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Hematological Parameters In Chronic Kidney Disease (CKD)- Study At A Tertiary Care Center

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Abstract
Background: *Chronic kidney disease (CKD) is a global health problem, which is characterised by slow deterioration in kidney function leading to numerous haematological and biochemical dysfunction. Aim of the present study was to find out the common haematological dysfunctions that may occur in the patients of chronic renal failure (CRF).*
Methodology:*This hospital based descriptive study was done over a period of 4 months (March 2021to June 2021) at Saveetha medical college and hospital on 90 CKD patients.The demographic data and clinical status of patients were accessed from hospital records and the haematological parameters were retrieved from the haematology laboratory.*
Results:*The age of the patients ranged from 28 to 81 years, with mid-fifties being the most common age of presentation. Male preponderance was noted. Anemia was the most common finding, morphologically it was predominantly normocytic normochromic anemia. Substantial study population showed neutrophilic leukocytosis. Preponderance of eosinopenia over eosinophilia was noted. Equal distribution of thrombocytosis and thrombocytopenia was seen.*
Conclusion*: Hematological dysfunctions have known to occur in CKD patients. Anemia being the predominant manifestation, an insight on these changes will warrant the clinician to have a high degree of suspicion in identifying and treating the complications associated with CKD.*
Keywords*: Chronic kidney disease(CKD),haematological parameters, anaemia*

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I. Introduction

Chronic kidney disease (CKD) is a broad term used to describe the final common pathway of progressive nephron loss resulting from any type of kidney disease.[1]It is anemerging global health problemand is an important contributor to morbidity and mortality from non-communicable diseases. As per the National Kidney Foundation India state kidney diseases rank third amongst the life-threatening diseases after cancer and heart diseases, affecting more than 200,000 persons every year.[2] Some of the common causes of CKD includes glomerulopathies, diabetes mellitus, systemic lupus erythematosus (SLE), amyloidosis, gout, tuberculosis (TB), essential hypertension, polycystic kidney disease, Alport's syndrome etc.[3]Slow but progressive deterioration in kidney function leads to irreversible worsening of renal function and decline in glomerular filtration rate (GFR) is exhibited by the numerous haematological and biochemical changes.[4]

Haematological parameters are shown to be commonly affected in CKD. Of all the parameters, red cell indices are more frequently and severely affected, in which anaemias are the most common presentation this is because as high as 90% of erythropoietin is produced in the juxta glomerular apparatus of the kidney while only 10% are produced in the liver and other organs.[5] Changes in red cell indices are associated with a number of factors aside erythropoietin production, the other contributory factors are nutritional insufficiency due to deficiency of iron or vitamin B12, increased blood loss, shortened red cell survival, mild chronic inflammation have also been indicated. Anaemias in CKD are usually normocytic normochromic, it can be microcytic hypochromic also, when associated with a superimposed iron deficiency anaemia.[6]Some cases may have macrocytic anaemia due to Vitamin B12/folate deficiency, dialysis-induced changes in red cell volume and bone marrow suppression.[7]Reduced haematocrit levels in these patients are attributed to thehaemodilution.[6] Other findings in CKD include eosinophilia, neutrophilia, while the white blood cells (WBCs) count, platelet count is

generally within normal ranges.Associated haematuria, proteinuria, glucosuria, elevated serum urea and creatinine levels are useful for diagnostic purposes. [8]
The aim of this study was to evaluate the haematologicalparameters in chronic kidney disease patients.

II. Material And Methods

This retrospective descriptive study was conducted on 90 chronic kidney disease (CKD) patients over a period of 4 months (March 2021 to June 2021) at Saveetha medical college and hospital.The demographic data and clinical status of patients were accessed from hospital records and the haematological parameters were retrieved using the Sysmex XN1000 Automated 6-part haematology analyser. Statistical analysis was carried out using the SPSS software version 23.

Inclusion criteria: All the patients suffering from chronic kidney disease and age > 15 years. Exclusion criteria: Patients with Recent blood transfusion (< 3 months) and patients on drugs affecting haematological parameters like NSAIDS, antihistamine and aspirin.

III. Results And Discussion

Among the 90 CKD patients included in this study, the age ranged from 28 to 81 years with a mean age of presentation being 57.24 years (Table1)Maximum number of patients (25 cases) were in the age group 50-60, followed by 18 cases in the age group 60- 70 s. A male preponderance was noted (54cases- 60%) with a M:F ratio of 1.5:1. (Fig 1).

Table 1: Age wise distribution of CKD patients

Age in years	Male	Female
0-10	-	-
11-20	-	-
21-30	1	-
31-40	8	2
41-50	7	10
51-60	12	13
61-70	13	5
71-80	11	6
81-90	2	-
Total cases	54	36

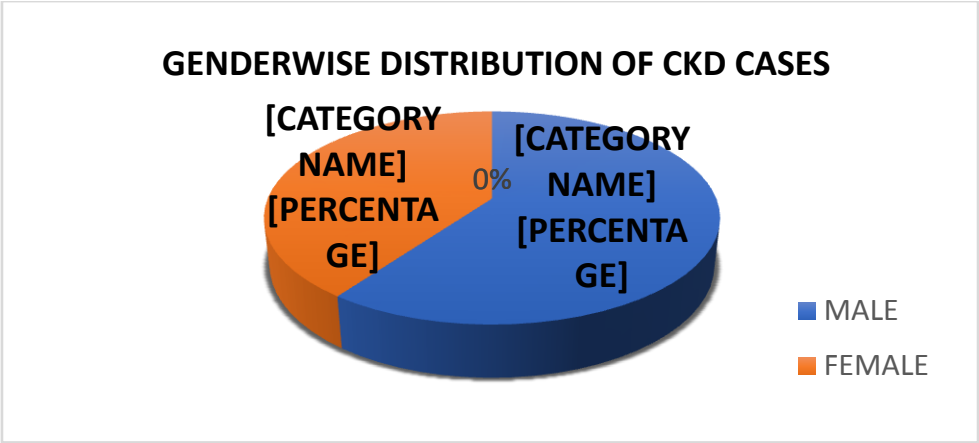

Figure 1: Gender wise distribution of CKD patients

Among the 90 cases, 76 cases were found to be anaemic (Hb<11g/dl). In this, mild anaemia was seen in 20 cases (26%), moderate anaemia in 32 cases (42%), severe anaemia in 24 cases(31.5%) respectively.(Fig 2)

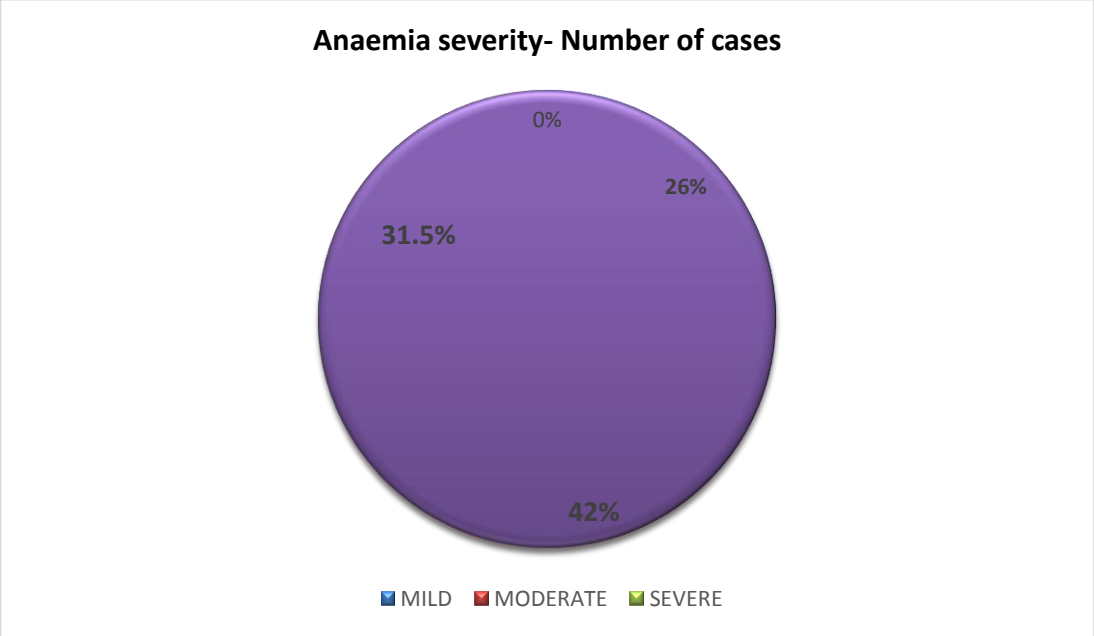

Figure 2: Anaemia severity in CKD patients.

Majority of the cases, morphologicallywere normocytic normochromicanaemia (76.3%), followed by 17 cases(22%) of microcytic hypochromicanaemia, macrocytic anaemia was seen only in 1 case(1.3%). A mean PCV of 29.01 ±8.62(l/l)and a mean RDWof 15.06 ± 2.25, respectively was observed in our study.

Table 2:Red cell indices in CKD patients.

Haematological parameter	Mean	Standard deviation	Minimum	Maximum
HB(g/dl)	8.736	15.60	4.30	15.60
RBC COUNT(x10^6/µL)	3.237	0.71	1.70	5.720
PCV(l/l)	29.01	8.62	15.90	85.20
MCV (fl)	87.960	7.49	63.90	103.80
MCHC (g/dl)	30.88	1.55	24.60	34.90
MCH (Pg)	27.35	3.06	15.70	39.30
RDW(l/l)	15.60	2.25	11.70	23.60

Overall leucocyte indices were relatively normal in 62 cases (68.1%), 24 cases (26.66%) had leucocytosis, while just a small proportion of patients (4 cases) had leukopenia. Majority of the patients n=57(63%) had normal neutrophil counts, while the remaining 33cases (47%) had neutrophilia. In the present study, a relative lymphopenia was observed in 52 cases(57.77%), 40% cases had normal lymphocyte counts, while only 2 cases had lymphocytosis.Preponderance of eosinopenia in32 cases(35.55%), over eosinophilia in 22 cases(24.44%) was noted.

There was an equal distribution of thrombocytosis and thrombocytopenia in 13 cases each (14.44%), while the majority presented with normal platelet counts.

Table 3:Mean values of leucocyte and platelet indices in CKD patients

Haematological parameter	Mean	Standard deviation	Minimum	Maximum
TOTAL COUNT(x10^3/µL)	10164.04	6448.43	943.00	39740.00
DC- N (%)	73.60	13.84	41.90	97.10
DC-L (%)	17.83	10.06	2.30	46.70
DC-E (%)	4.44	7.17	0.00	38.00
DC-M (%)	4.71	2.07	0.30	12.10
DC-B (%)	0.23	0.19	0.00	1.20
PLATELETS(x10^3/µL)	3.040	3.27	1.02	30.20

3.1 DISCUSSION:

The haematological changes in 90 CKD patients were studied. The results showed various degrees of changes in haematological parameters. In our study, predominantly we observed a decrease in the RBC

countand theprimary cause for this fall in RBC could be attributed tothe impaired production of erythropoietin and by factors that suppress marrow erythropoiesis and shortened red cell survival.
Haemoglobin and Haematocrit is consistently decreased in chronic renal failure as in our study and is an accurate reflection of the extent to which the circulating red cell mass. In CKD because of impaired erythropoietin secretion, increased destruction of red blood cells, leads to a fall in red blood cell count, which then reduces the haemoglobin concentration and haematocrit[8,9]. These erythrocyte indices findings were in concordance with the studies conducted by Christian et al[10],Suresh et al;[11]Shittu *et al*;[12],Alghythan and Alsaeed;[13]Talwar et al, [19]and Singh et al [20]

Mean values	**Present study**	**Christina et al**	**Suresh *et al.***	**Shittu *et al.***	**Alghythanet al.**
RBC count × 106/µl	**3.23**	**2.85**	**3.06**	**2.82**	**4.13**
Hb%	**8.73**	**8.45**	**8.83**	**7.6**	**11.7**
PCV %	**29.01**	**25.35**	**27.13**	**27.13**	**35.14**

The activation of the immune system,by inflammation and oxidative stress triggered by an underlying infection, drug, toxic chemical, hypertension ordiabetes, increases the WBC counts,our study proved the same, with the mean TLC being 10164.4($x10^3$/µL). In studies, like Obeagu EIet alCKD was associated with higher neutrophil and lower lymphocyte counts which wasin concordance with our findings of neutrophilia, lymphopenia.

Haematological parameter	**Present study**	**Obeagu Et al**
TOTAL COUNT($x10^3$/µL)	10164.04	6200.06
DC- N (%)	73.60	71.00
DC-E (%)	4.44	2.00

Dorgalaleh et al., [16] like in our study, reported a significant decrease in platelet count in theseCKD patients.Platelet dysfunction can be a result of decreased dense granule content, decreased sensitivity to platelet agonists, abnormal expression of platelet glycoproteins, defective arachidonate metabolism and depressed prostaglandin metabolism as well as impaired platelet adhesiveness and is also thought to be caused by the action of uremic toxins, anemia, increased nitric oxide production, von Willebrand factor abnormalities and the use of medication like β-lactam antibiotics.

IV. Conclusion

Hematological dysfunctions have known to occur in CKD patients. Anemia being the predominant manifestation,an insight on these changes will warrant clinician to have a high degree of suspicion inidentifying andtreating thecomplications associated with CKD as early as possible. This study attempts to re-establish the importance of reviewing basic hematological parameters in chronic kidney diseases.

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COMPETING INTERESTS
No competing interests exist.

AUTHORS' CONTRIBUTIONS
DR. DANITA G S EDWIN[1] -Wrote the protocol,performed the statistical analysis, wrote the first draft of the manuscript.
DR. SANJANA[2]– Data collection and literature search
DR. YOALAKSHMI [3] -Designed the study,correctionand approval of the final manuscript

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