HAEMATOLOGICAL PROFILE IN CHRONIC KIDNEY DISEASE PATIENTS IN KIMS HOSPITAL, HUBBALLI

Sanjay Neeralagi[1], Chandrashekar K[2], Pavan Kumar D[3], Praveen N[4], Chetan K. Ganteppanavar[5]

[1]Associate Professor, Department of General Medicine, Karnataka Institute of Medical Sciences, Hubli, Karnataka.
[2]Assistant Professor, Department of General Medicine, Karnataka Institute of Medical Sciences, Hubli, Karnataka.
[3]Senior Resident, Department of General Medicine, Karnataka Institute of Medical Sciences, Hubli, Karnataka.
[4]Junior Resident, Department of General Medicine, Karnataka Institute of Medical Sciences, Hubli, Karnataka.
[5]Junior Resident, Department of General Medicine, Karnataka Institute of Medical Sciences, Hubli, Karnataka.

ABSTRACT

BACKGROUND

Chronic Kidney Disease (CKD) is a worldwide public health problem. It encompasses a progressive decline in glomerular filtration rate (GFR).[1] Globally there has been an increase in the occurrence of chronic kidney disease. India in particular, faces a major burden of managing the end stage renal disease patients. Anaemia is an almost invariable manifestation of chronic kidney disease, often contributing substantially to the morbidity and mortality of the condition.[2] Anaemia is a common finding in CKD patients, this is probably because of inhibition of erythropoiesis by uremic inhibitors. The present study is an attempt at comprehensive review of red blood cell (RBC), leukocyte and platelet profiles to assess their significance in CKD as there are no extensive studies in Indian literature.

The objectives of this study were 1. to observe haematological parameters and 2. to assess the clinico-haematological correlation in patients with chronic kidney disease in KIMS, Hubballi.

MATERIALS AND METHODS

108 patients with chronic kidney disease were selected irrespective of their sex, clinical profile, aetiology and were subjected to a series of biochemical and haematological investigations.

RESULTS

The commonest causes of chronic kidney disease in this study were hypertension (50.9%) and diabetes mellitus (45.4%). Most patients presented with features of Anaemia (94.4%). 88% of the patients had normocytic normochromic anaemia. Thrombocytopenia was found in 44.4% of the patients. A raised ESR was found in 70.4% and a decreased PCV was seen in 79.6% of CKD patients.

CONCLUSION

Anaemia is the most common haematological abnormality noted. The severity of Anaemia correlates with the degree of azotaemia and stage of CKD. The most common type is normocytic normochromic anaemia.

KEYWORDS

Chronic Kidney Disease, Uraemia, Azotaemia, Anaemia, Thrombocytopenia, ESR, PCV.

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BACKGROUND

Chronic Kidney Disease (CKD) is a worldwide public health problem. It encompasses a progressive decline in glomerular filtration rate (GFR).[1] According to kidney disease improving global outcomes (KDIGO)-CKD-work group, CKD is defined as abnormalities of kidney structure or function present for more than 3 months.[3] KDIGO defines CKD as a GFR less than 60 ml/min/1.73m^2 for ≥3 months. Diabetes mellitus and hypertension together account for most of the patients being treated for ESRD. Other common causes are glomerulonephritis, interstitial nephritis, Polycystic kidney disease and obstructive uropathy. India in particular, faces a major burden of managing the end stage renal disease patients, adding to the cost of health care management. CKD patient is said to be suffering from Anaemia if the haemoglobin concentration is less than 13 gm/dl in males and less than 12 gm/dl in females.[4] The different morphological types of Anaemia in CKD are normocytic normochromic type, which is the most common, followed by microcytic hypochromic type and macrocytic type which is the least common. Though Anaemia is a common finding in CKD patients, this is probably because of inhibition of erythropoiesis by uremic inhibitors is much more than inhibition of granulopoiesis and megakaryocytopoiesis.

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Corresponding Author:
Dr. Sanjay Neeralagi,
Associate Professor, Department of General Medicine,
Karnataka Institute of Medical Sciences,
Vidyanagar, Hubli- 580021, Karnataka.
E-mail: sanjay.neeralagi@gmail.com
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Morphology of white blood cells (WBCs) appears to be within normal limit. But clinically the patient presents with an increased incidence of infection in uraemia due to abnormal chromatic function and defective receptor regulation.[5] Defect in platelets is chiefly qualitative. There is decreased platelet adhesiveness and aggregation in response to adenosine diphosphate(ADP) and decreased release of platelet factor III due to the accumulation of toxic metabolites in uraemia.[6] With a background prevalence of iron deficiency in India, the studies of other parts of world cannot be applied blindly to the Indian subcontinent.[7] The present study is an attempt at comprehensive review of red blood cell(RBC), leucocyte and platelet profiles to assess their significance in CKD as there are no extensive studies in Indian literature.

MATERIALS AND METHODS

In the present study, the data collected from 108 cases of CKD admitted in KIMS Hospital, Hubballi are discussed. The patients were of both sexes and their age more than 18 years were included. These cases have been recorded from in patients admitted to KIMS Hubballi from November 2015 to January 2017.

In the present work the investigation done was divided into 2 categories:

I. Investigations done to assess the renal function: Blood urea, serum Creatinine, serum electrolytes, Urine –Albumin, Sugar, microscopic examination, Abdominal ultrasound for kidney scan.
II. Investigations done to determine the haematological changes: HB, TLC, DLC, RBC count, Platelet count, Haematocrit, MCV, MCH, MCHC, Peripheral blood smear: for different types of anaemia., ESR, Bleeding time, Clotting time, Prothrombin time, Activated partial thromboplastin time.

During the study the patient who are known case of CKD and are diagnosed of bleeding / clotting diseases or drug induced bleeding history are excluded from the study. Also the cases of CKD with other known hematopoietic diseases / Diseases of bone marrow were excluded from the study.

Chi-square test was used as test of significance for qualitative data. Continuous data was represented as mean and SD. Independent t test was used as test of significance to identify the mean difference between two quantitative variables. ANOVA (Analysis of Variance) was the test of significance to identify the mean difference between more than two groups for quantitative data.

RESULTS

The p value (of <0.05) was considered as statistically significant after assuming all the rules of statistical tests. Chi-square test, Independent t test, ANOVA (Analysis of Variance) were used for calculations and for test of significance.

In the study majority of CKD subjects were in the age group 41 to 60 years (49.1%) age group. Among the total subjects, 50.9% were hypertensive, 45.4% were diabetics.

		Count	%
Age	<30 Years	21	19.4%
	31 to 40 Years	15	13.9%
	41 to 50 Years	27	25.0%
	51 to 60 Years	26	24.1%
	>60 Years	19	17.6%

Table 1. Age Distribution of Subjects in The Study

		Count	%
HTN	Absent	53	49.1%
	Present	55	50.9%
DM	Absent	59	54.6%
	Present	49	45.4%

Table 2. Past History Among CKD Subjects

		Count	%
Stage	Stage 3	29	26.9%
	Stage 4	27	25.0%
	Stage 5	52	48.1%

Table 3. Stage of CKD

26.9% were in Stage 3 CKD, 25% were in stage 4 and a majority 48.1% were in stage 5 CKD. Among CKD patients, 23.1% had mild, 38% had moderate and 33.3% had severe anaemia. 1.9% had leucopenia and 13.9% had leucocytosis, 70.4% had raised ESR, 44.4% had thrombocytopenia and 79.6% had decreased PCV.

		Count	%
PS	Dimorphic	5	4.6%
	Macrocytic	2	1.9%
	MCHC	1	0.9%
	MCNC	5	4.6%
	NCNC	95	88.0%

Table 4. Peripheral Smear Findings Among CKD Patients

88% had normocytic normochromic blood picture, 4.6% had microcytic normochromic, 4.6% had dimorphic, 1.9% had Macrocytic and 0.9% had MCHC blood picture in peripheral smear.

		Stage					
		Stage 3		Stage 4		Stage 5	
		Count	%	Count	%	Count	%
Hb	No Anaemia	5	17.2%	1	3.7%	0	0.0%
	Mild Anaemia	12	41.4%	5	18.5%	8	15.4%
	Moderate Anaemia	7	24.1%	18	66.7%	16	30.8%
	Severe Anaemia	5	17.2%	3	11.1%	28	53.8%

Table 5. Association between Stage of CKD and Haemoglobin Grading

$\chi 2 = 36.79$, df = 6, p <0.001*

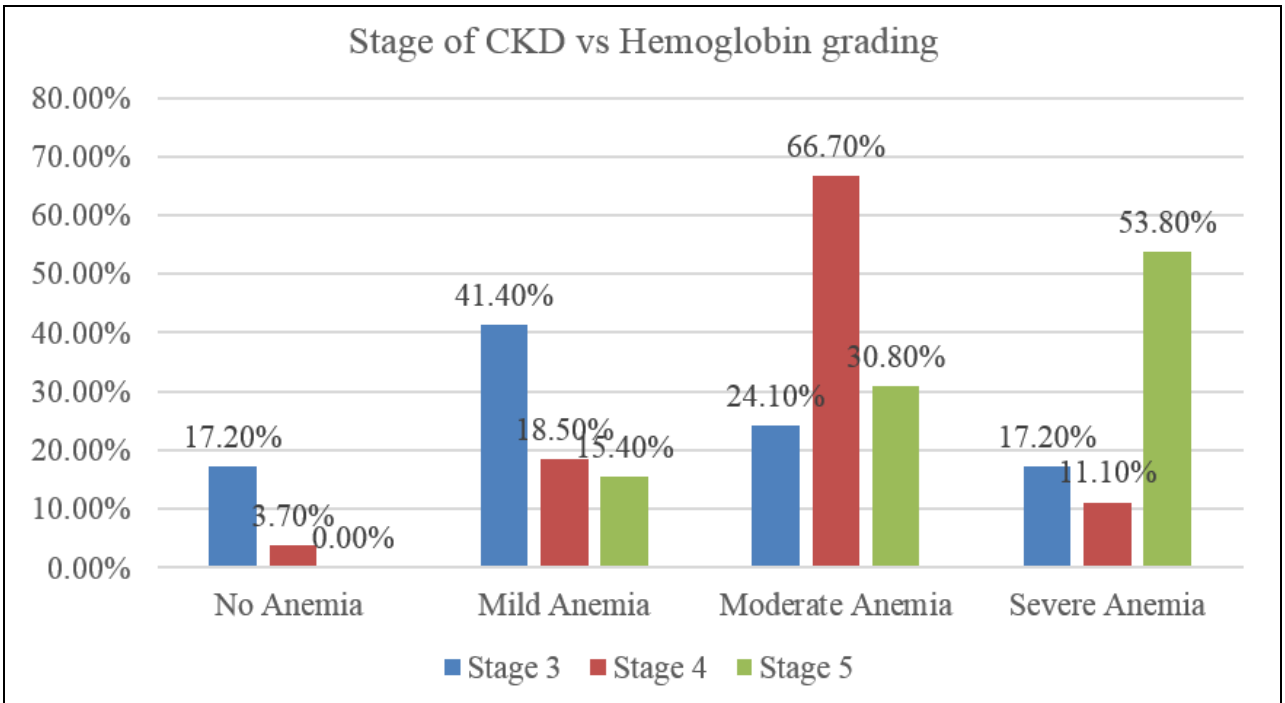

Figure 1

In Stage 3 CKD, majority had mild anaemia, in stage 4 CKD, majority had moderate Anaemia and in stage 5 CKD, majority had severe anaemia. This difference in Anaemia with respect to stage of Anaemia was statistically significant. There was no significant association between stage of CKD and Leucocytosis or leucopenia.

		Stage					
		Stage 3		Stage 4		Stage 5	
		Count	%	Count	%	Count	%
Platelet Count	Thrombocytopenia	8	27.6%	9	33.3%	31	59.6%
	Normal Platelet count	21	72.4%	18	66.7%	21	40.4%

Table 6. Association Between Stage of CKD and Platelet Count

$\chi 2 = 9.535$, df = 2, p = 0.009*

In Stage 3 CKD, 27.6% had Thrombocytopenia, in stage 4 CKD, 33.3% had Thrombocytopenia and in Stage 5 CKD, 59.6% had Thrombocytopenia. This difference in proportion of Thrombocytopenia with respect to stage of CKD was statistically significant. There was no significant association between stage of CKD and ESR.

	Stage						P value
	Stage 3		Stage 4		Stage 5		
	Mean	SD	Mean	SD	Mean	SD	
Blood Urea	68.0	33.4	83.1	37.3	153.6	63.4	<0.001*
Serum Creatinine	2.2	0.3	4.0	0.8	13.4	11.4	<0.001*
Urine Albumin	9.4	12.5	7.4	0.7	9.0	9.5	0.689
Na+	135.6	6.3	136.4	5.3	135.3	11.8	0.880

K+	4.3	0.7	5.2	.8	5.6	1.3	<0.001*
Calcium	7.9	0.4	10.0	12.4	7.2	0.4	0.157
PH	4.3	0.6	4.4	0.7	4.2	1.0	0.646
RBS	166.3	42.6	180.7	59.0	160.0	43.7	0.192
BT	4.4	1.2	4.7	1.0	5.4	1.1	0.001*
CT	6.6	1.4	6.7	1.3	7.7	1.2	<0.001*
PT	13.6	2.6	12.8	2.3	14.5	2.1	0.007*
APTT	27.5	6.6	26.7	6.7	33.5	5.7	<0.001*
24 hr Urine Protein	190.9	94.3	184.1	86.6	276.5	88.3	<0.001*
GFR	34.2	6.9	18.1	3.2	6.2	3.5	<0.001*

Table 7. Comparison of Laboratory Parameters with Respect to Stage of CKD

A significant increase in mean blood urea, serum Creatinine, serum potassium, Bleeding time, Clotting time, PT, APTT, 24 hr urine protein and a significant decrease in mean GFR was observed with respect to stage of CKD.

DISCUSSION

Chronic kidney disease is one of the major health problems throughout the world, ultimately resulting in End stage renal failure.[8] The association of Anaemia with renal failure was first noted by Richard Bright in 1936. Jacobson et al. in 1957 discovered a glycoprotein (erythropoietin) produced mainly by the kidney which regulates erythrocyte production.[9] Anaemia develops when the creatinine clearance drops to 30ml/min/1.73sq m of body surface area. Management begins with the identification and correction of any acute reversible causes of renal insufficiency in patients with CKD. It is important to anticipate and treat multiple manifestations of CKD including anaemia.

In our study, mean age group in the present study was 50 ± 10 years, which was comparable to that of study done by Caster et al.,[10] where the mean age group was 50 ± 8 years, and in Talwar et al[11] study was 52 ± 10 yrs. The commonest associated systemic disorder with chronic renal failure was hypertension accounting for 45.4%. It was about 40% according to Caster.

	Present study	**Talwar et al[11]**
Anaemia	94.4%	94%

Table 8

	Present Study	**Talwar et al[11]**
Normocytic Normochromic	88%	35%
Microcytic Hypochromic	0.9%	65%
Others	11.1%	5%

Table 9. Type or Anaemia

Criteria for CKD (either of the following present for >3 months)

A. Markers of Kidney Damage (One or More):

- Albuminuria (AER >30 mg/24 hours; ACR >30 mg/g)
- Urine sediment abnormalities
- Electrolyte and other abnormalities due to tubular disorders
- Abnormalities detected by histology
- Structural abnormalities detected by imaging
- History of kidney transplantation

Decreased GFR less than 60 ml/min/1.73m^2 (GFR categories G3a–G5)

GFR categories in CKD

GFR Category	GFR (ml/min/1.73 m^2)	Terms
G1	>90	Normal or high
G2	60–89	Mildly decreased
G3a	45–59	Mildly to moderately decreased
G3b	30–44	Moderately to severely decreased
G4	15–29	Severely decreased
G5	<15	Kidney failure

Anaemia is both a complication of CKD as a part of the uremic syndrome and a risk factor which influences the adverse outcomes of CKD. So, evaluation and management of Anaemia is important to prevent the progress of CKD and for the general well-being of the patient.

Anaemia is defined as a haemoglobin concentration less than 13 gm/dl in males and less than 12 gm/dl in females.[4]

Multiple factors are responsible for Anaemia like reduced EPO, Shortened red blood cell survival, Nutritional deficiencies, such as folate and vitamin B_{12}, anorexia or dialysate losses, impaired dietary iron absorption, hepcidin excess. CKD patients have increased iron losses, estimated at 1–3 g per year in haemodialysis patients, due to chronic bleeding from uraemia-associated platelet dysfunction, frequent phlebotomy, and blood trapping in the dialysis apparatus. Secondary iron overload also occurs from recurrent blood transfusions. Intravenous iron itself would further increase hepcidin levels[52] and worsen anaemia.

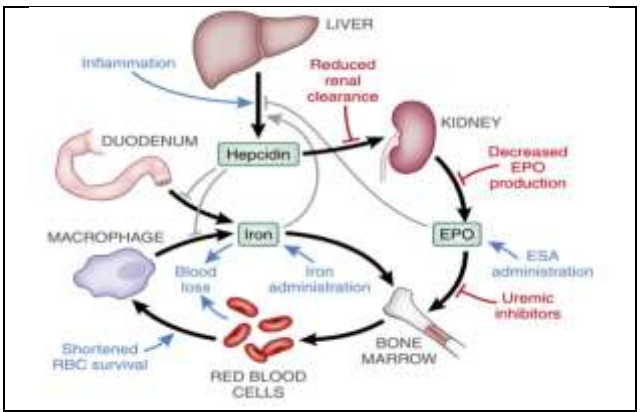

Figure 1. Schematic Representation of The Mechanisms Underlying Anaemia Of CKD

CONCLUSION

In the present study of 108 cases, done on patients of chronic kidney disease, admitted in KIMS, Hubli, majority were in the age group of 40 to 60 years. Common causes of CKD were hypertension in 55 (50.9%) cases; diabetes in 49 cases (45.4%). Most of the patients were anaemic, and it was normocytic normochromic in 88%, microcytic normochromic in 4.6%, microcytic hypochromic anaemia in 0.9%, macrocytic in 1.9% and dimorphic anaemia in 4.6% of the cases. Platelet count was<1.5 lakh cell/cumm in 48 (44.4%) of the cases. Raised ESR was found in 70.4% and decreased PCV was seen in 79.6% of the patients. Leucocytosis and raised ESR were not associated with any infection.

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