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Hematological Profile in Patients of Chronic Kidney Disease in a Tertiary Care Centre in South India

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Abstract

Background: Chronic kidney disease has increased rapidly in the world, especially in developing countries like India,due to increase in Diabetes mellitus, Hypertension etc.Besides, symptomatology in such patients, laboratory parameters like Hematological, Biochemical etc are important in establishing diagnosis in such patients. Often, importance is paid to Biochemical parameters and Hematological parameters are neglected.Hematological parameters play a pivotal role in prognosis of these patients.

Aim: The main aim of this study is to assess the hematological parameters in patients of Chronic Kidney disease and to assess their effect post dialysis.

Materials and Methods: This is a cross sectional study done on 64 patients of chronic kidney disease and on maintenance of dialysis. The study was carried out in Hematology section of Central Laboratory, Mahatma Gandhi Medical College and Research Institute,Pondicherry from January to July 2020.

Results: Out of 64 patients of Chronic Kidney disease, 47 (73.4%) patients were males and 17 (26.5%) patients were females. Majority of the patients were from the age group 41–60 years (76.5%), followed by the age group 21–40 years (18.7%). The major cause of Chronic Kidney disease was patients suffering from both Diabetes mellitus and hypertension accounting to 63 %, followed by Diabetes mellitus alone 25% and Hypertension alone 12%. (Graph 1) The hematological parameters before and after dialysis were anaemia, otherwise other parameters were within normal limits. The peripheral smear examination of all these patients, out of which 52(81.2%) patients showed Normocytic Normochromic anaemia and 12 (18.7%) patients showed (Graph 2) Microcytic hypochromic anaemia. Peripheral smear examination of Normocytic Normochromic anaemic patients showed evidence of hemolysis post dialysis in 28 patients. 12 patients showed fragmented red blood cells(schistocytes) alone, 7 patients showed microspherocytes alone and 9 patients showed both fragmented red blood cells and microspherocytes. Peripheral smear picture was more or less similar pre and post dialysis,except the parameters improved after the dialysis.

Conclusion: Chronic kidney disease is a serious health ailment, which requires careful monitoring of all the parameters, not merely the kidney function tests, but also the hematological parameters, which affect the prognosis of the condition of the patient.

Keywords: Hematological parameters; Chronic kidney disease; Anaemia.

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Introduction

Chronic Kidney disease has been a global health issue in the present world, especially in developing countries like India. Recent studies say that Chronic Kidney disease occupies the third place in the worlds disease burden. End stage renal disease is the grave stage of Chronic kidney disease ,where

the kidney function is irreversibly damaged and there is loss of maintenance and fluid and electrolyte balance.[1] It is characterized by the decrease in GFR (Glomerular Function Rate) and less than 10% function nephrons. In such patients,treatement strategies like Hemodialysis are done,to maintain electrolyte balance.[2] Hemodialysis is a very meticulous treatement modality, where careful monitoring of electrolytes are warranted.[3]

In patients with chronic kidney disease,many changes in hematological and biochemical parameters occur. Anemia of chronic disease is one such sequalae occurring in such patients, as a result of diminished Erythropoietin secretion, which precipates diminished red cell production and thereby culminating in anaemia of chronic disease.[4] Other causes may be due to blood loss, hemolysis and bone marrow suppression due to uremia. Hemodialysis itself can precipitate hemolysis in these patients. Besides, anaemia of chronic disease,other nutritional anemias like anemias due to vitamin B_{12} and folate deficiencies also occur. Secondary hyperparathyroidism which is another sequela of chronic kidney disease, also precipitate anemia.[5] Variations in total leucocyte count are seldom encountered in these patients, except when some underlying infection exists. Thrombocytopenia is commonly seen due to hemodialysis.[6] Hypo and hypernatremia, Hypo and Hyperkalemia, Hypocalcemia etc are few other biochemical abnormalities seen in these patients.[7] Studies also show some metal toxicity in these patients, as proximal convoluted tubule is responsible for reabsorption of such metallic ions. Hence, there are significant variations in hematological and biochemical parameters in these patients.[8]

There are very few studies on hematological and biochemical variations in such patients. The main aim of this study is to assess the hematological parameters in patients of Chronic Kidney disease and to assess their effect post dialysis.

Methodology

This is a cross sectional study done on 64 patients of chronic kidney disease and on maintenance of dialysis. The study was carried out in Hematology section of Central Laboratory, Mahatma Gandhi Medical College and Research Institute, Pondicherry from January to July 2020. The study was carried out on patients with established diagnosis of Chronic kidney disease. The blood samples were sent for Complete Blood Count and Peripheral smear examination and kidney function tests like serum urea, creatinine,levels of sodium, potassium and calcium. The blood samples for Complete Blood count were collected in EDTA vials, whereas, For the kidney function tests, serum was collected in red vial, which lacks any anticoagulant. The blood samples were collected by the routine technique of venepuncture in Outpatient, In patient and Dialysis units. The blood samples along with request forms were received in the respective sections like Hematology and Biochemistry. Request forms contained all the necessary details of patient, diagnosis, treating physician, name of the test required etc. Blood samples for complete blood count and run in Horriba Pentra DF Nexus and peripheral smears are made using Leishman stain. Kidney function tests like Creatinine, Urea and electrolytes are done by Jaffe method, Uricase and Isolyte methods. The hematological parameters are correlated with the peripheral smear findings and the reports are approved on the AOSTA (Laboratory Information System). All these data are maintained as a database in Excel sheet. Inclusion criteria included all patients above 15 years of age group. Exclusion criteria included those patients who had other diseases like malignancy, connective tissue diseases and congenital or acquaired blood diseases that could affect hematological parameters.

Results

Out of 64 patients of Chronic Kidney disease, 47 (73.4%) patients were males and 17 (26.5%)patients were females. Majority of the patients were from the age group 41–60 years (76.5%), followed by the age group 21–40 years (18.7%). Refer to the Table 1.

The major cause of Chronic Kidney disease was patients suffering from both Diabetes mellitus and hypertension accounting to 63%, followed by Diabetes mellitus alone 25% and Hypertension alone 12%. Refer to Fig. 1.

Effect of chronic kidney disease on hematological parameters and its relationship with hemodialysis: data presented in Table 2 shows that the RBC count, hemoglobin levels and platelets counts are significantly reduced in the patients of chronic renal failure and the process of hemodialysis further decreases the level of all the above mentioned hematological parameters.

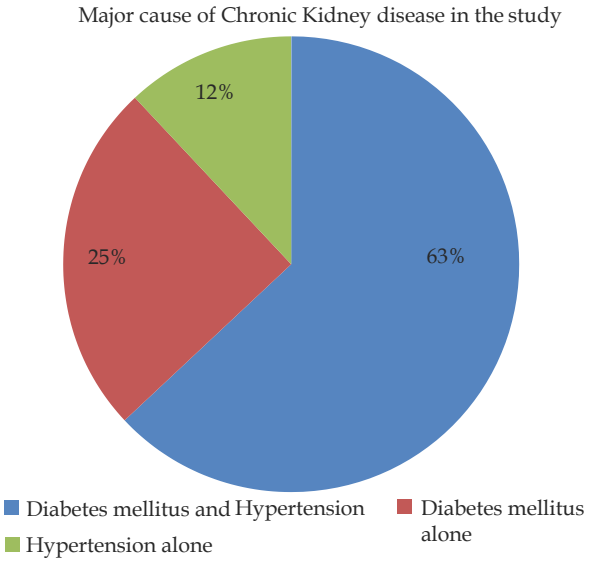
All the 64 patients underwent peripheral smear examination, out of which 52(81.2%) patients showed Normocytic Normochromic anaemia and 12(18.7 %) patients showed Microcytic hypochromic anaemia. Peripheral smear examination of

Normocytic Normochromic anaemic patients showed evidence of hemolysis post dialysis in 28 patients. 12 patients showed fragmented red blood cells (schistocytes) alone, 7 patients showed microspherocytes alone and 9 patients showed both fragmented red blood cells and microspherocytes. Peripheral smear picture was more or less similar pre and post dialysis, except the parameters improved after the dialysis.(Fig. 4)

Table 3 shows biochemical parameters in patients of Chronic Kidney disease: pre-dialysis and post dialysis.

Table 1: Age and sex distribution of patients suffering from Chronic Kidney disease.

Age (N)	Male (N)	Female (N)	Total no. (N)
<20	02	01	03
21-40	09	03	12
41-60	30	11	49
>60	06	02	08
Total	47	17	64



Graph 1: Major cause of Chronic Kidney disease in the study.

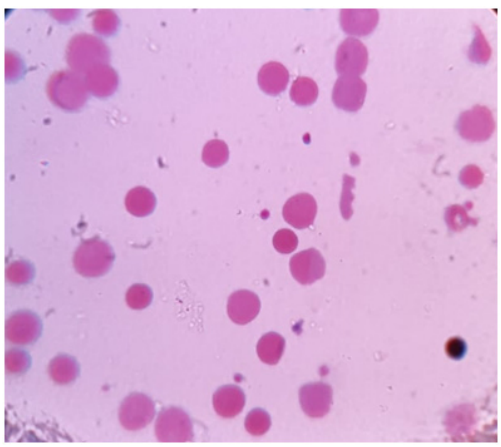
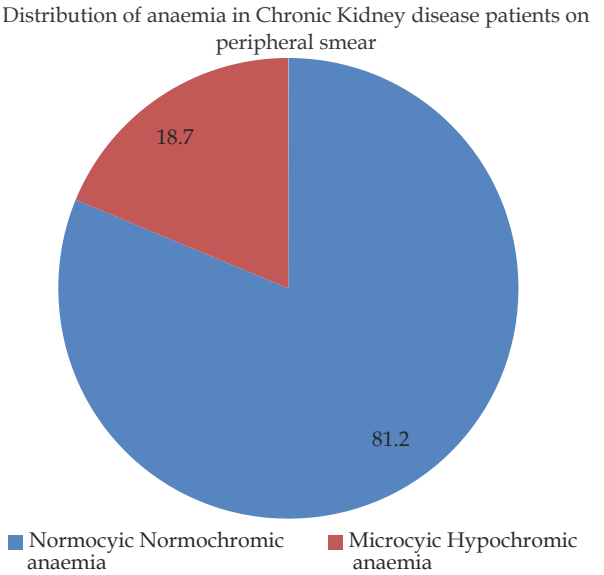


Fig. 1: Microspherocytes in the peripheral smear.

Table 2: Hematological parameters in patients of Chronic Kidney disease.

Parameters (N)	Control (Mean value) (N)	Pre-dialysis (Mean value) (N)	Post-dialysis (Mean value) (N)
Hemoglobin	12.5	7.4	8.1
Total RBC count	4.3	3.54	4.2
PCV	54	31.4	43.5
MCV	83.4	75.3	79.6
MCH	26.5	24.3	25.6
MCHC	28.4	26.4	27.4
Total Leucocyte Count	5.3	4.1	4.7
Neutrophils	63	62.2	62.7
Lymphocytes	26.7	24.3	25.4
Eosinophils	4.4	3	5
Monocytes	5.1	4.1	4.8
Basophils	0	0	1
Platelet count	2.31	1.45	2.21
ESR	21.4	16.3	21.2



Graph. 2: Distribution of anaemia in Chronic Kidney disease patients on peripheral smear.

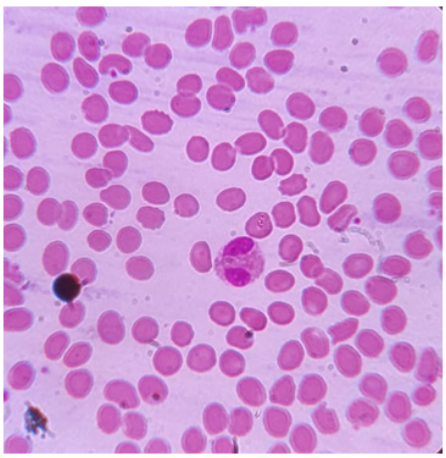


Fig. 2: Normochromic Normocytic cells in the peripheral smear.

Table 3: Biochemical parameters in patients of Chronic Kidney disease.

Parameters	Control (Mean value)	Pre-dialysis (Mean value)	Post-dialysis (Mean value)
Blood Urea Nitrogen	4.4	4.2	4.36
Creatinine	0.3	0.26	0.29
Total Protein	4.3	4.06	4.27
Serum Albumin	2.3	2.1	2.3
Globulin	0.3	0.16	0.27
A/G Ratio	0.4	0.32	0.38
Sodium	124.5	113.4	123.7
Potassium	2.3	1.7	2.2
Chloride	82.4	76.7	81.8
Bicarbonate	15.6	12.4	14.7

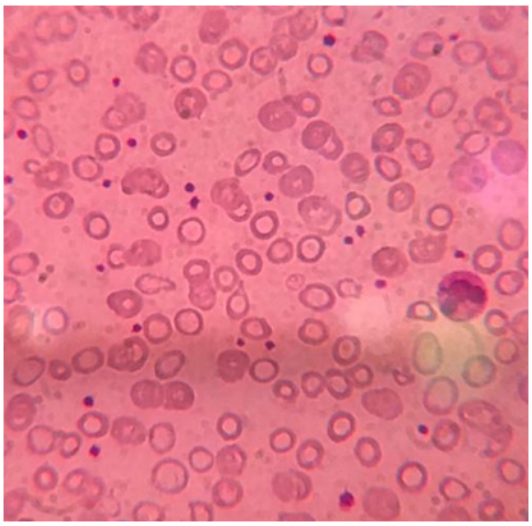


Fig. 3: Microcytic hypochromic cells in the peripheral smear.

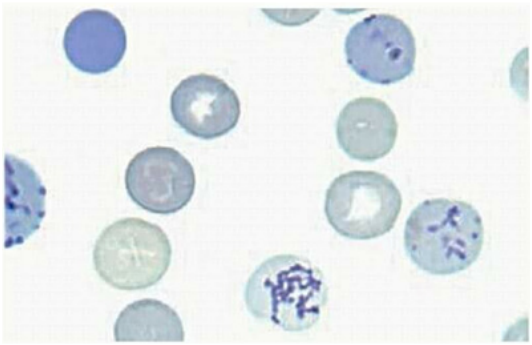


Fig. 4: Reticulocytosis in the supravital stain.

Discussion

In the present study, there has been decline in hematological parameters, which is also seen in all other studies. Many studies showed that Hemoglobin concentration, total red cell count and packed cell volume were decreased, which is seen in the current study too.[9] This is because of reduced erythropoietin production, thereby decreasing hemoglobin synthesis and red cell production.[10] It is said that RBCs are decreased in uremic patients with proportion to the Blood Urea Nitrogen (BUN) and there is an improvement in the parameters post-dialysis.[11] With the increase in urea levels in serum, the expression of phosphatidyl serine on the outer cell surface in red blood cells are also increased and thereby causing phagocytosis of red blood cells by the macrophages.[12] Likewise,The red cell indices like MCV, MCH and MCHC are within normal limits in the study, denoting Normocytic Normochromic blood picture, although Microcytic hypochromic anaemias were also reported. Similar findings were seen in the study by Shastry I et al.[13] (Fig.2)

Erythropoietin can decrease the platelet production also. Sometimes,dialysis can also cause thrombocytopenia.[14] But in our study, platelet levels were not reduced-both pre and post dialysis. The present study more or less is in concordance with the study by Habib A et al.[15]

The total leucocyte count and the various cells in differential count were also almost within normal range in the current study. The present study more or less is in concordance with the study by Habib A et al.[15] It is expected to have a spike in total leucocyte count with neutrophilic prepondereance, as Chronic kidney disease can trigger some inflammatory condition in such patients, triggering upregulation Tumor Necrosis Factor (TNF) and IL-6 levels, but with reduced lymphocyte count.[16] But, in the present study,almost all the the cells in differential count are more or less within normal limits. This can be explained that, there are no any inflammatory conditions occurring in such patients.[16]

Peripheral smear findings were predominantly of Normocytic Normochromic anaemia with few smears showing schistocytes and microspherocytes, denoting some hemolysis due to dialysis. Few smears also showed Microcytic hypochromic anaemia too. Our study is more or less compatible with the study of Shastry et al and Sudhir et al.[13,17](Fig.3)

Conclusion

Chronic kidney disease is a serious health ailment, which requires careful monitoring of all the parameters, not merely the kidney function tests, but also the hematological parameters, which affect the prognosis of the condition of the patient.

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