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Evaluate the Complete Blood Picture and Some Biochemical Parameters in Patients referred to the dialysis unit in Diyala General Hospital

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Abstract

Research done on 40 patients; 24 males, 20-79 years, and 16 females, 42-67 years; referred to dialysis unit, Baqubah hospital, in November and December, 2021; January and February 2022. Creatinine, Urea and Iron, record high levels. Glucose, calcium, sodium, potassium, and phosphate, were within normal, and low levels of albumin. Means of Total Erythrocyte Counts (TECs), hemoglobin (Hb), Hematocrit% (HCT), and Mean Corpuscular Hemoglobin Concentration (MCHC), showed lowered level. While, Mean Cell Volume (MCV), Mean Corpuscular Hemoglobin (MCH), Mean Red Blood Cell Distribution Width- Standard Deviation (RDW-SD), Mean Red Blood Cell Distribution Width- Coefficient of Variation (RDW-CV), were within normal. Total Leucocyte Counts (TLCs), Neutrophils, Lymphocytes, Eosinophil, Basophils, were within normal, Platelet Counts and related parameter were within normal. Within ranges some values were higher than normal as, potassium, phosphate, (RDW-SD), (RDW-CV), Neutrophils%, Eosinophil%, Lymphocytes, Mean Platelets Volume (MPV). While some other values were lower as sodium, (TRCs), (Hb), (HCT %), (MCV), (MCH), (MCHC), (RDW-SD), (TLCs), Lymphocytes%, platelets, Platelet Distribution Width (PDW), Platelet- Large Cell Ratio (P-LCR). But some values of glucose, and calcium, were high, and some other low. At the same time Monocytes%, Basophils% was within normal range. In conclusion creatinine and urea levels have an important role in diagnosis and follow- up of kidney failure. All patients have high levels of urea, iron and creatinine. But not all have higher level of potassium and glucose. Sodium and albumin, showed decreased level. Blood picture revealed microcytic, hypochromic anemia; as (TECs), (Hb), (HCT %), (MCHC) and (RDW-SD) were of lower values.

Introduction

Renal failure is the 9th factor that leads to death in many nations in the world [1-4]. Acute renal failure is a life threating illness whose mortality has remained high since the introduction of haemodialysis. Over the past half century, the widespread use of dialysis to prolong life for people without kidney function has been a remarkable achievement [5]. Acute renal failure is caused by ischemic (50%) or Nephrotoxic (35%) damage to the kidney [6]. Acute renal failure is typically diagnosed by observing rises in blood urea nitrogen (BUN) and

plasma creatinine and decrease in urine flow rates over several days [7]. When we management patients have renal dysfunction we require know about of glomerular filtration rate (GFR), that is necessary in the general evaluation of the kidney functions [8]. The laboratory parameter of many substances in urine and plasma is needed for the accurate assessment of the function of kidney. For the evaluate of renal function we need to detect many importance, include the rate of glomerular filtration(GFR), levels of protein in urine, disturbances in the electrolytes, and the concentrations of creatinine, uric acid, and urea [9]. Creatinine in urine and serum are also essential in the renal function evaluation, results utilized to directly estimate the GFR [10]. Using of filtration to remove substances from intravascular circulation called Dialysis. Typically, dialysis is ordered when kidney function declines to 10- 15% of normal function [11].

Planning for dialysis begin when patients reach chronic kidney disease stage 4, which is when glomerular filtration rate or creatinine clearance reaches below 30 ml/ min [12]. Urea is organic waste product originated from dietary protein; pass with urine as it filtered through kidney [13]. This compound in blood increased when kidney failure occurred [14]. The removal of the amount of potassium that was excess from blood and then returns the body back to physiological levels called Dialysis [15]. According to the National Institutes of Health, the overall all chronic kidney disease (CKD) prevalence of is about 14%. Worldwide, the diabetes and hypertension, the most common causes of it [16-19]. This researched was done, to evaluate the conditions of patients during process of dialysis, depending on the levels of certain biochemical elements and blood picture.

Material and Methods

The research done on 40 patients; 24 males, of 20-79 years old, and 16 females, of 42-67 years; in November and December, 2021, and January and February 2022, presented to unit of dialysis in general Baqubah hospital, Diyala, Iraq. The depended parameters were, some biochemical, and haematological parameters, including, creatinine, urea, Iron, albumin, phosphate, calcium, sodium, potassium, and complete blood pictures. Blood samples obtained to carry, complete blood pictures, with determination of some biochemical parameters. The determination of blood constituents were achieved by approved methods.

Statistical analysis

Results are expressed as mean ± standard error (M ±SE) [20].

Results

The results of work showed, that; means of creatinine, urea, and irons, were higher than normal, as their values were (471.75±29.43 μmol/l), (18.33 ±0.90 mmol/l), (38.48 ±3.79 μmol/l) respectively. But means of albumin was lower than normal (34.65 ±1.63 g/dl). While means of glucose (7.89±0.34 mmol/l), calcium (8.48±0.23 mg/dl), sodium (138.5 ± 0.50 mmol/l), potassium (4.55± 0.25 mmol/l), and phosphates (4.85±0.15 mmol/l), were within normal. The results showed that, from range of creatinine (98.61%) was higher, and only (1.39%) was within normal. Range of urea (91.67%) was higher, and (8.33%) was within normal. Iron range (54.84%) more, and (9.68%) less. Glucose range (31.88%) more, and (4.35%) less. Serum albumin range (66.67%) less; (5.56%) more. Serum Calcium range

(16.36%), more, and (16.36%) less. Sodium range, (35.48%) less. potassium range, (48.39%) more. Phosphates range (93.55%) more. (Table -1).

Table 1: The values of some biochemical parameters in blood serum

Parameter	Mean± S.E	Range	more	Less
Creatinine; µmol/l	471.75 ±29.43	117--1440	213 (98.61%)	0
Urea; mmol/l	18.33 ±0.90	3.80--40.0	198 (91.67%)	0
glucose: mmol/l	7.89±0.34	2.1---16.0	66 (31.88%)	9 (4.35%)
Albumin: g/dl	34.65 ±1.63	9--77	9 (5.56%)	108 (66.67%)
Calcium: mg/dl	8.48 ± 0.23	4.69--12.7	27(16.36%)	27(16.36%)
Iron: µmol/l	38.48±3.79	7--78	81 (54.84%)	9(9.68%)
Sodium: mmol/l	138.5 ± 0.50	126--159	0	33(35.48%)
Potassium: mmol/l	4.55± 0.25	2.8—8.8	45 (48.39%)	0
Phosphates: mmol/l	4.85±0.15	1.5-8.4	87(93.55%)	0

The results of research recorded that, means of TECs, Hb concentration HCT%, and MCHC were lower than normal; as their levels were (2.91 ± 0.17 x 10^6/ul), (7.60 ± 0.29 g/dl), (25.19± 0.74%) and (30.27 ± 0.26 g/dl) respectively. But means of, MCV, MCH, RDW-SD, and RDW-CV, were within normal, as they were (88.32 ± 1.78 fl), (26.71 ± 0.6 pg), (46.60±1.20 fl), (14.36±0.35%) respectively. The results showed that the range of TECs included (52.17%), Less and (4.35%) more. While ranges of Hb, HCT%, MCHC, MCV and MCH showed less levels from normal, (100%), (100%), (53.97%), (34.78%) and (15.87%) respectively. The ranges for RDW-SD (8.70%), less and (17.39%) more. For RDW-CV (26.1%) more (Table-2).

Table 2: Values of total erythrocyte counts, Haemoglobin concentration, and related parameters.

Parameter	Mean± S.E	Range	More	Less
TECs x 10^6/ul	2.91±0.17	2.03—6.30	3 (4.35%)	36 (52.17%)
Hb g/dl	7.60±0.29	5.7—10.9	0	69 (100%)
HCT %	25.19±0.74	17.3—35.8	0	69 (100%)
MCV fl	88.32±1.78	56.8—100.7	0	24 (34.78%)
MCH pg.	26.71±0.60	17.3—30.1	0	11 (15.87%)
MCHC g/dl	30.27±0.26	28.6—32.9	0	37 (53.97%)
RDW-SD fl	46.60±1.20	30.9-59.3	4 (17.39%)	2(8.70%)
RDW-CV%	14.36±0.35	11.8-16.3	6(26.1%)	0

The results of research indicated that, the means of all parameters related to total and differential leucocytes counts, were within normal. As means of TLCs, Neutrophils%, Lymphocytes%, Monocytes%, Eosinphils%, Basophils%, were, (5.19± 0.42 x 10^3/ul), (67.37±2.53%), (22.18 ±2.12%), (6.27±0.48%), (4.40±0.77%), and (0.46±0.06%) respectively. (25.40%) of ranges of the TLCs were less, and (19.67%) of Neutrophils% more. For Lymphocytes% (32.79%), less and (16.39%), more. For Eosinophil%: (21.74%) more. While for Monocytes% and Basophils % the ranges were within normal (Table-3).

Table 3: Values of total and differential leucocyte counts.

Parameter	M± S.E	Range	More	Less
T.L.C. x 10^3/ul	5.19±0.42	2.79—10.52	0	16 (25.40%)
Lymphocytes %	22.18±2.12	7.3—50.8	1(16.39%)	20(32.79%)
Neutrophils%	67.37±2.53	37.0—81.7	12 (19.67%)	0
Monocytes %	6.27±0.48	1.5-12.0	0	0
Eosinophils %	4.40±0.77	0.0-15.2	5 (21.74%)	0
Basophils%	0.46±0.06	0.0-1.0	0-	0

The results showed that, the means of Platelets and its relation parameters were within normal, as they were (179.52±16.24 x 10^3/ul), (112.65±0.41fl), (10.44±0.23fl), (27.87±1.81%) for Platelets, PDW, MPV, P-LCR respectively. The ranges were for Platelets (52.17%) less, PDW (17.39%) less; MPV (43.48%) more. P-LCR (8.70%) less. (Table-4).

Table 4: Values of platelets and its related parameters

Parameter	M± S.E	Range	More	Less
PLT x 10^3/ul	179.52±16.24	60-361	0	12 (52.17%)
PDWfl	112.65±0.41	7.9—15.4	0	4(17.39%
MPV fl	10.44±0.23	7.9-12.0	10 (43.48%)	0
P-LCR%	27.87±1.81	8.4-41.3	0	2(8.70%)

Discussion

This research found that all tested samples, showed serum creatinine values higher than normal, except one case within normal; as the ranged (117 to 1440), and mean (471.75±29.43 μmol/l). (Nisha *et al*.,) Found that the levels were high (7.95±2.44 mg/dl)[21]; and (Noor *et al*.,) found it (10.48±3.06 mg/dl) and (8.27±2.60 mg/dl)[22]. (Budhi *et al*.,) Found that in the investigations of blood are within the reference interval except for the increased concentration in serum of creatinine, and Uric acid [23]. The research found that serum urea values were higher than normal except 6 cases within; range (3.80 to 40.0), and mean (18.33 ±0.90 mmol/l). (Nisha *et al*.,) recorded (165.24 ±34.77) [21] , while (Noor *et al*.,) found (130.58 ±23.11)[22]. The level of uraemia also increased in chronic kidney failure, brought on by the inability to excrete nitrogenous wastes, parathyroid hormone, proteins and other physiological substances in toxic levels [24].

The urea produced by the metabolism of protein and most of it cleared by kidneys about 90% of it [25]. (Khalidah and Suhad,) Found that creatinine and urea increased in case of chronic renal failure significantly[26]. The incidence of serum creatinine and serum urea was significantly high before haemodialysis [21]. Development of renal damage is manifested by increase the level of serum creatinine and urea. Which are depended as parameters of monitoring renal work [27, 28].

Creatinine is a waste product originated from dietary protein and the normal breakdown of muscle tissue. In addition to chronic kidney disease, creatinine levels can be affected by, diet, muscle mass, malnutrition, and other chronic illness. (Ahmed and Othman), showed that there was an improvement in kidney function through the significant decrease in the levels of urea, creatinine, and uric acid in groups treated by extracts of pomegranate peel [29]. (Nisha *et al*., and Noor *et al*.,) found that difference agents involving physical status, sex and age of

person influenced level of creatinine in serum [21, 22]. The filtration of kidneys have the very important role in the release of toxins and waste products such as creatinine, urea and uric acid, and regulation of the volume of extracellular fluid, and electrolyte concentration, osmolality of serum and, as well as the production of hormones like 1, 25 dihydroxy vitamin D and renin erythropoietin(EPO) [30]. In current research serum albumin: 36 cases were of lower level, and 3 cases of higher levels: Range (9 to 77); and mean (34.65 ±1.63g/l) were within normal range. (Gonella,) Showed normal serum albumin [31]. (Marzah, and Hasson) Hypoalbuminemia was common in CKD[32]. The presence of albuminuria is indicative of glomerular dysfunction, and of chronic kidney disease [33].

In our study the level of phosphate in blood were higher than normal range. The hyperphosphatemia and phosphate retention are one of signs in patients with End Stage Renal Diseases (ESRD) [34]. In this research serum glucose, 3 cases were lower, and 22 cases were of higher levels; range (2.1- 16.0), and mean (7.89± 0.34 mmol/l) within normal. Random Blood Sugar level of (11.1 mmol/ l) - or higher suggests diabetes. Fasting blood sugar levels less than 5.6 mmol/ l is normal. A fasting blood sugar level from 5.6- to 6.9 mmol/l) is considered prediabetes. If it's (7 mmol/l) or higher on two separate test, mean diabetes [35]. (Arwa *et al*.,) found that hypertension with diabetes, prediabetes and Kidney had a clear effect on biochemical parameters, as vimentin blood protein, fasting glucose (FSG), urea, creatinine, uric acid. While diabetes alone had no clear effect [36].

In this research; mean and ranges of (TECs, Hb, and HCT %), in addition to mean and ranges of 34 cases of MCHC were less than normal. But ranges of only 15 cases of MCV and 10 cases of MCH were less than normal. This indicated anaemia, and some patients suffer from microcytic anaemia according to values of MCV; others suffer from hypochromic according to MCHC (microcytic hypochromic anaemia). This mainly found in iron deficiency anaemia. Haemoglobin concentration is the standard indicator for anaemia among those with chronic kidney disease (CKD) [21]. Hb ranged from 6.8 to 18.0 g/dl with a mean of 12.5±1.8 g/dl [37]. Anaemia may begin in early stages of CKD [38, 39].

Anaemia is common among patients with nephropathy attributed to type 2 diabetes and is a known risk factor for morbidity and mortality among patients with end stage renal disease (ESRD) [40]. Low haemoglobin concentration is a risk factor for progression of both diabetic and non-diabetic nephropathies [41]. Anaemia may contribute to progression of CKD [42]. That decreasing kidney function is associated with a higher prevalence of anaemia [43]. Iron status must be serially monitored. Detecting iron deficiency difficult because of the inaccuracy of available diagnostic tests [44]. Baseline haemoglobin concentration was correlated with subsequent development of ESRD; even mild anaemia, Hb < 13.8 g/dl increases risk for progression to ESRD. Haemoglobin is an independent risk factor for progression of nephropathy to ESRD in type 2 diabetes [37].

The study recorded that, (52.17%) of ranges of Platelets, was less than normal, (17.39%) for PDW, and (8.70%) for P-LCR. Thrombocytopenia is common pathological features in many renal diseases. Uremic patients show a bleeding diathesis that is mainly due to abnormalities of primary hemostasis, in particular, platelet dysfunction and impaired platelet-vessel wall interaction [45].

Conclusions

Creatinine and urea levels are important blood constituents as they have an important role in diagnosis and follow- up of kidney failure. The study revealed that all patients used dialysis have high level of urea, phosphates and creatinine. But not all of patients have from higher level of blood potassium and glucose. While the sodium levels and albumin, showed decreased level in comparison with standard values. The blood picture revealed microcytic, hypochromic anaemia; as the TEC, Hb level, HCT%, MCHC were of lower values compared with reference values.

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تقييم صورة الدم الكاملة وبعض المعايير الكيميوحيوية في المرضى المراجعين إلى وحدة الديلزة (الغسل الكلوي) في مستشفى عام بعقوبة

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الخلاصة:
انجز البحث على 40 مريضا؛ 24 من الذكور، 20-79 سنة، و 16 من الإناث، 42-67 سنة؛ يترددون على وحدة الديلزة، مستشفى بعقوبة، في تشرين الثاني، وكانون أول 2021، وكانون الثاني، وشباط 2022. الكرياتنين، اليوريا، والحديد، سجلت مستوى عالي.. مستويات الكلوكوز، الكالسيوم، الصوديوم، البوتاسيوم، والفسفات كانت ضمن الطبيعي. ومستوى الألبومين كان واطئ. عدد الحمر الكلي، الخضاب، مكداس الدم، ومعدل تركيز خضاب الكريه، أظهرت مستوى أوطئ. بينما معدل حجم الكريه، معدل خضاب الكريه، معدل عرض انتشار خلايا الدم الحمر- الانحراف القياسي، معدل وسع انتشار الخلايا الحمر _ الاختلاف المكافئ كان ضمن المدى الطبيعي. معدلات عدد الخلايا البيض الكلي، ونسبة العدلات، اللمفاوية، الحمضات، القعدات كانت ضمن الطبيعي، معدلات عدد الصفائح، وقيم المعايير المرتبطة بها كانت ضمن الطبيعي. ضمن قيم المدى بعضها اظهر مستوى اعلى من الطبيعي؛ كما في البوتاسيوم، والفسفات، معدل عرض انتشار الحمر – الانحراف المعياري و معدل عرض انتشار الحمر - الاختلاف المكافئ، نسبة العدلات، الحمضات ، واللمفاوية ، معدل حجم الصفيحة . بينما البعض الأخر اظهر مستويات ادنى، كما في الصوديوم، عدد الحمر الكلي، الخضاب، مكداس الدم، معدل حجم الخلية، معدل خضاب الكريه، معدل تركيز خضاب الكرية، معدل عرض انتشار الحمر – الانحراف المعياري ، عدد البيض الكلي ، نسبة اللمفاوية ، الصفائح ،عرض انتشار الصفائح PDW ، الصفاح- نسبة الخلايا الكبيرة P-LCR . في نفس الوقت بعض من قيم مدى الكلوكوز، الكالسيوم كانت ادنى وبعضها الأخر اعلى. القعدات كانت ضمن الطبيعي. يمكن الاستنتاج ان مستويات الكرياتينين واليوريا تملك دورا مهما في تشخيص ومراقبة القصور الكلوي. جميع المرضى كانوا يمتلكون مستوى عالي من اليوريا، الحديد والكرياتنين. لكن ليس جميعهم يمتلكون مستوى عالي من البوتاسيوم والكلوكوز. اظهر الصوديوم والألبومين مستوي منخفض. أظهرت صورة الدم فقر الدم صغير الخلية ، قليل الخضاب، كون عدد الحمر الكلي، الخضاب ، ومكداس الدم ، ومعدل تركيز خضاب الكريه كانت ذا قيم واطئة.