Original article

Cross sectional study of anaemia in chronic kidney disease

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Abstract:

Introduction: Chronic kidney disease encompasses a spectrum of different pathophysiological processes associated with progressive decline in glomerular filtration rate. Prevalence of CKD ranges from 0.79% to 1.4%. Kidneys disease is ranked 3rd amongst life threatening diseases in India, after cancer and heart disease. Anemia affects 60-80% of patients with renal impairment and common in both pre-dialysis and on dialysis leading to decreased exercise tolerance, reduced quality of life and additional risk factor for early death.

Materials and Methods: 50 cases of CKD were randomly selected for this cross sectional study between October 2012 to August 2014. All patients were examined and investigated thoroughly as per the proforma.

Results: The most common type of anemia was NNA with 33(66%) patients. MHA 9(18%) patients and NHA 8(16%) patients mean Hb% was 8.49±1.17 gm%. Most common symptoms were facial puffiness, 44(88%) patients easy fatiguability 39(78%) patients, pedal edema 36(72%), and decreased urine output 21(42%) patients. Most common associated diseases were hypertension 43(86%), diabetes mellitus 32(64%), ischaemic heart disease 14(28%) and dyslipidemia 7(14%). 40 patients were on dialysis and 10 patients were on medical line treatment.

Conclusion: CKD is more prevalent in adult population with male predominance in older age groups. Anaemia is the most common complication of CKD and severity of anemia increases as CKD worsens and all patients had anemia. Both MHD and medical line treatment with rEPO have beneficiary effects on Hb% levels.

Key words: Chronic kidney disease, Anemia, Hemoglobin, rEPO& Dialysis.

Introduction:

Chronic kidney disease is an important, chronic, non-communicable epidemic disease that affects world including India.[1,2]It is characterized by irreversible deterioration of renal function, which results from diminished effective functioning of renal tissue. Ensuing impairment of excretory, metabolic and endocrine functions of the kidney leads to the development of clinical syndrome of uremia.[3]

In 2000, the National Kidney Foundation (NKF) and the Dialysis Outcomes Quality Initiative (DOQI) advisory board approved the development of clinical practice guidelines to define the chronic kidney disease and to classify stages in the progression of kidney disease. The work

group developed the following operational definition of chronic kidney disease.[4]

1. Kidney damage for ≥ 3 months as defined by structural or functional abnormalities of the kidney, with or without decreased glomerular filtration rate (GFR), manifest by either *pathological abnormalities* or *markers of kidney damage*, or *abnormalities in imaging tests.*
2. GFR less than 60ml/min/1.73m^2 for ≥ 3 months with or without kidney damage.

CKD is not a static condition. It tends to progress and worsen over time to ultimately end up with kidney failure because of the progress of the disease. There are certain risk factors which influence the onset and progression of CKD and its outcomes in an adverse manner. The different morphological types of anemia in CKD are normocytic normochromic type which is the most common followed by microcytic hypochromic type and macrocytic type which is the least common.

Objective :

1. To find out the extent of anaemia in CKD.
2. To know the consequences of anaemia in CKD
3. To know the exact cause of anaemia in CKD and how this helps in definitive management of CKD.

Methodology :

50 cases of chronic kidney disease patients, both male and female, attending to J.J.M. Medical College, Davangere will be included in this study, During the period from October 2012 to August 2014. Patients were diagnosed and staged based on estimation of GFR by Cockcroft-Gault equation.

Methods of collection of data :

For the purpose of the study, the following definitions were used.

- Chronic kidney disease defined as the functional abnormality of the kidney manifested by elevated serum creatinine of >1.5 mg/dl for more than 3 months.
- Anemia in CKD defined as Hb<12 g/dl in adult males and postmenopausal females and <11 g/dl in pre menopausal females and pre pubertal persons.
- Anaemia is categorized into mild, moderate and severe with Hb% of 9-11 gm%, 7-9 gm% and <7 gm% respectively as per WHO anaemia classification.

Inclusion criteria :

- Patients with chronic kidney disease with stage I-V disease.
- Patients with end stage renal failure on replacement therapy in the form of hemodialysis and/or peritoneal dialysis and/or medical line treatment..

Exclusion criteria :

- Patients with other systemic illness without renal failure.
- Pregnancy
- Aplastic anaemia
- Known hematological malignancy causing secondary renal failure.
- Patients with end stage renal disease treated with renal

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replacement therapy in the form of renal transplantation.

- History of blood transfusion during last three months.

Data was be collected using pretested proforma meeting the objectives of the study. Purpose of the study was be carefully explained to the patients and consent was be taken. Detailed history, physical examination and necessary investigations.

Results:

Table 1: Association between Haemoglobin and Serum creatinine (N = 50)

Serum Creatinine Levels (in mg/dl)	Haemoglobin Levels (in g/dl)						Total
	Medical Management			Maintenance Haemodialysis			
	≤ 7	7-9	9-11	≤ 7	7-9	9-11	
1.5-5	0	1	8	0	2	0	11
5-10	0	0	1	6	8	10	25
10-15	0	0	0	1	11	1	13
15-25	0	0	0	1	0	0	1
Total	0	1	9	8	21	11	50

Table 2: Association between Haemoglobin and Complete Haemogram (N = 50)

Haemoglobin Levels (in g/dl)	Complete Haemogram			Total
	Microcytic Hypochromic	Normocytic Normochromic	Normocytic Hypochromic	
< 7	2	4	2	8
7-9	4	14	4	22
9-11	3	15	2	20
Total	9	33	8	50

Table 3: Association between Haemoglobin and Stage of the Kidney Disease (N = 50)

Haemoglobin Levels (in g/dl)	CKD Stage 4	CKD Stage 5	Total
< 7	0	8	8
7-9	1	21	22
9-11	9	11	20
Total	10	40	50

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Table 4: Distribution of patients according to their treatment (N = 50)

Treatment	No.	Percent
Medical	10	**20.0**
Maintenance Haemodialysis	40	**80.0**

8 patients were on rEPO + iron therapy in both groups. These patients showed modest improvement in their Hb% from baseline but none had Hb% >12 g/dL despite of therapy. The Serum creatinine level was in the range of 5-10 mg% in majority of patients in both groups, which probably has a role in maintaining adequate haemoglobin levels. 24 patients were on rEPO treatment in both groups, whose Hb<11 g/dl despite of rEPO.Remaining 18 patients were on MHD treatment alone.All patients on dialysis had repeat S.creatinine and haemoglobulin levels. The drop in serum creatinine level was sharper and ranged from 4 to 2.5 mg/dl. The increase in haemoglobin level ranged from 1.5 to 2.5 g/dL. However none hadHb% > 12 g/dL and few patients were not on regular dialysis. Patients underwent blood transfusion earlier to inclusion in the study or during the period of follow up, may also have contributed to the change in haemoglobin level.

Discussion:

CKD is characterized by elevation in Blood urea nitrogen and serum creatinine concentration with or without reduced urine output. It leads ultimately to functional disorders involving every organ system in the body including fluid, electrolytes and metabolic disturbances. In the present study, the prevalence of anaemia in 50 cases of chronic kidney disease was studied.

Table 5 : Comparison of mean age (years)

Chug et al[5]	Talwar et al[6]	Caster et al[7]	Present study
54±9	52±10	50±8	49.7±14.0

Table 6 : Comparison of gender incidence male to female

Avasthi et al[8]	Alam SM et al[9]	AltafBasha et al[10]	Present study
1.8:1	1.7:1	2.3:1	2.85:1

Table 7 : Comparison of incidence of associated disease

Associated disease	Chug et al[5]	Caster et al[7]	Talwar et al[6]	Present study
DM	24%	28%	-	64%
HTN	22%	40%	-	86%
IHD	-	-	16%	28%

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Table 8 : Comparison of incidence of anaemia

Incidence	Talwar et al[6]	Present study
Anaemia	94%	100%

Table 7 : Comparison of S.ferritin concentration and transferrin saturation

	Silverberg et al[11]	Bruce et al[12]	Present study
S.ferritin	177.07±113.8	146±173	114.89±76.85
TSAT (%)	20.05±6.4	11.3±6.1	26.29±16.6

Haemoglobin as an index of anaemia :

Haemoglobin concentration is a primary parameter with an international standard, can be measured directly without influenced by differences in technology. Thus, this accepted parameter was used as a baseline investigation as well as for follow up in this study. For repeated analysis, this investigation is financially viable also for a patient. The cut off value of the Hb level for the diagnosis of anaemia in CKD is 12 g/dl as set by the DOQI guidelines. In the present study no patients had Hb>12 g/dL, indicating that all patient were anaemic.

44% hadHb in the range, 7-9 g/dl suggestive that more patients had moderate anaemia followed by 40% had mild and 16% had severe anaemia. Hb levels decreased with increasing serum creatinine levels indicating that severity of anemia increased with the increase in the severity of CKD. The study done by Callen SR et al showed that anaemia becomes more severe as CKD progresses.[13] This is because as CKD progresses inhibition of bone marrow, deficiency of EPO, deficiency of iron and bleeding tendencies increase as a result of an increase in the circulating uremic toxins.

Microcytic hypochromic and normocytic hypochromic blood picture was seen in 34%. 16% patient had moderate anaemia with Hb% 7-9 g%. The result of iron studies available supported iron deficiency as the cause in 16% of patients.

Conclusion:

Observations made in the present study regarding anaemia prevalence, it's etiological factors, clinical and morphological pattern of anaemia and outcome of treatment are comparable to the western literature and may fills up the lacunae in the Indian literature of chronic kidney disease. The optimum management of individual patients may vary in the clinical course of the disease and individual needs.

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