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A STUDY OF HEMATOLOGICAL PROFILE IN CHRONIC KIDNEY DISEASE

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ABSTRACT

Chronic kidney disease has become a worldwide public health problem. In this study, an attempt has been made to study the Hematological profile of CKD patients.

Materials and methods: This study is a prospective study, conducted at Government Mohan Kumaramangalam Medical College Hospital, Salem District, TamilNadu. **Results:** The study population includes one hundred and twenty patients with chronic kidney disease. Anemia was seen in 97.5 % of patients. The mean RBC count was 2.83 million. Among the 117 anemic patients, 71 patients (60.7%) had microcytic hypochromic anemia. Leucocytosis was observed in 30 patients (25%). Leucopenia was seen in 11 patients (9.2%). Low platelet count less than one lakh was seen in 28 patients (23.3%). **Conclusion:** The prevalence of anemia in CKD in our study coincides with many other studies. Anemia in CKD has prognostic and therapeutic implications and hence early diagnosis is mandatory.

INTRODUCTION

In the modern era, chronic kidney disease (CKD) has become a worldwide public health problem.[1] According to the statement by The National Kidney Foundation in India, kidney diseases rank 3rd after cancer and heart diseases among the morbid illnesses.[2]

CKD is defined as abnormalities of kidney structure or function, presenting for more than3 months, with implications for health. The markers of Kidney Damage are albuminuria more than 3mg/mmol, urinary sediment abnormalities, electrolyte abnormalities due to tubular dysfunction, structural abnormalities, detected during imaging/ histology and history of renal transplantation. CKD is diagnosed when glomerular filtration rate (GFR) is less than 60ml/min per 1.73m^2.

According to NHANES (National Health and Nutrition Examination Survey) in United States, the prevalence of CKD stages 1 to 4 among people 20 years aged or older was 13.1%.[3] The prevalence of CKD in India is 13-15.04%. This indicates that we are almost having the same status as western people.[4]

With the increased incidence of Diabetes and Hypertension, the prevalence of CKD is increasing.[5]

Various changes in hematological parameters have been noted in patients with chronic kidney disease.[6] The changes occur in hemoglobin, hematocrit, total count, platelet count and coagulation parameters. In this study, an attempt has been made to study the Hematological profile of CKD patients.

Materials and Methods

This study is a prospective study, conducted at Government Mohan Kumaramangalam Medical College Hospital (GMKMCH), Salem District, TamilNadu for a period of one year (January2017 to December 2017). Venous samples of CKD patients who were referred for hematological analysis were collected in EDTA tubes and samples were analyzed immediately for Complete Blood Count (RBC count, WBC count, Hemoglobin, Hematocrit and Platelet count) using fully automated three part hematology analyzer and also peripheral smear study done after staining with leishman stain. CKD patients with co-morbid illnesses which would affect hematological profile such as malignancies, connective tissue disorders and bleeding diathesis were excluded from the study. Pregnant and lactating women were also not included in the study.

OBSERVATION AND RESULTS

The study population includes one hundred and twenty patients with chronic kidney disease. They include all age groups ranging from 13 years to 85 years with predominant age group being 51-60 years (43%) (Table I).

Table1: Age wise Distribution of CKD Patients

Age range (years)	Number of patients	Percentage
<20	4	3.3%
21-30	8	6.7%
31-40	5	4.2%
41-50	27	22.5%
51-60	39	32.5%
61-70	27	22.5%
>70	10	8.3%

The total number of males were 77 and females were 43, with male: female ratio of 1.8:1.

In the study group, most of the patients were in CKD stage V (67), followed by stage IV (33),

18 patients belonged to stage III and 2 patients were in Stage II. Hemoglobin Distribution is as follows.

Table: 2. Hemoglobin Distribution

Hemoglobin concentration (gm/dl)	Number of people
<4	2
4.1- 6	26
6.1-8	41
8.1-10	27
10.1-12	21
12.1- 14	3

Anemia is seen in 97.5 % of patients. Most of the people had hemoglobin concentration in the range of 6.1 to 8 gm/dl. Degree of anemia is more with increase in the stage of CKD. The mean RBC count was 2.83 million. Among the 117 anemic patients, 71 patients (60.7%) had microcytic hypochromic anemia, 43 patients (36.8%) had normocytic normochromic anemia and 3 patients (2.6%) had dimorphic anemia with both microcytic and macrocytic blood picture.

Leucocytosis was observed in 30 patients (25%). Leucopenia was

seen in 11 patients (9.2%). In rest of the 79 patients, there was no change in white blood cell count. In all the 30 patients with increased WBC count, there is neutrophilic leucocytosis.

Low platelet count less than one lakh was seen in 28 patients (23.3%). In remaining patients, there was no change in platelet count.

DISCUSSION

CKD is a hazardous health problem globally. In the present study, most of the patients were in the age group of 51-60 years, which is similar to the study by Sheth Nidhi et al and Froissart M et al.[7,8]

In our study there is male preponderance which is similar to the study by Nidhi et.al, and they attributed this to increased risk factors for CKD in male population.[7] Majority of patients with anemia in our study were in stage V, which simulates the study by Nidhi et al, and in a study by Agawar et al, most of the cases were in stage III and IV.[9]

Anemia is very common in CKD and it has important prognostic and therapeutic implications. In our study group, 97.5% patients were anemic since most of our patients were in CKD stage V. The prevalence of anemia increases as kidney function declines. Severe anemia has a greater impact on the quality of life of people with renal disease.

Anemia is defined by WHO as hemoglobin concentration less than 12g/dl for adult women and less than 13 g/dl for adult men. According to The National Kidney Foundation's clinical practice guidelines, hemoglobin concentration less than 12g/dl for adult women and lower than 13.5 g/dl for adult men is considered as anemia.[10]

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Anemia in CKD was first noted by Richard Bright in 1836.[11] According to the data from a study by United Kingdom renal registry, with each 1gm/dl fall in hemoglobin, death rate increased by three folds within the range of 9-13gm/dl.[12]

Anemia is one of the significant consequences due to defective Erythropoietin (EPO) secretion. Normal erythropoietin concentration in subjects with good renal function is 3-30mU/ml. As hemoglobin falls, EPO level increases 100 folds. In Patients with renal disease, this inverse relation between Hb and EPO disappears. The proposed mechanisms for relative EPO deficiency in advanced CKD patients are: The diseased kidney adapts by attenuating tubular sodium reabsorption.This decreases oxygen consumption, thereby increasing oxygenation in outer medulla. This diminishes the stimulus for EPO production. In uremic patients, proteases mediated desialylation is increased which inactivates EPO. In Dialysis patients a 27-kDa splice variant, EPO-R is present in circulation which neutralizes EPO and its transcription is mediated by TNF and IL[6].

Iron deficiency also contributes significantly to anemia in CKD. Iron deficiency is due to blood loss from frequent phlebotomy, uremic bleeding, blood loss in dialysis circuit and poor absorption due to increased Hepcidin in CKD patients. Hepcidin is increased in CKD patients due to persistent inflammation and reduced renal clearance. In advanced CKD, there is accelerated destruction of erythrocytes due to increased expression of Phosphatidyl serine. Hypophosphatemia decreases red cell membrane deformability and may precipitate hemolysis. In patients on dialysis, a chronic inflammatory state with increased cytokines has been described. TNF α inhibits erythropoiesis directly and also impairs erythropoietin production and response. Also, there is a net loss of folate in patients on dialysis.

In both human and animal experiments, inflammation plays a key role in the pathophysiology of Kidney disease.[13] The inflammatory state in CKD is attributable to increased generation of oxygen radicals and associated activation of monocytes and degranulation of neutrophils. This releases many proinflammatory mediators. Assessment of WBC count, which is a traditional marker of systemic inflammation, can predict the decline in renal function.

In patients on dialysis, there will be complement activation in vivo due to exposure of blood to artificial membranes. Complement activation induces neutrophil aggregation and adherence to endothelial surface with resultant fall in total leukocyte count.[14] In some studies it has been observed that low WBC count in addition to high WBC count is associated with CKD progression.[15] In the current study, leucocytosis was observed in 25%, leucopenia seen in 9.2%. In rest of the 65.8% patients, there was no change in white blood cell count.

In a study by Habib A, et al, there is a slight increase in leukocyte count in CKD patients.[16] In a study by Naghmi Asif et al, there was no change in leukocyte count.[17]In many other studies, there were insignificant changes in total count and platelet values.[18] In the present study, 24 patients (20%) showed significant increase in ESR which could be due to the proinflammatory state in CKD.

Studies have shown decreased thrombopoietic activity in CKD. This is due to the fact that erythropoietin plays a key role in activating megakaryocytic colony stimulating factor and also it has homology with thrombopoietin.[19] Erythropoietin receptors have also been detected on megakaryocytes. This indicates that erythropoietin is a major regulator of platelet mass.

In our study low platelet count less than one lakh was seen in 28 patients (23.3%) where as in the study by Naghmi Asif et al, thrombocytopenia was noted in 12% of study population.[18]

Table 3: Prevalence of Anemia in CKD Patients in Various Studies

Study	Prevalence of anemia
Nidhi et al	93%
Arun S et al.[20]	98%
Abdu et al.[21]	94%
Current Study	97.5%

CONCLUSION

From our study, we have concluded that, various hematological changes have occurred in Chronic Kidney Disease. Anemia is the most common of all. The prevalence of anemia in CKD in our study coincides with many other studies. Anemia in CKD could be attributed to relative erythropoietin deficiency and it also accounts for thrombocytopenia. Anemia in CKD has important prognostic and therapeutic implications. The degree of anemia increases with the progression of CKD. Early diagnosis of anemia and treatment would improve the quality of life of CKD patients.

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