College Of Medicine / Al-Nahrain University

Department of Medicine

EVALUATION OF ANEMIA IN HEMODIALYSIS PATIENTS

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Abstract :

Background: Anemia is common in patients with chronic kidney disease although anemia is not as common in earlier stages of chronic kidney disease, patients with stage III disease have a prevalence of concurrent anemia of 5.2%, whereas those with stage IV disease have a prevalence of concurrent anemia of 44.1% There is also a greater prevalence of anemia of chronic kidney disease in those older than 60 years, as compared to those aged between 46 and 60 years This is probably secondary to the greater rate of chronic kidney disease in older individuals, as well as the lower estimated glomerular filtration rates (GFRs) that are associated with aging..

Aim of the study **:** To evaluate anemia in patients undergoing heamodialysis.

Patients and methods : In this study 40 patients data were collected randomly, all the documented data was done at pre-dialysis time, HB levels along with Urea, serology status were recorded for patients who were on regular heamodialysis at Hamida Al-Mussafat Dialysis center at Al-Imamaen Al-Khadmaen teaching hospital

Results: The results calculated after collectin the necessary data, relationships between dialysis duration, serology status compared with the degree of severity of anemia. Male predominated 60% over female 40%. The most common age interval was (70- 79) with117.5% while the least common age

interval was less than 20 with 2.5%. From the complete blood count for the patients, 96% were anemic and 67,5 % of those had mild anemia predominating over moderate anemia (32%) . Most of the patients were free of infection with hepatitis B and C serology were 0\40. The transferring level ranged between (13.6%- 45%) with an average of 30.67%. The hemoglobin level ranged between (7g\dl-11g\dl). The urea level ranged between (58.3 mg\dl-244 mg\dl).

Conclusion: Anemia is very common presentation in patients on dialysis, mostly mild anemia in severity which is found to be anemia of chronic disease.

Introduction:

Anemia is strictly defined as a decrease in red blood cell (RBC) mass. The function of the RBC is to deliver oxygen from the lungs to the tissues and carbon dioxide from the tissues to the lungs. This is accomplished by using hemoglobin (Hb), a tetramer protein composed of heme and globin. Anemia impairs the body's ability for gas exchange by decreasing the number of RBCs transporting oxygen and carbon dioxide.

. It is diagnosed when a blood test shows a hemoglobin value of less than 13.5 gm/dl in a man or less than 12.0 gm/dl in a woman. Normal values for children vary with age

Many people are at risk for anemia because of poor diet, intestinal disorders, chronic diseases, infections, and other conditions. Women who are menstruating or pregnant and people with chronic medical conditions are most at risk for this disease. The risk of anemia increases as people grow older. People who engage in vigorous athletic activities, such as jogging or basketball, may develop anemia as a result of red blood cells breaking down in the bloodstream.

Genetally, Factors that raise the risk for anemia include:

- A diet that is low in iron, vitamins, or minerals
- Blood loss from surgery or an injury
- Long-term or serious illnesses, such as kidney disease, cancer, diabetes, rheumatoid arthritis, HIV/AIDS, inflammatory bowel disease (including Crohn's disease), liver disease,heart disease and thyroid disease
- Long-term infections
- A family history of inherited anemia, such as sickle cell anemia or thalassemia

Anemia is common in patients with chronic kidney disease although anemia is not as common in earlier stages of chronic kidney disease, patients with stage III disease have a prevalence of concurrent anemia of 5.2%, whereas those with stage IV disease have a prevalence of concurrent anemia of 44.1% There is also a greater prevalence of anemia of chronic kidney disease in those older than 60 years, as compared to those aged between 46 and 60 years This is probably secondary to the greater rate of chronic kidney disease in older individuals, as

well as the lower estimated glomerular filtration rates (GFRs) that are associated with aging..

In a person with normal renal function, the finding of anemia on routine blood analysis would prompt a work-up to determine the ultimate cause. In chronic renal failure, anemia is almost always present, and can be a result of any of the mechanisms 1) blood loss, excessive destruction of red blood cells (hemolysis), and abnormally low production of red blood cells by the bone marrow. However, the typical "anemia of chronic renal insufficiency" is a result of a decreased production of red blood cells by the bone marrow.

This defect in red blood cell production is largely explained by the inability of the failing kidneys to secrete the hormone erythropoietin. This hormone is a necessary stimulus for normal bone marrow to produce red blood cells. In addition, other factors associated with renal failure, including the accumulation of so-called uremic toxins, may play a role in depressing bone marrow function. Excess stores of aluminum may accumulate in the bone marrow of long term dialysis patients and can contribute to anemia as well.

Blood Loss and red blood cell destruction also frequently contribute to the anemia in patients with renal failure. Platelets, which are small constituents of blood which aid in blood clotting, do not work normally in uremia. The defective blood clotting seen in uremia makes bleeding more common. Rapid bleeding—from an ulcer in the gastrointestinal tract, for example—causes a rapid decrease in the hematocrit and is a medical emergency. Very slow loss of blood can also cause anemia by depleting the body's stores of iron, which the bone marrow uses to produce blood cells.

Excessive destruction of red blood cells is also seen in advanced renal failure. Normally, red blood cells survive for about four months before being destroyed. This life span is reduced in renal failure, probably because of chemical effects of uremia and decreased flexibility of the

red blood cells. This hemolysis is usually mild and a person with a normal bone marrow could easily compensate for it by increasing red blood cell production. However, in renal failure, the bone marrow's capacity to compensate is diminished.

Another proposed mechanism for anemia of chronic illness deals with cytokines, such as interleukins (IL-1 and IL-6), and tumor necrosis factor (TNF-alpha), which are believed to cause the destruction of RBC precursors and decrease the number of erythropoietin receptors on progenitor cells.
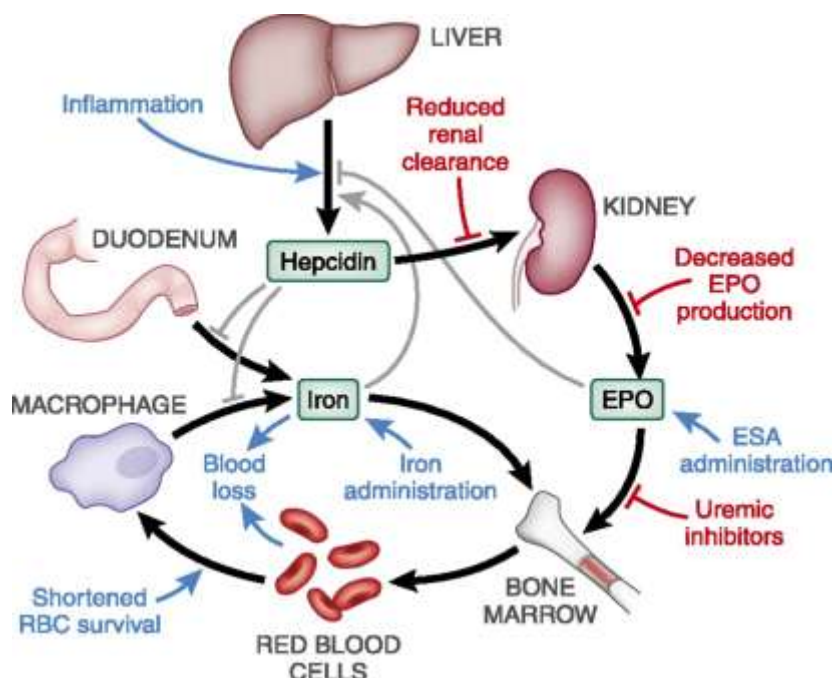

Figure (1) Mechanism of anemia in chronic kidney disease

Haemodialysis, is a method that is used to achieve the extracorporeal removal of waste products such as creatinine and urea and free water from the blood when the kidneys are in a state of renal failure. Hemodialysis is one of three renal replacement therapies (the other two being renal transplant and peritoneal dialysis). An alternative method for extracorporeal separation of blood components such as plasma or cells is apheresis.

Hemodialysis can be an outpatient or inpatient therapy. Routine hemodialysis is conducted in a dialysis outpatient facility, either a purpose built room in a hospital or a dedicated, stand alone clinic (8)

The decision to initiate dialysis usually depends on a combination of the pt's symptoms, comorbid conditions, and laboratory parameters. Unless a living donor is identified, transplantation is deferred by necessity, due to the scarcity of cadaveric donor organs (median waiting time, 3–6 years at most transplant centers.

Absolute indications for dialysis include severe volume overload refractory to diuretic agents, severe hyperkalemia and/or acidosis, encephalopathy not otherwise explained, and pericarditis or other serositis. Additional indications for dialysis include symptomatic uremia (e.g., intractable fatigue, anorexia, dysgeusia, nausea, vomiting, pruritus, difficulty maintaining attention and concentration) and protein-energy malnutrition/ failure to thrive without other overt cause. No absolute serum creatinine, blood urea nitrogen, creatinine or urea clearance, or glomerular filtration rate (GFR) is used as an absolute cutoff for requiring dialysis, although most individuals experience, or will

soon develop, symptoms and complications when the GFR is below ~10 mL/min.(9)

<u>Aim of the study :</u>

To evaluate anemia in patient undergoing Haemodialysis in Al-Imamen Al-Khadmaen medical hospital .

Patients and methods :

This group study is acase series study of 40 patients undergoing haemodialysis at Hamida Al-mussafat dialysis center in Al-Imamen Al-kadhmaen hospital, The patient were chosen randomly .this study is performed through out a 3 months period from december -2018 to march -2019 .

Exclusion criteria :

Bleeding :

History of Hemoglobinopathies (bleeding Tendency) :

All the patients were on regular dialysis and all the data were recorded at pre-dialysis time documented on registary .

Inclusion criteria : Patients with chronic kidney disease undergoing dialysis regularly .

<u>Statistical Analysis :</u> Data was gathered , organized , tabulated using Microsoft office 2007 , and percentages and tables were done using Microsoft office excel 2007 . Discrete variables presented as numbers and percentages and continuous variables mean_+sD (standard deviation).

Results:

The demographic and clinical characteristics of the 50 patients were shown in table 1.

Table (1): Demographic and clinical characteristics of patients on heamodialysis.

Variables		Frequency	percentage	Mean± SD (Range)
Age years		-	-	51.18±15.6 (19-79)
Gender	Male	24/40	60%	-
	Female	16/40	40%	-
Dialysis duration	≤1year	11/40	27.5%	-
	<1year	29/40	72.5%	-
Dialysis Frequency **Per week**	1\week	2/40	5%	-
	2\week	22/40	55%	-
	3\week	16/40	40%	-
Blood **Transfusion**	Yes	10/40	25%	-
	NO	30/40	75%	-
Hemoglobin level g\dl		-	-	(9±1.8)
Urea level mg\dl		-	-	144.3±33.4(58.3-203)
Creatinine mg/dl		-	-	8.2±1.2 (5.8-11)
Serum iron mg/dl		-	-	20.9±2.8(18-27)
TIBC mg/dl		-	-	61±5.8(50-70)
Saturation		-	-	13%-45%

1- **Age distribution**: The patients age ranged from 19-79 years, majority of them were presenting at age ranged from 40-49 years (11 patients). While the least frequent age range was 10-19 years(1 patient). No patient was in the age below 10 years or above 80 years as shown in Table (2) and figure (1).

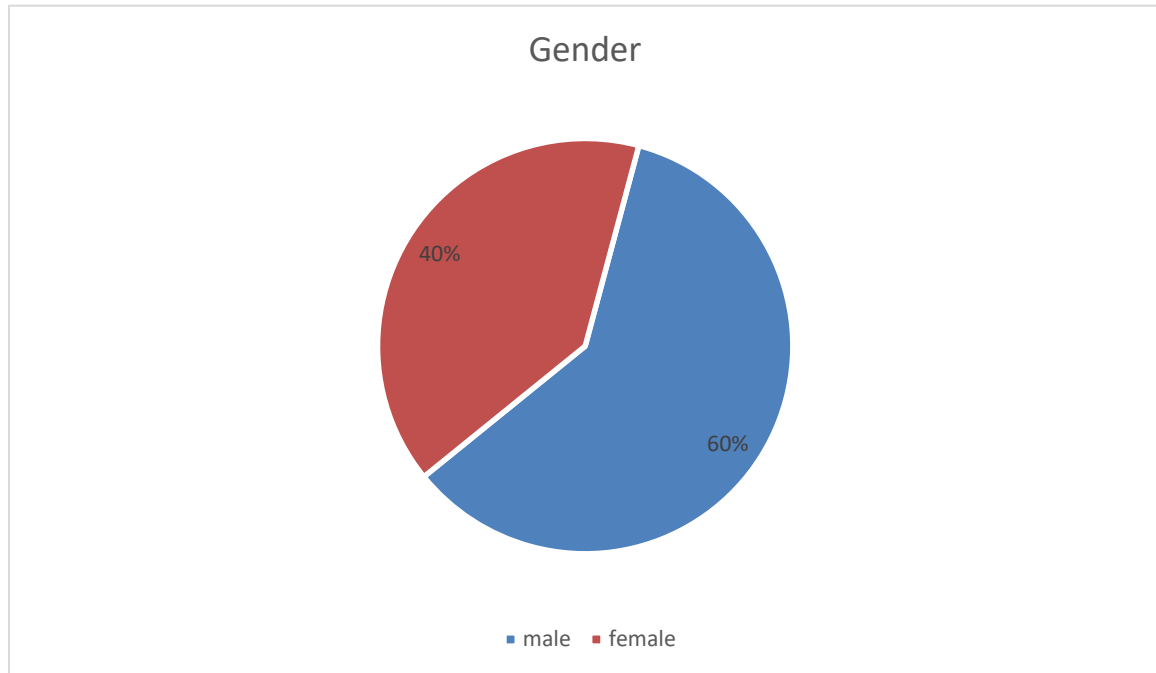Table (2): Age distribution of the studied individuals

Age interval (years)	Frequency (No.)	Percentage (%)
>10	0	0
10 -19	1	2.5
20 - 29	3	7.5
30 - 39	3	7.5
40-49	11	27.5
50-59	10	25
60-69	5	12.5
70-80	7	17.5
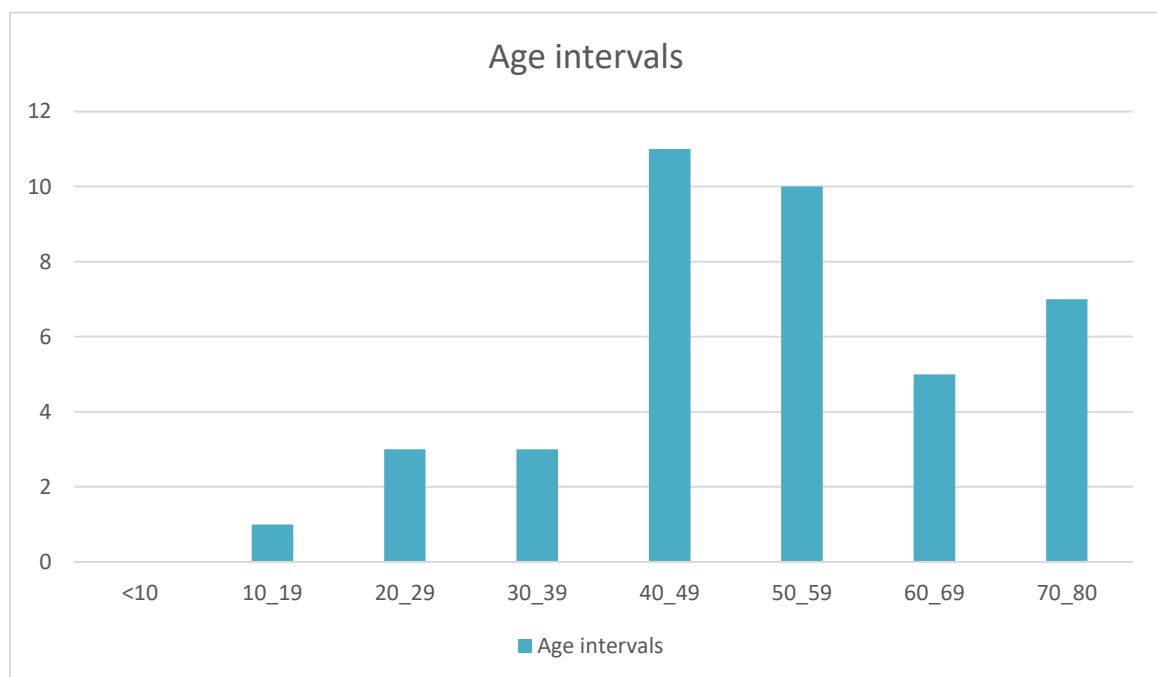
Figure(1) :Age distribution of the studied individuals

2- **Gender Distribution :**

The majority of patients were male (24 patients). While the minority were female (16 patients). As shown in figure 2.

Figure(2) : male to female ratio between the studied individuals.

3- **Duration of Dialysis :**

Out of the 40 patients, the majority of them undergo haemodialysis for more than one year (29 patients, 72.5%) and the number of patients that undergo it for less than one year was 11 patients (27.5%).
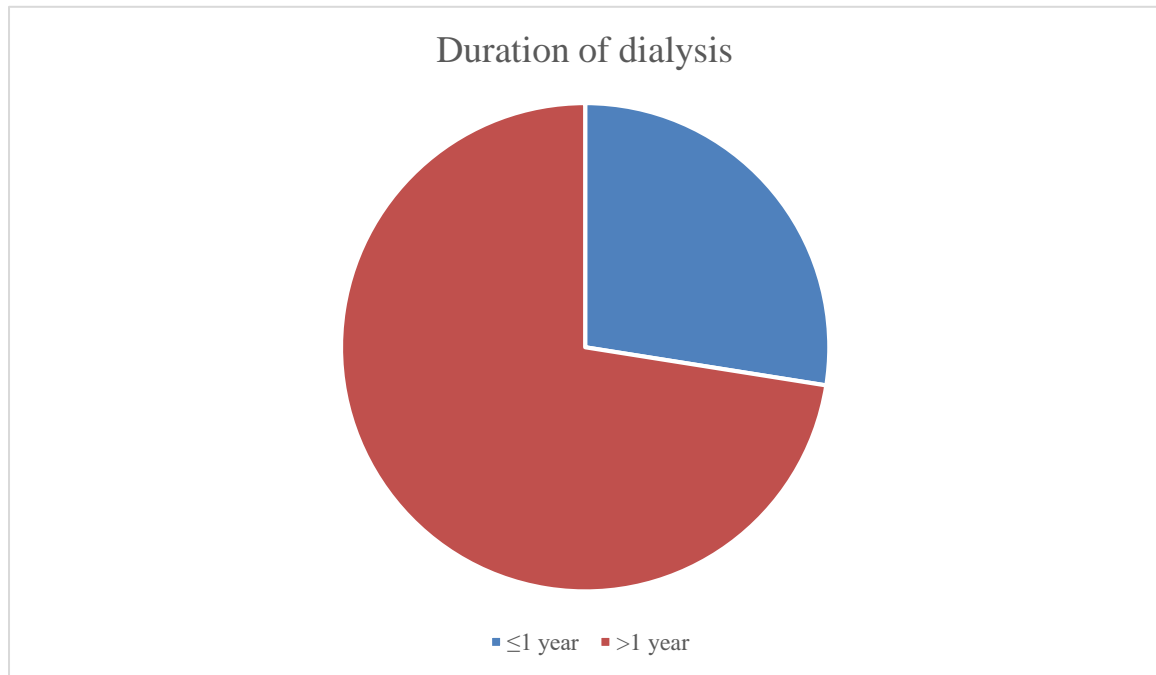
Figure (3) : Distribution of patients depending on the duration of dialysis.

4- **Serology status:**

All the patients had no infection with either hepatitis B virus nor hepatitis C virus.

5- **Hemoglobin status :**

It was found during this study that the highest result collected was (11g/dl) and the lowest result was (7g/dl) with the intervals of results was mostly between 9 – 11 g/dl which is classified as mild anemia and shown in table (3).

Table (4): HB level intervals according to the severity

HB intervals (g/dl)	Frequency (No.)	Percentage (%)
Mild (9 – 11 g/dl)	27	67.5%
Moderate (7 – 9 g/dl)	13	32.5%

6- **Saturation status :**

The range of Transferrin saturation was between (13% - 45%) and it was also clear that most of the patients (37 patients) had a saturation level between (15%- 50%) while only 3 patients had a level less than 15%.
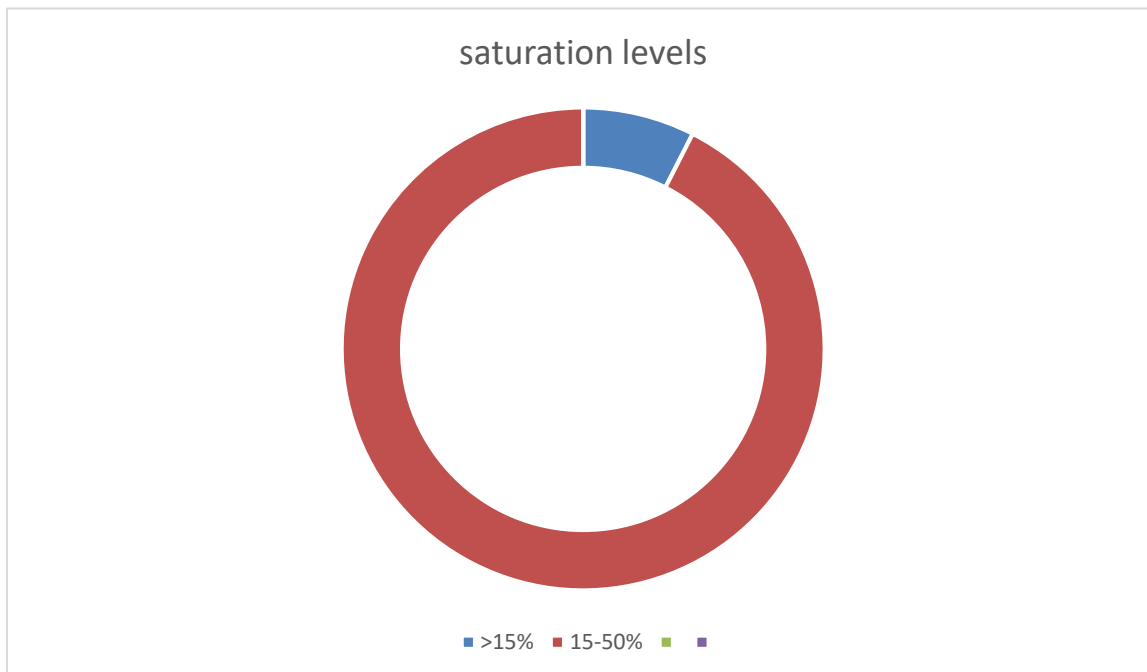
The mean was 30.67±6.8% (mean±SD).

Figure (4) : Transferritin levels in patients undergoing heamodialysis.

7- **Relation between the severity of anemia and age and gender:**

There was no significant relation between the age group and gender in relation with the severity of anemia as shown in table (5) and (6).

Table (5): Relation between the severity of anemia and age

Age interval (years)	Anemia		P value
	Mild	Moderate	
10 -19	0(0%)	1(2.5%)	0.062
20 - 29	3(7.5%)	0(0%)	
30 - 39	1(2.5%)	2(5%)	
40-49	7(17.5%)	4(10%)	
50-59	6(15%)	4(10%)	
60-69	3(7.5%)	2(5%0	
70-80	7(17.5%)	0(0%)	

Table (6): Relation between the severity of anemia and gender:

Gender	Anemia		P value
	Mild	Moderate	
Male	15(37.5%)	9(22.5%)	0.318
Female	12(30%)	4(10%)	

8- **Relation between the severity of anemia and dialysis duration:**

There was no significant relation between the duration of dialysis and the severity of anemia as shown in table (7).

Table (7): The relationship between severity of anemia and duration of dialysis.

Anemia	Duration of Dialysis		P value
	Less than 1year	More than 1year	
Mild	6/40 (15%)	21/40 (52.5%)	0.239
Moderate	5/40 (12.5%)	8/40 (20%)	

Discussion:

Anemia is a common complication in patients with chronic kidney disease. The current study showed that all the patients that were enrolled in the study had mild or moderate anemia; in other words, the prevalence of anemia among the studied patients was higher than the prevalence of anemia found by Di lorio in Italy which was 88.7% for anemia (1) and also higher than that in the study done by Kamath Saritha U in a tertiary center in India which was 85.85%(2).

present study showed that most of the patients (67.5%) had mild anemia while those with moderate anemia were (32.5%) which disagrees with the study done by Bhatta S1 in Nepal that showed a higher prevalence for moderate anemia (50%) and for mild was (45%) (3). The results which are higher could be due to the effect of malnutrition along with ineffective dialysis, poor patients compliance, interruption of sessions with hemotonics and poor technical methods.

endogenous TPO secretion (secondary to thrombocytopenia)(7) and alternations in iron metabolism(8) In our study, the relation between hemoglobin level and HCV and HBV infection cannot be studied possibly due to the limited sample size.

The mean value for transferring saturation was 30.67±6.8% (mean±SD) which was nearly similar to another study showed that saturation was 31±5% (mean ±SD) (9) which agrees with our study and that means most patients have anemia of chronic disease.

Age relation to hemoglobin level was found to be non-significant P=0.062 and also there was non-significant relation between gender and the hemoglobin level. These findings were disagreed with the study done in Canada in which P value was >0.001 (10)

The duration of dialysis in relation to hemoglobin level was found to be non-significant P=0.239. These findings were disagreed with the study done by Michael V et al in which P value was >0.001 (11

Conclusion:

Anemia is a very common presentation in patients on dialysis, mostly the anemia is mild in severity in which it is found to be anemia of chronic disease.

Recommendations:

Dialysis should be done with more efficiency from all its aspects and techniques, evaluation of the causes of anemia should be undertaken, and the evaluation should be done properly, regular screening for the patients should be done. As for the limited sample size in this study we recommend that more patients are preferably to be studied.

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