

ANAEMIA AND CHRONIC KIDNEY DISEASEMohammed Umar Farooque¹, Bharat Bhushan²¹Assistant Professor, Department of Medicine, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar.²Associate Professor, Department of Medicine, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar.**ABSTRACT****BACKGROUND**

Blood haemoglobin (Hb) concentration serves as the key indicator for anaemia, because it can be measured directly.

Aim: To determine the profile of anaemia and to correlate the severity of anaemia with serum creatinine levels in pre- and post-dialysis CKD patients.

MATERIALS AND METHODS

The study was carried out over a period of 6 months. The study consisted of 40 pre- and post-dialysis CKD patients. Venous blood samples were obtained from patients before dialysis and after completion of dialysis. Hb, Hct and Red cell indices were calculated, peripheral blood smears were studied for red blood cell morphology and serum creatinine levels.

RESULTS

Of the 40 CKD patients, 20 (50%) were male and 20 (50%) were female. The age of the patients ranged from 20 - 83 years with mean age being 46.1 ± 17.54 years. The most frequent causes of CKD was hypertension 30 (75%). Normocytic and normochromic anaemia was predominant in both pre- and post-dialysis patients. In post-dialysis patients, microcytic hypochromic and macrocytic normochromic anaemia was higher than in pre-dialysis patients (20% and 7.5%, respectively). Severe anaemia is increased in post-dialysis patients, i.e. 20% in pre-dialysis it is 5%. There was a significant difference in the Hb and Hct levels between post-dialysis and pre-dialysis patients ($P < 0.001$). The prevalence of anaemia was 100% in both pre- and post-dialysis patients. The relationship between Hb and Serum creatinine levels was determined using linear regression and correlation. The correlation between Hb and SC levels was not significant in both the pre- and post-dialysis groups ($P > 0.05$).

CONCLUSION

The most frequent anaemia in chronic kidney disease patients was normocytic and normochromic type of a moderate degree. Significant correlation was not found between the severity of anaemia and serum creatinine levels in both pre- and post-dialysis group of patients.

KEYWORDS

Post-dialysis, Normocytic and Normochromic, Creatinine Levels.

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BACKGROUND

Anaemia commonly contributes to poor Quality of Life (QOL) in patients with Chronic Kidney Disease (CKD). Fortunately, among the disorders that may afflict patients with CKD, anaemia is perhaps the most responsive to treatment. Anaemia is defined in terms of low levels of Haematocrit (HCT) or Haemoglobin (Hb). It is a common sequelae of Chronic Kidney Disease (CKD) associated with significant morbidity. The cause, treatment and prognostic significance of anaemic disorders vary widely. Causes are distinguished clinically by markers of the magnitude and appropriateness

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of a marrow response to anaemia. Anaemia of renal failure begins relatively early in the development of kidney disease. As the destruction of the kidney progresses, the degree of anaemia increases. Although, there is a large degree of patient to patient variability, the Hct generally begins to fall when the plasma creatinine concentration is above 2 mg/dL and gets lower as Glomerular Filtration Rate (GFR) declines.¹⁻³

Anaemia develops early in the course of CKD and is nearly universal in patients with CKD stage.⁴ The purpose of specifying Hb level thresholds to define anaemia is to identify patients who are most likely to show pathological processes contributing to a low Hb level and who therefore are most likely to benefit from further anaemia evaluation.

A normocytic normochromic red blood cell is common complication of CKD. A microcytic and hypochromic blood picture suggests either iron deficiency or aluminium intoxication. Macrocytic anaemia is usually due to folate and B12 deficiency. Both types of anaemia can occur in CKD patients. The aim of this study was to determine the profile of anaemia and to correlate the severity of anaemia with



serum creatinine levels in pre- and post-dialysis CKD patients.

MATERIALS AND METHODS

The study was carried out over a period of 6 months (June to November 2015). The study consisted of 40 pre- and post-dialysis CKD patients.

Inclusion Criteria- Patients with documented chronic kidney disease and patients providing informed consent.

Exclusion Criteria- Patients with acute or chronic inflammatory disease, malignancy or known haematological disorder and recent severe haemorrhagic episode.

Data including age, gender and CKD causes were collected in a questionnaire. Venous blood samples were obtained from patients before dialysis and after completion of dialysis. Hb, Hct and Red cell indices were calculated using the Coulter Counter, peripheral blood smears were studied for red blood cell morphology. Serum creatinine levels were determined using the semi-automated analyser.

The 2006 National Kidney Foundation (Kidney Dialysis Outcomes Quality Initiative (KDOQI)) Guidelines for CKD anaemia (Hb level < 13.5 g/dL in males and < 12 g/dL in females) were used. In our study, the severity of anaemia was graded as mild (Hb > 10 g/dL), moderate (Hb = 7 - 10 g/dL) and severe (Hb < 7 g/dL).

All data analyses were carried out using the Statistical Package for Social Sciences (SPSS) for Windows. P-value < 0.05 was considered as statistically significant.

RESULTS

Of the 40 CKD patients, 20 (50%) were male and 20 (50%) were female. The age of the patients ranged from 20 - 83 years with mean age being 46.1 ± 17.54 years. The most frequent causes of CKD was hypertension 30 (75%) followed by a combination of hypertension and diabetes mellitus 8 (20%) and chronic glomerulonephritis 2 (5%).

Type of Anaemia	Male	Female	Total	Male	Female	Total
Normocytic Normochromic	18	17	35 (87.5%)	15	14	29 (72.5%)
Microcytic Hypochromic	0	3	3 (7.5%)	3	5	8 (20%)
Macrocytic Normochromic	2	0	2 (5%)	2	1	3 (7.5%)
Total	20 (50%)	20 (50%)	40 (100%)	20 (50%)	20 (50%)	40 (100%)

Table 1. Type of Anaemia in Pre- and Post-Dialysis Patients

Normocytic and normochromic anaemia was predominant in both pre- and post-dialysis patients. In post-dialysis patients, microcytic hypochromic and macrocytic normochromic anaemia was higher than in pre-dialysis patients (20% and 7.5%, respectively).

Severity of Anaemia	Male	Female	Total	Male	Female	Total
Mild	10	8	18 (45%)	4	0	4 (10%)
Moderate	8	12	20 (50%)	10	18	28 (70%)
Severe	2	0	2 (5%)	6	2	8 (20%)

Table 2. Severity of Anaemia in Pre- and Post-Dialysis Patients

Severe anaemia is increased in post-dialysis patients, i.e. 20% in pre-dialysis it is 5%. The Hb levels in pre-dialysis patients ranged from 5 g/dL to 12 g/dL with a mean of 9.78 ± 1.76 g/dL, whereas in post-dialysis patients the range was 4.5 g/dL to 11 g/dL with a mean of 8.1 ± 1.98 g/dL, mean of $24.6 \pm 4.41\%$. There was a significant difference in the Hb and Hct levels between post-dialysis and pre-dialysis patients ($P < 0.001$). The prevalence of anaemia was 100% in both pre- and post-dialysis patients.

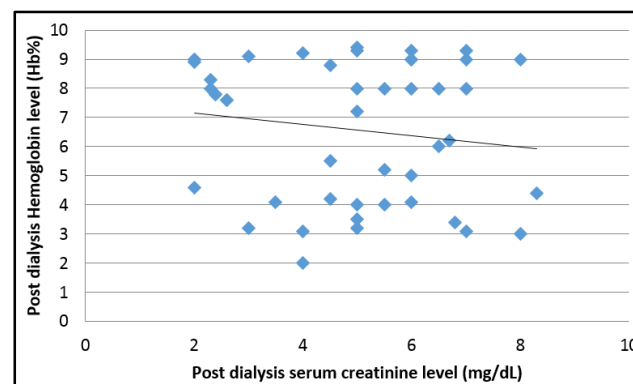


Figure 2. Correlation of Creatinine and Haemoglobin in Post-Dialysis Patients

The relationship between Hb and Serum creatinine levels was determined using linear regression and correlation. The correlation between Hb and SC levels was not significant in both the pre- and post-dialysis groups ($P > 0.05$), $r = -0.13$ and -0.16 .

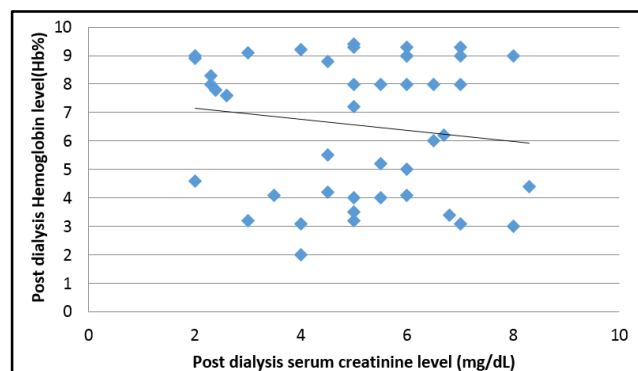


Figure 1. Correlation of Creatinine and Haemoglobin in Pre-Dialysis Patients

DISCUSSION

Anaemia is a common complication of CKD. In 30 (75%) of the patients, we found hypertension to be the most frequent cause of CKD. In other studies, diabetes mellitus was the most frequent cause of CKD followed by hypertension.^{5,6} Anaemia in CKD is evident when a patient's Creatinine Clearance (CC) is less than 30 mL/min/1.73 m, GFR is below 50 - 40 mL/min or serum creatinine is more than 3 mg/dL. If the GFR is less than 20 mL/min or the serum creatinine is more than 5, anaemia is always present and the Hb level is below 10 g/dL. In a cross-sectional study of 5,222 adult patients with CKD, mean Hb levels for an MDR eGFR of 60 or greater (CKD stages 1 and 2), 30 to 59 (CKD stage 3), 15 to 29 (CKD stage 4), and less than 15 mL/min/1.73 m², (CKD stage 5) were 12.8 ± 1.5, 12.4 ± 1.6, 12.0 ± 1.6, and 10.9 ± 1.6 g/dL, respectively. The prevalence of untreated anaemia (defined as an Hb level ± 12, 10 to 12 and ± 10 g/dL) for different CKD stages.⁷ In this study, anaemia was present in 100% of pre- and post-dialysis patients. In another study, the prevalence of anaemia was 100% in post-dialysis patients and 73.1% in pre-dialysis patients.⁸ Reza Afshar et al⁵ found anaemia in 85% of post-dialysis patients and 75% of pre-dialysis patients. The lower the GFR or EPO production, the greater the loss of haematopoietic nutrient elements. Inflammation caused by the dialytic membrane can lead to lower mean Hb and Hct levels in dialysis patients.⁹

Our study showed significant patients, which is similar to the study done by Seuga et al.¹⁰

The degree of anaemia increases as progressive destruction of kidney tissue occurs. This study like others revealed presence of a predominantly moderate degree of anaemia in pre- and post-dialysis patients. Severe anaemia was present in 20% of post-dialysis patients and 5% of pre-dialysis patients. The most frequent morphological feature of anaemia was normocytic and normochromic type followed by microcytic and hypochromic anaemia. This was similar to the findings in other studies.^{11,12} Microcytic hypochromic anaemia has different causes, but the most common is iron deficiency, particularly due to a decreased iron intake or an increase in iron loss.¹³ Macrocytosis in post-dialysis patients was higher than in pre-dialysis patients. The possible causes are loss of water soluble B12 and folate during haemodialysis. In progressive renal insufficiency, the degree of anaemia is generally proportional to the severity of azotaemia. In one study, the Hb concentration was positively correlated with the estimated CC ($P < 0.001$). Another study revealed a negative correlation between Hb and serum creatinine levels.^{7,9} There was no significant correlation between the severity of anaemia and creatinine levels in our study.

CONCLUSION

Our study showed that the most common type of anaemia in CKD patients is normochromic and normocytic type. A moderate degree of anaemia is the most frequent finding in pre- and post-dialysis patients. There was a significant difference between Hb and Hct levels in pre- and post-

dialysis patients. There was no significant correlation between Hb and serum creatinine levels.

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