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Evaluation of Hematological Parameters and Iron Status among Renal Failure Patients Attending Ribat National Hospital – Khartoum, Sudan

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Abstract:

This is a hospital based analytical case-control study was conducted in Al Ribat hospital, Khartoum, Sudan to determine the morphological pattern of anemia and iron status among chronic renal failure patients.

Blood samples were collected under sterile condition from one hundred patients with chronic renal failure as case group, and fifty healthy individuals as control group. The hematological parameters and serum ferritin were measured using automated machine sysmex kx 21 and chemistry analyzer selectra X-L respectively. Data obtained were analyzed using SPSS software computer program.

Among the study population 80 (53.3%) were males and the remaining 70 (47.7%) were females. Regarding the age groups the

study revealed that adult were 67 (44.7%) and elderly were 83 (55.3%). All case groups take erythropoietin and also iron supplement. The results showed that the means of hemoglobin (9.5 g/dL), hematocrit (29%) and RBCs count (3.2×10 ^{12} cells/L) of case group were statistically significant lower than means of control group (13.7 g/dL), (41%), (4.6×10 ^{12} cells/L) respectively (P. value < 0.05). The study showed that71 (71%) of case group were anemic and remaining 29 (29%) were non anemic individuals. Patients with chronic renal failure developed normocytic normochromic anemia (100%). The study showed that a highly significant level of serum ferritin in chronic renal failure patient (621µg/L) when compared to control group the mean (73µg/L), (P. value < 0.05).

Conclusion: *The study concluded Hb, PCV and RBCs count are lower in patient with renal failure and most of them developed normocytic normochromic anemia with increased level of ferritin.*

Key words: renal failure, anemia, hematological parameters, iron status, Ribat National Hospital, Khartoum, Sudan

INTRODUCTION:

Anemia affects over 800 million women worldwide. Although the primary cause of anemia is iron-deficiency, it is seldom present in isolation. More frequently it coexists with a number of other causes, such as malaria, parasitic infection, nutritional deficiencies, and haemoglobinopathies (1).

Anemia is defined clinically as a blood hemoglobin or hematocrit value of group of persons who are presumed to be without hematologic disease i.e. normal (2).

Patients often have no symptoms or signs attributable to anemia specially when it is mild and gradual in onset when complaints occur fatigue and lack of energy are common with severe anemia, dysponea may develop because of the decreased oxygen caring capacity of the blood or because of high output a

congestive heart failure which rarely occurs with hematocrit more than 20 L/L in the absence of other cardiac disease tachycardia and increase force of ventricular conditions, neurologic symptoms some time present in severe anemia. Diagnosis of anemia is made from the history, physical examination, signs and symptoms, hematological values such as complete hemogram (CBC), reticulocyte count, bone marrow examination and special tests according to the type of anemia [(3)].

Renal failure is a condition in which the kidneys fail to remove metabolic end-products from the blood and regulate the fluid, electrolyte, and pH balance of the extracellular fluids. The underlying cause may be renal disease, systemic disease, or urologic defects of non renal origin. Renal failure can occur as an acute or a chronic disorder. Acute renal failure is abrupt in onset and often is reversible if recognized early and treated appropriately. In contrast, chronic renal failure is the end result of irreparable damage to the kidneys. It develops slowly, usually over the course of a number of years [(4)].

Chronic Kidney disease (CKD) is a prevalent health problem worldwide, the prevalence of CKD stages1 to 4 increased from 10% in 1988-1994 to 13.1% in 1999-2004 [(5)]. In a small scale community survey performs dies in Sudan in 2004, the prevalence of CKD was found to be 7.7% [(6)].

Renal failure may be caused by any conditions which destroy the normal structure and function of kidney, such as glomerulonephritis, diabetic glomerulonephritis, hypertensive nephrosclerosis, polycystic kidneys, drug, and toxin [(4)].

MATERIALS AND METHODS

Study design:

This was a hospital based analytical study was conducted in Khartoum state in Ribat hospital.

Study population:

One hundred individuals affect with chronic renal failure were selected as cases, and 50 healthy individuals were selected from healthy persons as control group.

Ethical consideration:

Informed consent was taken from each chronic renal failure patients and all patients agree to participate in this work.

Sample collection:

Five ml of blood was collected under sterile condition, 2.5ml was drained in to K^2EDTA container for CBC by the aid of automated hematological analyzer (Sysmex 21) and for preparation of thin blood films for evaluation of RBCs morphology, and the remaining 2.5ml was drained into sterile plain container to obtain clotted sample which was centrifuged to harvest serum for determination of ferritin using selectra – XL.

Statistical analysis:

Data were analysis using SPSS program, mean, SD, frequencies are obtained and independent student T test was used to compare between the parameters of case and control.

RESULTS:

Table (1) showed the frequency of study participant in cases and control groups according to sample, cases were 100 (66.7%), control were 50 (33.3%), according to sex, males were 80 (53.3%), females were (47.7%), according to age groups adult were 67 (44.7%) and elderly were 83 (55.3%), according to erythropoietin supplement in case groups were 100 (100%), according to iron supplement in case groups were 100 (100%).

Table (2) showed the relation between cases and control in Hb level, the mean of cases was 9.5 g/dl, and the mean of the control was 13.7g/dl (P value 0.000). RBCs count, the mean of cases was 3.2×10^{12} cells/L, the mean of the control was 4.6×10^{12} cells/L (P value 0.000). PCV, the mean of cases was 28.9%, the mean of the control was 41% (P value 0.000). Serum ferritin, the mean of cases was 621µg/L, the mean of the control was 37µg/L (P value 0.000).

Table (3) showed the frequency and percent of anemia among cases group, anemic group was 71 (71%) patients and the remaining 29 (29%) patient were non anemic individuals.

Table (4) showed the frequency and percent of morphological pattern of anemic group, normocytic normochromic pattern 71 (100%), no microcytic hypochromic or dimorphic picture was observed.

Table (1): Demographic data of study participants

Demographic data	Subject	Frequency	Percent
Sample	Case	100	66.7
	Control	50	33.3
	Total	150	100
Sex	Male	80	53.3
	Female	70	47.7
	Total	150	100
Age group	Adult	67	44.7
	Elderly	83	55.3
	Total	150	100
erythropoietin supplement	Yes	100	100
	No	0	0
	Total	100	100
Iron supplement	Yes	100	100
	No	0	0
	Total	100	100

Table (2): Relation between case and control in hemoglobin level, RBCs count, PCV and serum ferritin

Parameter	Subject	N	Mean	SD	P. value
Hb (g/dL)	Case	100	9.5	2.00	0.000
	Control	50	13.7	0.88	

RBCs count	Case	100	3.2	0.82	0.000
	Control	50	4.6	0.47	
PCV	Case	100	29	5.37	0.000
	Control	50	41	2.83	
Serum ferritin	Case	100	621	72.23	0.000
	Control	50	73	31.37	

Table (3) Frequency of anemia among case group

Pattern	Frequency	Percent
Anemic	71	71.0
Non-anemic	29	29.0
Total	100	100

Table (4): Frequency of morphological patterns of anemia among anemic group

Anemia type	Frequency	Percent
Normocytic normochromic	71	100
Microcytic hypochromic	0	0
Dimorphic picture	0	0
Total	71	100

DISCUSSION:

This study involved one hundred chronic renal failure patients as case group, and fifty healthy persons as control, the study groups involve 71% anemic and 29% non anemic. The study group responded to our questionnaire, the frequency of study participants in case and control groups according to sex, males were 80 (53.3%), females were 70 (47.7%), and according to age groups adults were 67 (44.7%), and elderly were 83 (55%). Erythropoietin supplement in case groups were 100 (100%). Iron supplement in case groups were 100 (100%).

The study reflects that the means of hemoglobin, RBCs, count, and hematocrit of case group were (9.4 g/dL ± 2.0), (3.2 × 10^{12} cells/ L± 0.8), and (28% ± 5.3) respectively. MCV, MCH, MCHC, and serum ferritin were (89± 8.7), (28±2.5), (31±1.6), and (621± 72) respectively.

The results obtained from normal healthy control group revealed that the means of hemoglobin, RBCs, count, and hematocrit were (13.7 ± 0.9), (4.6± 0.4), and (41± 0.8) respectively. MCV, MCH, MCHC, and serum ferritin were (84± 3.8), (28±1.4), (31±1.2), and (73 ± 31) respectively.

The study showed that, the mean of Hb, hematocrit and RBCs count level in chronic renal failure were (9.4 g/dL ± 2.0), (3.2×10^{12} cells/ L± 0.8), and (28% ± 5.3) were significantly lower than the mean of control group P value <0.05.

The study explained that, the hematological parameters in Sudanese patients with chronic renal failure was significantly lower than the values obtained from control group which consistent with study in Bangladesh which obvious that the mean Hb, PCV, and total count of red blood cells were significantly lower in CKD patients compared to those of healthy subjects or control group [(7)].

The study reflected that the mean of serum ferritin in case group was 621± 72 was significantly higher than the mean of control group 37µg/L (P value <0.05).

The study explained that a high level of serum ferritin in chronic renal failure patients because they received iron supplementation to avoid iron deficiency anemia, this study consistent with a study in Greece which obvious that patients with chronic renal failure always show high level of serum ferritin [(8)].

The study reflected that the frequency and percent of anemia among case group 71 (71%) were anemic and remaining 29 (29%) were non anemic, similar study in Europeans explain that anemia is very common in patients with CKD [(9)].

The frequency and percent of morphological patterns of RBCs in anemic group showed that all patients developed normocytic normochromic pattern 71 (100%), this result is compatible with result obtained by Cullen in 1999 who

discussed that patients with chronic renal failure develop a normocytic normochromic anemia [10].

CONCLUSION:

The study concluded that the hematological parameters, such as Hb, PCV and RBCs count in patients with chronic renal failure are decreased. The most common type of anemia in patients with chronic renal failure is normocytic normochromic type. The frequency of anemia among chronic renal failure patient is very high. All patients with chronic renal failure show high level of serum ferritin and this due to recurrent receiving of iron supplementation.

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