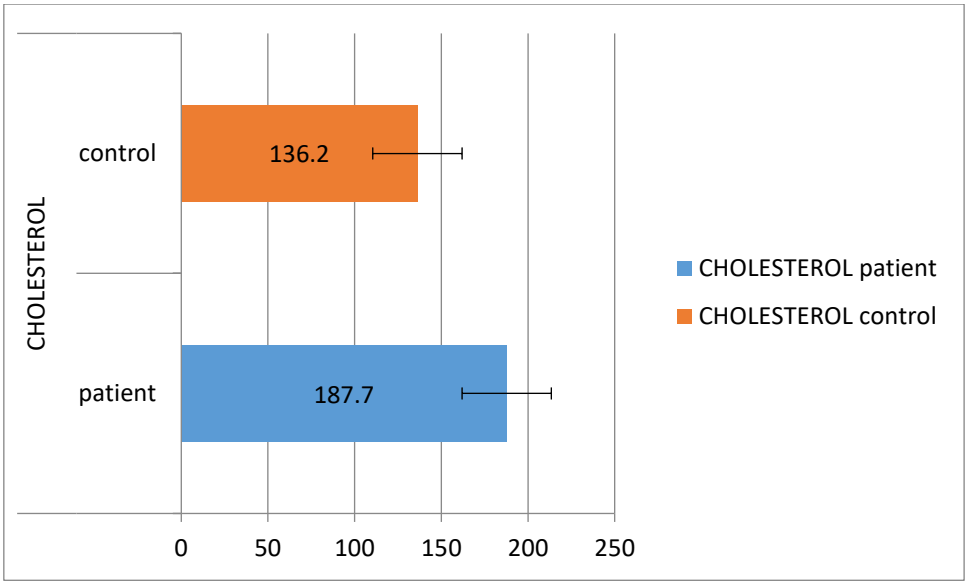

Figure 4: **Changes in the mean of cholesterol in the blood for kidney failure patients**

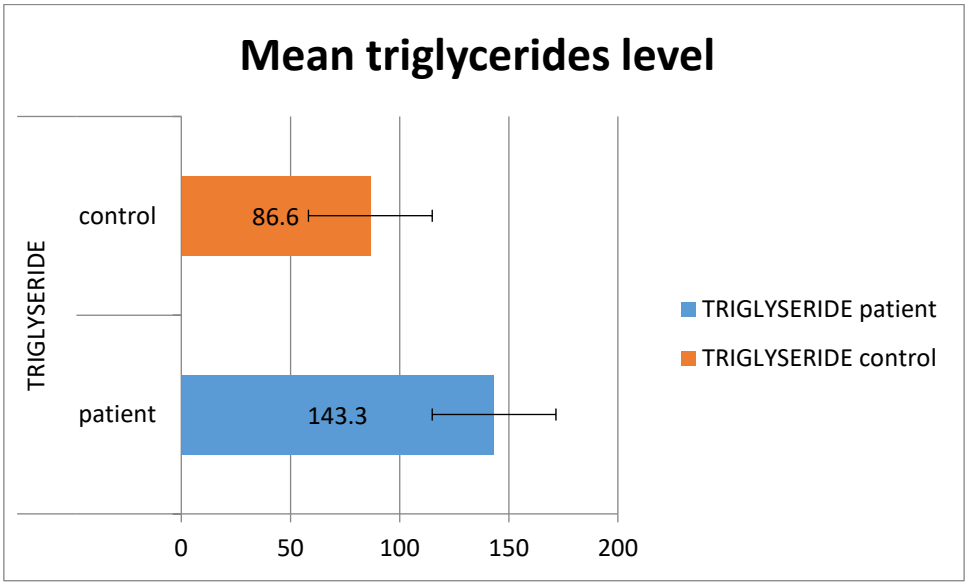

Figure 5: **Changes in the level of triglycerides in the blood for kidney failure patients**

B- Kidney Functions

Significant spikes (p value <0.001) in urea and creatinine levels in serum for patients with chronic renal failure compared to the healthy group (table 3 and figures 6-7)

A significant increase in serum uric acid was found in patients with chronic renal failure when compared to healthy subjects (table 3 and figure 8).

High levels of potassium and sodium ion concentration were found among patients with chronic renal failure compared to healthy subjects (table 3, and figures 9-10).

Table 3: **Biochemical changes in kidney function of patients with kidney failure compared to healthy people.**

Variables	Patients Mean ± S.D	Healthy group Mean ± S.D
Serum Creatinine	8.0± 0.29	0.89 ±0.05
Blood Urea	111.2 ± 1	27.8 ± 1.3
Uric acid	8.8± 0.22	5.5 ± 0.15
Na	141±1.9	139 ± 0.55
K	7±0.73	4±0.29

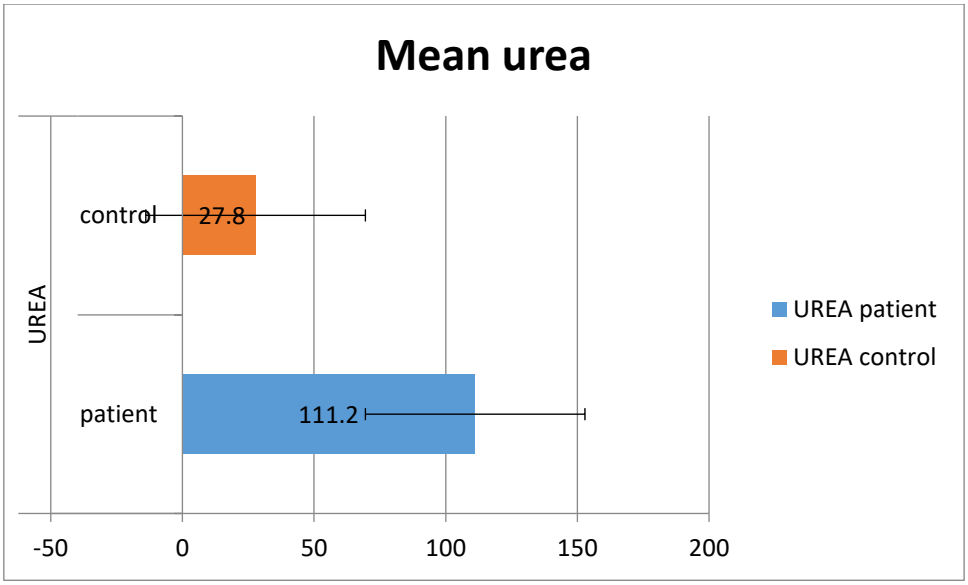

Figure 6: Changes in mean blood urea level in patients with chronic renal failure.

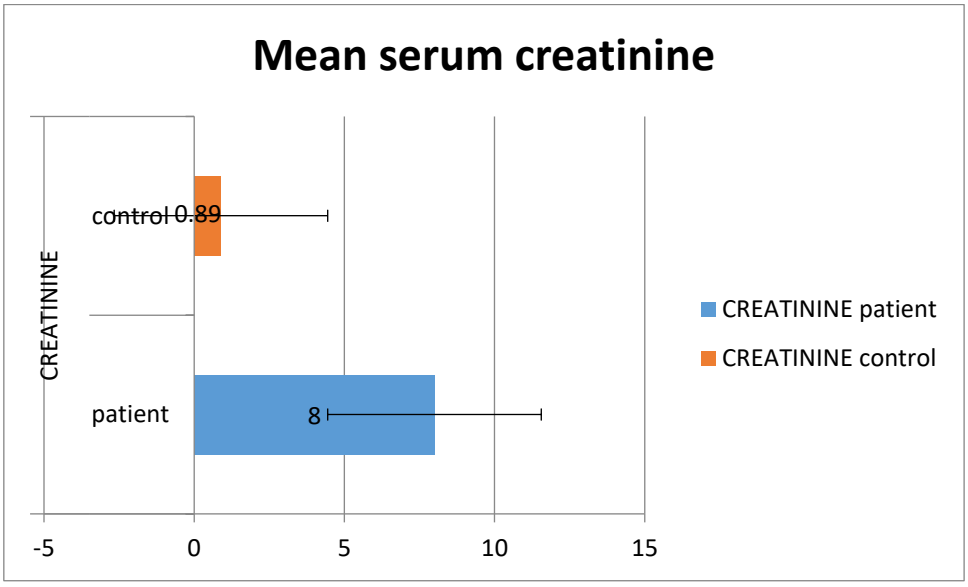

Figure 7: Changes in mean serum creatinine level in patients with chronic renal failure compared to healthy.

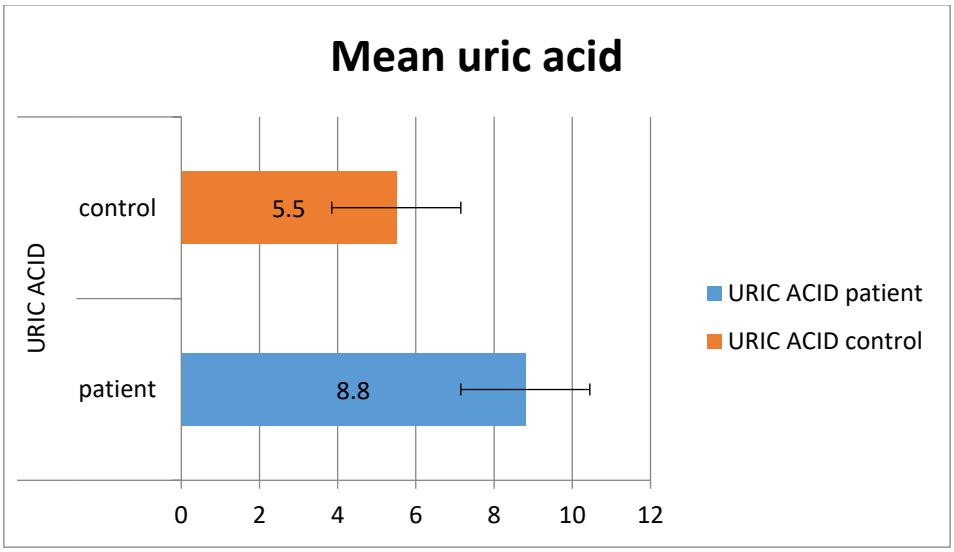

Figure 8: Changes in mean uric acid concentration in patients with chronic renal failure compared to healthy.

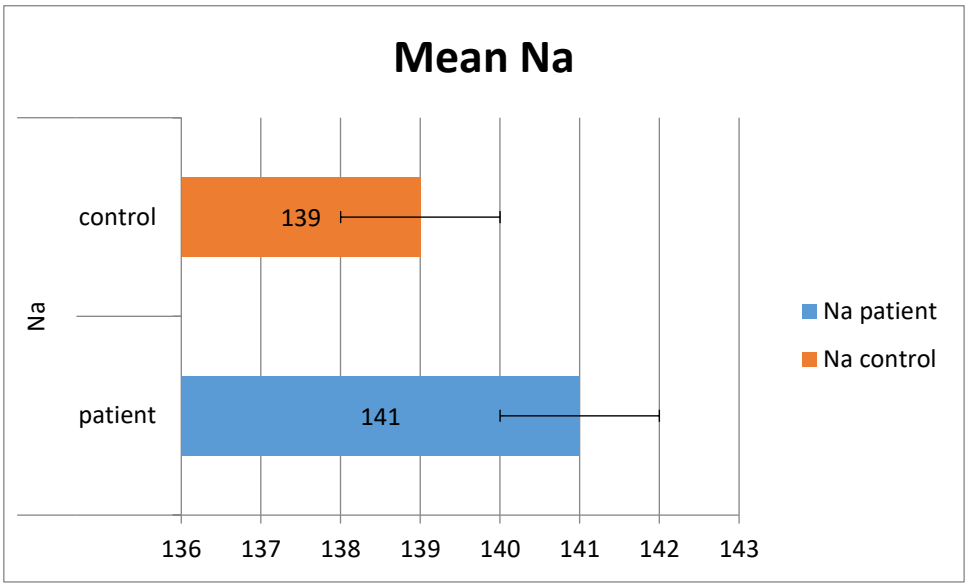

Figure 9: Changes in mean Na level between patients with chronic renal failure and healthy persons.

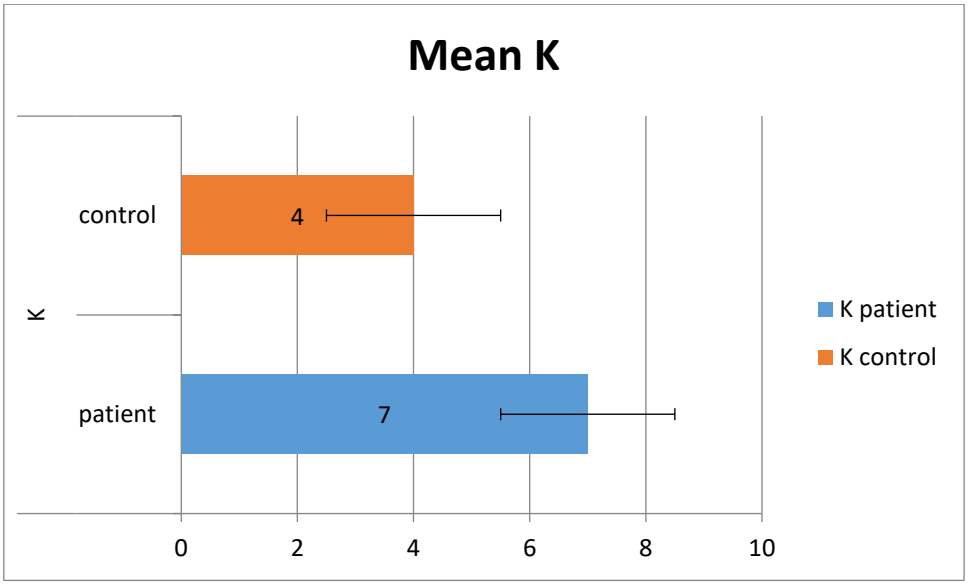

Figure 10: Changes in mean blood K level between patients with chronic renal failure and normal healthy people.

DISCUSSION

It is clear from the results of the current study that there is a significant decrease (P- value <0.05) in the concentration of hemoglobin (Hb), which are indicators of anemia in patients with chronic kidney failure, and many studies have indicated that anemia represents one of the most important complications that accompany chronic kidney failure (29). The results of this study were identical to many studies that indicated that the presence of anemia in patients with chronic renal failure due to a decrease in the secretion of the Erythropoietin hormone in the bone marrow responsible for stimulating the process of formation of red blood cells (Erythropoiesis). One of the important causes of low hemoglobin concentration is the deficiency in the iron component that enters in the chemical composition of its hemoglobin molecule.

This deficiency may be caused by poor nutrition experienced by patients with chronic kidney failure and the inhibition of iron absorption from the intestine due to the high level of cytokines [29] [30]. Other reasons that lead to anemia in patients with chronic renal failure is the collection of nitrogenous wastes in the blood that inhibit the production of red blood cells in the bone marrow. [31]

The results of the study indicate a significant increase (P-value <0.05) for the number of white blood cells in the blood of patients with chronic renal failure compared with the healthy group, this study agreed with what was mentioned in other study [32]. The increase in white blood cells may be due to the inflammatory situation accompany the case uremia, and treatment of hemodialysis.

The current results showed a significant decrease (p-value <0.05) of the number of platelets counts in the group of chronic kidney failure patients compared with the healthy group, and they were agreed with other studies (33) mentioned a decrease in platelets in the bone marrow. This decrease can be attributed to the increase in the acidity of

the blood in patients with chronic kidney failure, as it was found that it has a direct relationship with the low platelet counts [34]. An important factor is the deficiency in the level of the hormone thrombopoietin responsible for regulating the formation of platelets . (35)

Other results also showed by this study is the presence of significant increase (P-value <0.05) in the levels of triglycerides and cholesterol in patients with chronic renal failure compared to the healthy group. Can attributed this rise in triglycerides concentration to low levels of enzymes and proteins involved in the mechanism of the purification of blood, was due increase blood cholesterol among patients with chronic renal failure to decrease the effectiveness of the enzyme Lecithin cholesterol Acyltransferase (LCAT) fat triple 26) this leads to disrupt the transfer of cholesterol free from Alonsjhmahaitih to protein molecules greasy high density - high density Lipoprotiein (HDL-C) [36]

It is known that urea, creatinine and uric acid in the blood and serum are used as a diagnostic test for kidney function, and it was noted in this study highs significant increase in both urea and creatinine in addition to increase in uric acid in the blood patients with chronic renal failure compared to the healthy group, and this for glomerular renal filtration, and accumulation of uric acid occurs in the blood.

The results also indicated in this study that there are high levels of potassium and sodium ions concentration among patients with chronic renal failure compared to the healthy group, as the increase in potassium can be attributed to many reasons, including the role of the kidney function in releasing approximately 95-90% of the potassium entering the body. When chronic renal impairment occurs, the efficiency of this process decreases, and these results are consistent with other studies done [30]. As for the increase in sodium ion, this may be due to a decrease in the efficiency of glomerular filtration (GRF) that works to reduce sodium filtration and increase its concentration, and this is consistent with the study [37]

CONCLUSIONS

The most important conclusion of this study is the patient suffering from chronic renal failure in hemodialysis unit in Wasit province were complaining from anemia, increased triglycerides and cholesterol level. Significant increase in urea, creatinine, serum uric acid, potassium, and sodium levels.

RECOMMENDATIONS

Through the results of this study, we recommend the following:

- Following a diet low in protein, potassium and sodium to reduce negative results and their harmful effects on the health of people with kidney failure. - Avoid excessive intake of medications and pain relievers as they damage the kidneys.
- The sodium intake should be controlled no more than 1-2 grams per day.
- Urgent medical procedures must be taken when the kidneys are injured for fear of worsening the disease and entering into dialysis operations to get rid of waste and toxic substances.
- Focus on drinking sufficient amount of clean drinking water.

CONFLICT OF INTEREST

No.

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