Background: Patients with chronic kidney disease (CKD) frequently develop anemia, which has been linked to a reduction in their quality of life as well as an increase in morbidity and mortality. Anemia also has been linked to an acceleration in the course of CKD in certain studies.

Methods: In this study, a total of 60 cases consisting of 40 patients with CKD and 20 control were examined. The patients had ages ranging between 15 to 75 years. The study cases are determined hematological parameter and erythropoietin in patient with CKD. Also, this study compared between the two level of Hb in in patient with CKD.

Result: The result in this study exhibits significant decrease in hematological characteristic (Hb, platelets, and RBC) but there is non-significant decrease in WBC number in patients with CKD when comparison to control. Also, the result showed significant decrease in erythropoietin in patients with CRF comparison with healthy group.

Conclusions: In our study we concluded that high evidence found between CKD and anemia. The central feature of anemia is the erythropoietin deficiency in CKD patient. So that, hemoglobin negatively regulates the erythropoietin. However, the anemia treatment with erythropoietin is required.

Keyword: CKD, anemia, erythropoietin, urea, hemoglobin

I. INTRODUCTION

Long-term renal impairment (CKD) is defined as an abnormally high serum creatinine level that persists for more than 3 months or an estimated kidney function rate (GFR) that is less than 60 milliliters per minute/1.73 cubic meters per minute (mL/min/1.73 m2). It is frequently associated with a gradual decrease of kidney function that necessitates the use of renal replacement medication (dialysis or transplantation). End-stage renal disease (ESRD) is a medical illness that occurs when a patient requires renal replacement therapy (1).

Diabetes mellitus, particularly type 2 diabetes mellitus, is the most popular reason of end-stage renal disease (ESRD). Hypertension is the second most popular reason for stroke. There are several other causes of chronic kidney failure, including glomerulonephritis, polycystic kidney disease, renal vascular disease, and diabetes. Other recognized causes include a prolonged blockage of the urinary tract, nephrolithiasis, Vesicoureteral reflux, a disease in which urine backs up into the and kidneys, and kidney stones. Recurrent kidney infection/pyelonephritis is a condition that occurs on a regular basis (2). The pathophysiology of CRF is mostly attributed to a particular starting mechanism, which has been identified. As a result of this, compensatory hyperfiltration and hypertrophy of remaining viable nephrons occur over time, resulting in the development of chronic kidney disease (3). Hemodialysis, peritoneal dialysis, and kidney transplantation are the specific treatment strategies for kidney disorders, respectively (4).
The decrease in kidney function occurs gradually and may first manifest itself as asymptomatic. The natural history of renal failure varies depending on the cause of the disease, but it is ultimately defined by early homeostatic mechanisms such as nephron hyperfiltration in the early stages of the disease. Because of the damage done to the nephrons, the kidney increases the rate of filtration in the remaining healthy ones, ultimately resulting in higher filtration overall. This can cause the patient with moderate renal impairment to have normal creatinine levels, allowing the illness to go undiscovered for a period of time before being discovered (5).

End-stage renal disease can present with a range of signs and symptoms. Anemia, mineral and bone problems, and metabolic derangements such as hyperkalemia, hypernatremia, metabolic acidosis, hypo/hypercalcemia, and hyperphosphatemia are among the conditions that might develop. Uremic poisoning can cause anorexia, nausea, vomiting, bleeding diatheses, seizures, coma, and death. Other symptoms include pericarditis, uremic neuropathy or encephalopathy, and uremic neuropathy. Uremic toxicity is a sign that dialysis should be performed immediately (6).

It is sometimes referred to as anemia of CKD. Anemia of CKD is a kind of hypoproliferative anemia that is normocytic, normochromic, and hypochromic. It is commonly connected with poor results in chronic renal disease and is related with a higher risk of death as a consequence. The goal of treatment is to improve renal function whenever feasible while also enhancing red blood cell production. Anemia associated with chronic renal illness is best treated with erythropoiesis-stimulating medications in conjunction with iron supplementation, which is the gold standard therapy. This activity provides an overview of the assessment and therapy of anemia associated with chronic renal illness, as well as the importance of the interprofessional team in the care of patients suffering from this disease (7).

The aim of this study was early prediction and diagnosis of the CKD in addition to estimate some of biochemical markers and correlate with BMI and Hb in patient with chronic kidney disease.

II. MATERIALS AND METHODS

Subjects
The research was performed in "the Artificial Kidney Unit in Al-Sadder Teaching City and at the Al-Hakeem hospital in the province" of Al-Najaf Al-Ashraf, as well as in other locations. A total of 60 cases were studied, with 40 patients suffering from chronic kidney disease (CKD) and 20 being healthy controls.

Study Design
The samples tested were patients suffering from the chronic renal failure and treatment with hemodialysis, all patient under the study had no smoking, no suffering from the hepatitis and other diseases but some have diabetes. The ages of patient range between (15-70 years). This study including 20 males and 20 females in additional to 20 control group. Blood samples were taken from the veins using sterilized synergies and a volume of 5 milliliters of blood. The sample was placed in the tube that had been labeled. Blood was allowed to coagulate for 10 minutes at room temperature before being centrifuged at 6000 rpm for 15 minutes. The serum was then isolated and stored at -80 degrees Celsius until it was time to conduct the laboratory analysis for the study.

Assessment of Complete Blood Count (CBC)
Using Mythic™ eighteen (Ringelsn Co., Turk), a complete blood count was performed on anticoagulant blood in the Haematology Laboratory using anticoagulant blood.

Erythropoietin (EPO)
The quantities of erythropoietin (EPO) in the serum were determined employing an enzyme-linked immunosorbent assay (ELISA) based on a preparation obtained from Elabscience, China (Cat-No. E-EL-H0066).

Statistical Analysis:
The SPSS application (Version 23) was used to conduct the statistical analysis of the data. The statistical analysis of the data was carried out using the SPSS program (SPSS, Version 23). The Pearson correlation coefficient and multivariate ANOVA were used to compare the measured parameters among the subdivided groups in order to make the comparison. The statistical significance of all of them was determined at P<0.05 P0.05 (Al Rawi, 2000).
III. RESULTS

Comparison between Hematological Characteristics according to two Levels of Hb (g/dl) Groups of Patients with CKD

The results of figure (1, 2, and 3) indicated non-considerable (p<0.05) in Hb, WBC number and platelets while there was a considerable decrease (p<0.05) of RBC number in patients with Hb<7 comparison with Hb>7 group. Also, the result revealed considerable decrease (p<0.05) of erythropoietin in patients with Hb>7 comparison with Hb<7 group.

Figure 1: Comparison of the Hematological between two Levels of Hb (g/dl) Groups of Patients with CKD

Figure 2: Comparison of the platelet between two Levels of Hb (g/dl) Groups of Patients with CKD
Correlation

Results of the association and linear regression among Hb and biomarkers concentrations at the Patients with CKD revealed:

- Figure (7) (8) (11) displayed a non-considerable correlation between Hb and platelet, WBC number and urea concentrations of Patients with CKD.

- Figure (9) displayed a considerable positive correlation between Hb and RBC number of Patients who suffer from CKD.

- Figure (10) (12) displayed a considerable negative correlation between Hb and (erythropoietin level and creatinine) of Patients who suffer from CKD.
Figure (8): Correlation between Hb and WBC of Patients with CKD

Figure (9): Correlation between Hb and RBC of Patients with CKD
Figure (10): Correlation between Hb and urea of Patients with CKD

\[ y = -6.33x + 204.76 \]
\[ R^2 = 0.0316 \]

Figure (11): Correlation between Hb and creatinine of Patients with CKD

\[ y = -0.7769x + 14.594 \]
\[ R^2 = 0.1399 \]
The findings of the current investigation displayed that there is considerable decrease in (hematological characteristic) Hb, platelets, and RBC in patients with CKD in comparison to healthy group. In accordance with Almahdi et al (2016) (8), who discovered a statistically significant reduction in hemoglobin levels in Libyan CKD patients in comparison to the control group, these findings were confirmed. Another recent study, which was similar with our findings, discovered that the hemoglobin concentration and RBCs count of severe CKD patients in Nigeria were substantially different from those of the control group (9).

Similarly, our findings were consistent with those of several other research (10,11). Panetta et al., (2017) (12) demonstrated that the concentration of hemoglobin reduced as the severity of renal failure increased. This can be ascribed to the extensive damage done to the renal tissues as well as the absence of normal EPO production, secretion, and control. Also, the result of current study displayed a considerable decrease (p< 0.05) of erythropoietin in patients with CRF comparison with healthy group. Hemoglobin levels inversely influence Erythropoietin production and secretion, according to a previous study. The hypoxia-inducible factor-alpha, a transcription factor that regulates the erythropoietin production in the renal cortex, is upregulated when the oxygen saturation of the tissue falls below a certain level. Fundamentally speaking, "relative erythropoietin deficiency« in the situation of renal failure can be resulted from two different mechanisms: "either the biosynthesis of erythropoietin is decreased as a result of the tissue damage caused by the underlying disease, or the set-point for erythropoietin secretion is lowered in relation to tissue oxygenation as a result of the underlying disease" (12).

According to the findings of a previous study, patients with CKD had a significant increase (p< 0.05) in the concentrations of Urea and Creatinine, but a considerable decrease (p< 0.05) in the levels of EPO, hemoglobin, red blood cells, white blood cells, and lymphocytes in comparison to the healthy group. (13)

The result of previous study showed considerable increase (p< 0.05) in the condensation of Urea and Creatinine but displayed considerable decrease (p< 0.05) in the EPO, Hb, RBC, WBC and Lymphocytes in patients with CKD comparing with control group. (13)

Furthermore, according to another research, EPO insufficiency is the major reason of anemia in chronic kidney disease (CKD), and it has been proven to happen at every stage of kidney failure. Because the kidney is the main source of EPO synthesis in adults, a decrease in renal mass, such as that observed in advanced CKD, typically results in a decrease in EPO production, resulting in anemia in these individuals (14).
Individuals with renal illness have decreased EPO production, which results in erythropoietin insufficiency in these patients (15-17). T-lymphocyte activation results in the production of inflammatory cytokines such as IFN-gamma and TNF-α, which block the release of EPO from the kidney and, as a result, impede the development of erythroblasts and increase the death of erythroblasts by causing cell damage (18,19). According to other studies, a decrease in blood flow to the kidneys causes a decrease in the activity of the tubular transport system, resulting in a constant amount of oxygen in the kidneys, allowing the kidneys to stay stable. As a result, EPO secretion was reduced as a result of the variation in oxygen levels, which was independent of the variation in renal blood flow. This resulted in a reduction in EPO secretion (13).

Anemia is a popular sign in individuals with CKD, and it is largely caused by a decrease in the synthesis of erythropoietin in the kidney, as well as a reduction in red cell survival (20). The findings of present investigation shows considerable increases in serum levels of urea and creatinine in patients with CKD in comparison with control as similar to study of Panetta et al., (2017) found that significantly lower Hb levels, and significantly higher creatinine levels in comparison to the control group. (12)

The findings of the investigation reflected that there is a negative correlation between hemoglobin and EPO in patients who suffer from CKD, that was consistent with another study that found "a normal inverse correlation between EPO and hemoglobin level, which means that when hemoglobin level” decreases, the EPO level rises. However, in patients with CKD, the findings revealed a positive correlation between hemoglobin level and EPO, which was consistent with another study that found "a positive correlation between hemoglobin level and EPO"(21).

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REFERENCE


