<u>Original Research Article</u>

A Study of Hematological Profile in Patients of Chronic Kidney Disease Undergoing Hemodialysis in a Tertiary Care Hospital, South-West Bihar

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Abstract

Aim: This study was conducted to know various hematological abnormalities observed in CKD patients undergoing hemodialysis.

Methods: The cross sectional study was conducted with the samples received in Department of Pathology from the hemodialysis unit, Narayan Medical College and Hospital, Sasaram, Bihar, India and the duration of the study was one year. A total of 100 cases of age >18 years were studied. All of the patients were undergoing hemodialysis at least 3 months prior to the commencement of study.

Results: The cases studied ranged from age group of 20 to 86 years. CKD was more common in males, out of 100 cases, 70 (70%) were males and 30 (30%) were females. Hence, Male Gender was more prone to CKD. In the present study, 95% patients had anemia. Severity of anemia was correlated with the stages of CKD. In present study, 95% patients had anemia and Hemoglobin decreased with increasing stage of CKD. Severe anaemia (<7 gm %) was seen in 15 out of 25 CKD stage 4 patients. Normocytic Normochromic Anemia was present in (90) 90% of the patients of which 74% cases were Stage -5 CKD. Of the 100 patients, 60 (60%) patients showed normal Total leucocyte count, 20 (20%) patients showed Leucocytosis and 15 (15%) patients showed Leucopenia. In present study, although platelet count showed a decreasing trend with increasing stage of the disease, mean platelet count was normal in all CKD stages. Total mean platelet count was 2.24±0.97. In present study, serum iron levels were decreased with increasing of CKD stage but mean Serum Iron was normal in all CKD stages. Total mean Serum Iron was 51.04±34.67.

Conclusion: In our study we found that anemia was prevalent 95% cases and the cause of anemia is understood to low erythropoietin levels but the data of that is not available in this study. Hb less than 9 gm% was statistically significant in CKD patients. Normocytic normochromic morphology was seen in majority of anemias.

Keywords: Chronic Kidney Disease, Hematological Abnormality, Anemia, Hemodialysis.

Introduction

Chronic kidney disease (CKD) and End stage renal failure (ESRD) are major health problem in the world, including India. The disease affects almost 10% of

the general population and affects 50% of the high-risk population who suffer from non-communicable diseases like hypertension and diabetes mellitus. [1] It is estimated that the number of patients undergoing hemodialysis increase by 10-20% each year. [2]

KDIGO (kidney disease improving global outcome) 2012 guidelines define CKD as abnormalities of kidney structure or function, present for 3 months, with implications for health. CKD is classified on the basis of cause, GFR category, and albuminuria category (CGA). On the basis of GFR, CKD have been categorized into total of 5 stages. KDIGO guidelines define anemia in CKD as Hb concentration is 13.0 g/dl (or 130 g/l) in males and 12.0 g/dl (or 120 g/l) in females. [3] CKD encompasses a wide range of physiological processes altered by the progressive decline in glomerular filtration rate (GFR). [4,5] Uremic patients may also have decrease in white blood cell count. Albumin globulin ratio is said to have significant association in prediction of development of CKD and also has prognostic significance. [6]

Anaemia in CKD is associated with reduced quality of life and increased cardiovascular disease, hospitalizations, cognitive impairment, and mortality. [7] Iron deficiency anaemia is common in CKD patients. Iron deficiency may be absolute, often due to poor dietary intake or sometimes occult bleeding, or functional, when there is the imbalance between the iron requirements of the erythroid marrow and the actual iron supply. [8] Iron deficiency leads to decreased formation of red cell hemoglobin and produces hypochromic microcytic type of anaemia. Early detection and treatment of iron deficiency is crucial in the treatment of anaemia and reducing morbidity. According to NKF-KDOQI guidelines absolute iron deficiency is defined as either TSAT <20% or serum ferritin <100 ng/ml.

Disturbances in the hemostasis are a common complication of CKD, mainly due to defective platelet function and anaemia. These have a major influence on the quality of life of patients. Uncorrected anaemia can be crippling to the patient who is already disabled. Early detection of anaemia and its etiology, and factors influencing platelet function and coagulation are very important for providing patient care in patients with CKD.

This study was conducted to know various haematological abnormalities observed in CKD patients undergoing hemodialysis.

Methods

The cross sectional study was conducted in the Department of Pathology, Narayan medical college and hospital, Sasaram, Bihar, India and the study was conducted for the period of one year. A total of 100 cases of age >18 years were studied.

Inclusion criteria

The study included samples from out-patients and in-patients, both males and females, of age greater than 18 years, with diagnosis of Chronic Kidney Disease (stages III-V) based on elevation of serum creatinine (>1.5 mg/dL) for more than 3 months. Only newly diagnosed CKD patient (stages III, IV & V) were included, before start of any intervention or treatment.

Exclusion criteria

Exclusion criteria included patients with other systemic illness without renal failure, pregnant women and those diagnosed with aplastic anaemia or haematological malignancy. Patients with End Stage Renal Disease (ESRD), treated with renal replacement therapy in the form of renal transplantation and those with history of blood transfusion during previous three months or history of oral or parenteral iron therapy during previous 3 months were also excluded from the study.

The CBC of each patient was done on a 5-part ERBA H-560. Peripheral blood smears were made and stained with Leishman stain, and examined for RBC, WBC and platelet morphology. The bleeding time of each patient was recorded by giving a 5mm deep puncture on the fingertip and pressure applied on a blotting paper.

All age groups are taken into account. Patient's creatinine and Urea levels are obtained. Through patients Creatinine and other details, eGFR is calculated and they are categorized into CKD stages. Stage1 with GFR of >90ml/min/1.73m^2 and Stage 5 with GFR of <15 ml/min/1.73m^2. The CBC sample of the patient is run on 5-part ERBA H-560. The hematological parameters which are taken in our study are Hemoglobin levels, Total count, Differential count, platelet count, red cell distribution width (RDW) and Mean Corpuscular Volume (MCV). The peripheral smear examination of the CBC samples is done on slides that are stained with Fields and Leishman stains and observed under the microscope.

Results

Table 1: Gender and platelet count distribution

Gender	N%
Male	70 (70%)
Female	30 (30%)
Platelet count	**Number**
<1.5 Lakhs/cumm	20 (20%)
1.5-4.5 lakhs/cumm	78 (78%)
>4.5 lakhs/cumm	2(2%)

The cases studied ranged from age group of 20 to 86 years. CKD was more common in males, out of 100 cases, 70 (70%) were males and 30 (30%) were females. Hence, Male Gender was more prone to CKD. In this study platelet count was normal in majority of the patients (78 cases-78%). Thrombocytopenia was seen in 20 (20%) patients and Thrombocytosis was seen in 2 (2%) patients.

Table 2: Distribution of Hemoglobin

Hb (gm%)	CKD stage 3	CKD stage 4	CKD stage 5
< 7	2	15	45
7-11	2	8	20
>11/<13	0	0	2
>13	1	2	3

In present study, 95% patients had anemia and Hemoglobin decreased with increasing stage of CKD. Severe anaemia (<7 gm %) was seen in 15 out of 25 CKD stage 4 patients.

Table 3: RBC morphology in Anemias – Stagewise

Morphology	Stage-3	Stage-4	Stage-5	Total
Normocytic Normochromic	2	20	68	90
Microcytic Hypochromic	0	1	5	6
Macrocytic	0	1	1	2
Dimorphic	0	2	0	2
Mean± SD	8.98± 3.62	7.27±2.05	7.48±6.05	

Normocytic Normochromic Anemia was present in (90) 90% of the patients of which 74% cases were Stage -5 CKD. Microcytic Anemia was present in 6% of the patients. Macrocytic and Dimorphic was present in only 2% cases each. Stage 5 CKD patients had statistically significant anemia with Hemoglobin levels with mean ±SD 7.48±6.05 (p<0.05).

Table 4: Stage wise Total Leucocyte Distribution

WBC	Stage-3	Stage-4	Stage-5	Total
Leucocytosis	1	4	10	20
Normal Count	5	20	25	60
Leucocpenia	0	1	14	15
TLC	3	4	3	5
Mean	17522	11104	9803	10389
SD	9941.2	7985.61	7437.68	7745.15

Of the 100 patients, 60 (60%) patients showed normal Total leucocyte count, 20 (20%) patients showed Leucocytosis and 15 (15%) patients showed Leucopenia.

Table 5: Platelet count and Serum iron distribution in study population

Platelet count distribution	Mean	SD	P Value
CKD stage 3	2.46	1.03	
CKD stage 4	2.33	1.03	0.370
CKD stage 5	2.09	0.90	
Total	2.24	0.97	
Serum iron distribution			
CKD stage 3	61.61	29.10	
CKD stage 4	51.09	41.79	0.450
CKD stage 5	47.86	28.40	
Total	51.04	34.67	

In present study, although platelet count showed a decreasing trend with increasing stage of the disease. Total mean platelet count was 2.24±0.97.

In present study, serum iron levels were decreased with increasing of CKD stages. Total mean Serum Iron was 51.04±34.67.

Discussion

Chronic kidney disease is a major health problem throughout the world. Incidence and prevalence of chronic kidney disease is increasing worldwide. Renal dysfunction gives rise to a variety of hematological manifestations. Renal failure typically affects the red blood cells, leucocytes and platelets causing anaemia, increased incidence of infections and bleeding. Anaemia was first linked to CKD over 170 years ago by Richard Bright. Anaemia has been shown to start appearing at GFR below 60ml/min, but more prevalent when it falls below 30ml/min (or stages 4 and 5 of CKD). [9,10] It affects nearly all patients with stage 5 CKD. [7] It is caused by the failure of renal excretory and endocrine function.

Majority of CKD patients were male which was similar to studies done by Pandurang et al [11], Chakravarti et al [12] and Arun et al. [13] In this study, 95% patients had anemia which is in concordance with Chinwuba et al [14], Islam et al [15] and Bhattacharjee et al. [16] Only 6 patients had hemoglobin > 13 gm% out of 100. The hemoglobin distribution was categorized into mild, moderate and severe and then prevalence of anemia in different stages of CKD was obtained. It showed Stage 5 CKD patients had statistically significant anemia with Hemoglobin levels with mean ±SD 7.48±6.05 (p<0.05) which was similar to studies by Chakravarti et al12 and Dewan et al. [17] The major cause of anemia in CKD patients is lack of Erythropoetin (EPO) synthesis in the damaged or injured peritubular cells in kidneys resulting in low levels of EPO and thus anemia. As the anemia is because of low EPO levels it is of usually of Normocytic and

Normochromic type. But as with the CKD, there is decline in the nutritional status of the patients due to repeated Dialysis and inadequate intake which may give Microcytic Hypochromic or Macrocytic or Dimorphic anemias.

An adequate Hb target for anemia improves physiologic and clinical parameters and quality of life. [18,19] Adequate iron stores are essential to optimize the effects of ESA, such as recombinant human erythropoietin (EPO) or darbepoetin alfa. In fact, decreased iron stores or decreased availability of iron represent the most common cause for resistance to the effect of these agents. Platelet count was normal in majority of patients (78 cases - 78%). Thrombocytopenia was seen in 20 out of 100 patients (20%). Similar to the study done by M Huang et al, mean platelet count decreased from stage 3 to stage 5, but this correlation was not statistically significant. [20]

Total WBC count was not significantly altered. There was mild thrombocytopenia in a few patients. Bleeding time or other in vitro tests of platelet function were not measured in this study. [21] Peripheral smear examination showing abnormal cells like fragmented RBCs suggest hemolysis as contributory factor for anemia other than EPO deficiency. The higher incidence of secondary infections is suggested by neutrophilic leucocytosis. Platelet count was within normal limits also bleeding time and clotting time. However, these parameters were abnormal in other studies conducted. It can be concluded that it is necessary to monitor the haematological parameters in dialysis patients to initiate early treatment and to improve the outcome.

Conclusion

In our study we found that anemia was prevalent in 95% cases and the cause of anemia is understood to low erythropoietin levels but the data of that is not available in this study. Anemia seen in study population was predominantly normocytic normochromic type. Peripheral smear examination showing abnormal cells like fragmented RBCs suggest hemolysis as contributory factor for anemia other than EPO deficiency. The higher incidence of secondary infections is suggested by neutrophilic leucocytosis. It can be concluded that it is necessary to monitor the haematological parameters in dialysis patients to initiate early treatment and to improve the outcome.

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