ANEMIA IN END STAGE RENAL FAILURE PATIENTS

Anees Muhammad[1], Muhammad Asif Zeb[2], Malik Zeb Khan[3], Hina Hayat[4], Mehreen Hameed[5], Aman Ullah[6]

ABSTRACT

OBJECTIVE: The objective of current study was to evaluate the anemia and its severity in end stage renal failure patients through complete blood count analysis.

METHODS: This analytical cross-sectional study was conducted at tertiary health care hospital in Peshawar. A total of 120 end stage renal failure patients with 120 healthy control group for determination of anemia were included in present study. Blood analysis was accomplished on sysmex haematology analyzer for complete blood count. Statistical analysis was executed on SPSS version 21 along with Microsoft excel 2016.

RESULTS: Total of 240 blood samples was obtained in which 120was control group individuals and same number of samples with end stage renal failure patients. Male ratio was high as compared to female with mean age was 40.47 ± 15.27 years range from 12 to 85 years. Prominent burden was ascertained of kidney failure patients in 45-60 years of age while the least noted in 0-15 years children. Almost, all the indices of red blood cells along with leucocytes and platelets was significantly decreased in renal failure patients. Mean Hb level was 9.23 ± 1.66 g/dl in all kidney failure patients.

CONCLUSION: It is concluded with the result of present study that anemia (91.7%) is commonly observed in renal failure patients due to continuous loss of blood during regular and periodic dialysis along with impairment of kidney function. Appropriate treatment must be taken in these patients along with the earlier diagnostic strategy.

KEY WORDS: End Stage renal failure disease, anemia, complete blood count

[1] Research Assistant, Department of Medical Lab Technology, University of Haripur, Haripur, Pakistan
[2] Lecturer, Department of Medical Lab Technology, Institute of Paramedical Sciences, Khyber Medical University, Peshawar, Pakistan
[3] Professor, Institute of Kidney Disease, Hayatabad Medical Complex, Peshawar, Pakistan
[4] Trainee Medical Officer Haematology, Rehman Medical Institute, Peshawar, Pakistan
[5] Trainee Medical Officer Haematology, Rehman Medical Institute, Peshawar, Pakistan
[6] Lecturer, Department of Medical Lab Technology, Institute of Paramedical Sciences, Khyber Medical University, Peshawar, Pakistan

Correspondence
Anees Muhammad
Research Assistant, The University of Haripur, Haripur, Pakistan
Email: aneesafridi15295@yahoo.com
Cell: +92344-9112106

INTRODUCTION

Anemia is associated with renal failure and persistently increasing with severity of kidney disease. Anemia with renal disease is a major public health concern all over the world. Usually kidney activity can measure by creatinine level and clearance. Anemia is contrary relevant to glomerular filtration rate (GFR). In earlier condition anemia developed and become worsens with decreasing GFR. Thus, anemia severity increasing with the downgrading of GFR (1).The primarily cause of anemia in renal patients is due to the impairment of erythropoietin level secreted by malfunction kidney (2). Anemia is defined as the haemoglobin level less than 12.0 g/dl in female while 13.5 g/dl in male. Mild anemia, moderate and severe anemia was categorized on the basis of haemoglobin level, concentration of Hb9.00-12.0 g/dl is considered as mild anemia and moderate anemia corresponds to a level of 7.0-9.0 g/dl, while less than 7.0 g/dl was considered severe anemia (3).The mortality rate among kidney failure patients are greater as compared to healthy person due to several reasons (4). In case of renal failure with critical condition, kidney transplantation and dialysis are only currently available treatment. The etiological factors reported for kidney failures are hypertension, diabetes or family history of hypertension and diabetes (5).

Mortality rate of chronic kidney failure patients was increased annually from 1990-2013 is 0.4 to 0.95 million (6). The mortality rate inside the United State (US) is also elevated and about thirty five thousand per annum occur due to renal failure. The death rate from the renal failure was increased abruptly by 52% in last sixteen years and higher among the blacks than whites (7). Study reported that more than thirteen percent of US population was diagnosed as chronic

kidney diseases patients due high obesity level which leads to hypertension and diabetes. Moreover, it is predicted that the burden of chronic kidney diseases will increase in future throughout the world (8).

The National Kidney Foundation (NKF) of India reported that a kidney disease is 3rd most common disease after cancer and cardiac vascular disease. Report from India shows that 0.2 million individuals leads to renal disease annually and about 13% kidney failure patients (7). Exact prevalence is unknown in Bangladesh but approximately 20 million individuals are suffering with kidney disease that is about 18% of total population (9). In Pakistan, the incidence is 1 in 10 thousands with an increment of 16,000 patients each year (10). The highest burden was reported from Punjab 19%, followed by Baluchistan and Khyber Pakhtunkhwa 12% each, while lowest in Sindh 7% (5).

Hematopoietic changes are typically associated with kidney failure such as suppression of bone marrow due to retained uremic factors, blood loss leads to anemia (7).It is examined that anemia is the most common haematological change in kidney failure patients due to

the reduction of erythropoietin as consequence of impaired kidney function (8). Intensity of anemia is increased parallel to progression of kidney disease. Study in Karachi reported that red blood cells (RBC), haemoglobin (Hb), packed cell volume (PCV), mean cell haemoglobin (MCH) and mean cell haemoglobin concentration (MCHC) decreased significantly in chronic kidney failure patients after side by side comparing with control group, whereas PCV and leucocytes (TLC) count increased significantly (5). The aim of the present study is to investigate anemia and its severity in end stage renal failure patients.

METHODS

This analytical cross-sectional study was conducted at tertiary health care center Peshawar, Khyber Pakhtunkhwa, Province of Pakistan. Present study was carried out on renal failure patients enrolled from May 2017 to September 2017. Almost 120 kidney failure patients was included and compared with 120 individuals of age and gender matched controls group. Control group consist of family members, friends, relatives and hospital staff. Besides renal transplant,

hematological malignancy, pregnant women and whole/packed blood transfused patients all kidney failure patients were part of study irrespective to their duration of dialysis, age, gender and ethnic group. Before commencing the study written informed consent were obtained from all included participants. All participants from control group were neither suffering from thallessemia nor were transfused.

Randomly three milliliter (ml) venous blood samples were collected in ethylene diamine tetra acetic acid (EDTA) vacutainer tube for complete blood count (CBC) with each participant. Automatic Sysmex haematology analyzer (sysmex XE-2100) was used to find out the haematological parameters such as haemoglobin (Hb), red blood cells (RBC), mean cell volume (MCV), packed cell volume (PCV), mean cell haemoglobin (MCH), mean cell haemoglobin concentration (MCHC), white blood cell (WBC) and platelets (PLTs) counts.

Statistical Package for Social Sciences (SPSS) version 21 software was used for descriptive data computation and analysis. Mean and standard deviation were calculated for each parameter and

expressed as mean± SD. Student t-test was employed for comparison numerical data of patients and control group. P-value less than 0.05 were considered as statistical significant.

RESULTS

Randomly, 240 blood samples were collected from 120 chronic kidney failure patients and 120 with control group. Among 120 patients, 67 (55.83%) were male and 53 (44.17%) were female while in control group 71 (59.17%) were male and 49 (40.83%) were female patients. Mean age of all patients was 40.47±15.27 years (12-85years) whereas mean age of control group was 38.16±13.21 years (15-68 years).

Mean age of male and female patients was 38.13±1.7 (12-85 years) and 40.33±2.43 years (13-67 years) respectively. Similarly, mean age of male control group was 37.61±1.2 years (15-67 years) and female was 38.6±1.83 years (17-65 years).Highest prevalence of haemodialysis patients was observed in age of 45-60 years with decline pattern 30-45, 15-30, 60/above and 0-15 years.

Table 1: According to age and gender dialysis patients are distributed.

Age	Male (♂)	Female (♀)	Total patients	Percentage
01-15	01	01	02	1.67%
15-30	17	07	24	20.00%
30-45	18	14	32	26.67%
45-60	22	21	43	35.83%
60- above	09	10	19	15.83%
Total	67 (55.83%)	53 (44.17%)	120	100%

According to age and stage of anemia dialysis patients were distributed as shown in table No. 2., Among 120 patients, 110 (%) was anemic and 10 (08.3%) was non-anemic. According to different stages of anemia, severe anemia

was detected in 3(2.5%), moderate anemia 54(45.0%) and mild in 53(44.2%) patients. Severity of anemia was highest among 45-60 years age of patients with decline trend 30-45 years, 15-30 years, 60-above and 01-15 years.

The conclusion of table no.2 is that anemia (mild, moderate & severe) was found in 91.7% patients which are worth evidence of association between anemia and kidney failure.

Table 2: Anemia according to age and stages of anemia in dialysis patients.

Age	Normal Patients (>12-17g/dl)	Mild anemia (<12.0g/dl)	Moderate anemia (7-9g/dl)	Severe anemia (<7g/dl)
01-15	00	02	00	00
15-30	01	10	13	00
30-45	04	13	14	01
45-60	05	20	16	02
60 & above	00	08	11	00
Total	10(8.3%)	53(44.2%)	54(45.0%)	03(2.5%)

Erythrocytes and its indices mean variation between patients and control group were shown in table No. 3. Mean RBCs ($\times 10^6$/ul) count of patients (3.35±0.71) and control group (4.7±0.60) was compared and significant decrease in patients' blood count, with P-value less than 0.005. Significant decrease was observed in patients Hb (g/dl) (9.23±1.66) as compared to control group (13.18±1.37) where the P-value was <0.005. Significant decrease

was observed for haematocrit (%) level in patients (29.10±5.48) when compared with control group (39.09±5.04), with <0.0005 P-value. The level of MCV (fl) was significantly decrease in patients (87.32±6.74) as compared to control group (83.33±8.12) where P-value was <0.005. The value of MCH (pg) was non-significantly increased in patients (28.12±4.16) after comparing with control group (28.03±2.55) along with

0.42 P-value. As compared to control group (33.67±1.33) MCHC (g/dl) count in dialysis patients (31.72±1.25) was significantly decrease, with the P-value was less than 0.005. For red cell distribution width (RDW) level (%), significant decrease was studied in patients (16.4±1.77) as compared to control group (14.04±1.47) while the P-value was recorded <0.005.

Table 3: Variation between mean of RBCs, Hb, Hct, MCV, MCH, MCHC, RDW, WBC and Platelets in dialysis patients and control group.

Variables	Dialysis Patients Mean±SD	Control Group Mean±SD	Statistical Evaluation P-value
RBC ($\times 10^6$/ul)	3.35±0.71	4.78±0.60	<0.005
HB (g/dl)	9.23±1.66	13.18±1.37	<0.005
HCT (%)	29.10±5.48	39.09±5.04	<0.005
MCV (fl)	87.32±6.74	83.33±8.12	<0.005
MCH (pg)	28.12±4.16	28.03±2.55	<0.42
MCHC (g/dl)	31.72±1.25	33.67±1.33	<0.005
RDW (%)	48.94±6.47	14.04±1.47	<0.005
TLC (x10^3/ul)	8.33±2.66	9.40±2.82	<0.0014
Platelets (x10^9/l)	223.21±92.37	250.37±62.83	<0.0041

TLC count was significant decrease in patients 8.33±2.66 when compared with control group count (9.40±2.82) while the P-value was 0.0014. Dialysis have direct effect on platelets count and significantly decrease the value in patients (223.21±92.37) as compared to the control group (250.37±62.83), with P-value was 0.0041 (Table 3).

DISCUSSION

This present study evaluated the prevalence of anemia in renal failure patients. This study has advantage over other studies due to have a control group and data analyzed by t-test for comparison. Several variations were observed in various parameters of complete blood count between renal failure patients and control group.

Current report revealed that anemia was found in 91.2% kidney failure patients, similarly results were reported by Naghmi Asif et. al, and Wolfgang Jelkmann W et. al. that haemoglobin is one the frequently affected haematological parameter in kidney failure patients(11,12). Anemia is initial and functionally complicated problem in

these patients(13,14). Eschbach JW Jr. reported from Sudan that almost all kidney failure patients were anemic; in which mild anemia, moderate and severe anemia was in 28.2%, 56.3% and 15.5% respectively (15) while in present study mild anemia was found in 44.2%, moderate in 45.0% and severe 2.5% patients while 8.3% patients were non-anemic, the little variation due to sample size and different setting.

In current study, almost all the indices of RBC were significantly decreased in renal failure patients as compared to control group except MCH which the supports the findings of a Islam MN et al. from Bangladesh who report significant decrease in count of RBC in chronic kidney failure patients (16). The decrease in values is associated with impaired production of erythropoietin level and non-response of bone marrow to erythropoietin and other factors such as increasing hemolysis, hematuria, gastrointestinal bleeding and nutritional substances(17,18). Consistent result like present study were reported by Wasti AZ. et al. from Karachi, Pakistan that RBC, Hb, PCV, MCH and MCHC were decreased in 23%, 28.9%, 30.6%, 4.2%

and 10% respectively in kidney failure patients, while non-significant change was recorded in MCV (5). Malyszko J. et al., (2001) reported similar results with their studies like current report. Alghythan et al., from Saudi Arabia reported significant decreased in RBC, Hb, Hct and MCH in chronic kidney failure patients as compared to control group and non-significant decline in MCV, MCHC and RDW (10). Present study is also in line with the report of Yassein RB et al. and Suresh M et al. who recorded the mean of Hb, RBC and Hct significantly decreased in chronic kidney failure patients as compared to control group (4, 5).

Total leukocytes count was significantly decreased in chronic kidney failure patients as compared to control group in present study but was normal range. Islam MN et al. also reported similar results that leukocytes count significantly decrease in chronic kidney failure patients than control group with unknown cause but could be due to exposure of blood to artificial membrane leads to activation of complement system typically C3a and C5a. Leukocytes aggregation occur as a consequences of

C3a and C5a activation in-turn leukocytes decreased (16).

Similar to other blood parameters, thrombocytes count were also significantly decreased in chronic kidney failure patients as compared to control group in present study but in normal range, similar results was reported by various studies (7, 9) which is explained with a fact that Erythropoietin potentiates the effect of megakaryocyte colony stimulating factors, acetlyhydroase (PAF-AH) and paraoxonase (PON1). In chronic renal disease, impaired erythropoietin secretion leads to a decrease in platelet count. Erythropoietin can affect platelet level due to extensive homology between erythropoietin and thrombopoietin, erythropoietin act as the major humoral regulator of platelet mass (19, 20).

CONCLUSION

It is concluded with the result of present study that anemia is proportionally associated with renal failure and these patients are more susceptible to anemia irrespective of age and gender. All parameters were significantly decreased after comparing with normal control group. This study favor the worth evidence regarding the anemia and its severity in renal failure patients which provide an opportunity for earlier management, diagnosis and improve outcome. Further prospective study with greater sample size is required to evaluate the anemia condition and its management in kidney failure patients.

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