

TO STUDY ETIOLOGICAL PROFILE OF ANAEMIA IN PATIENT OF CHRONIC KIDNEY DISEASE IN TERTIARY CARE CENTRE OF UTTARAKHAND

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Abstract

Anemia is the most common multifactorial complications of CKD which is caused by decreased EPO (erythropoietin) hormone production. The study was carried out to know the etiological profile of anemia in CKD patients, the burden of disease on patient and describe severity of anemia. The study was conducted on 100 patients from OPD and IPD suffering from CKD. Patients with anaemia in Chronic kidney disease, there is male predominance. Hypertension and diabetes are commonest aetiology of chronic kidney disease. The most common pattern of anaemia observed our study in CKD patients is anaemia of chronic disease. Iron deficiency was seen in majority of the patients (59%) in chronic kidney disease. Serum vitamin B12 deficiency was seen in very low percentage of patients in chronic kidney disease. The commonest morphological profile of anaemia on General blood picture was Normocytic normochromic. The severity of anaemia increases as the course of chronic kidney disease progresses severity if anaemia correlated with severity of ckd. Haemoglobin level decreases and severity of anaemia increases with the decline of Serum Albumin decreases. Severe anaemia was associated with prolonged duration of hospital stay and increased burden of symptoms.

INTRODUCTION

Anemia is one of the most common complications of CKD (chronic kidney disease) and is multifactorial. Main cause is decreased EPO (erythropoietin) hormone production and occur early in CKD stage 3. Etiology other than this are absolute iron deficiency, functional iron deficiency, blood loss which may be occult or overt, uremic inhibitors, decreased half-life of erythrocytes, decreased levels of Vitamin B12 or folic acid or both, chronic inflammation and condition involving more of these together.^[1,2] Anemia in patients of CKD increases the disease burden leading to symptoms aggravation, prolonged hospital stays for frequent blood transfusions, EPO replacement and management of infections. This is important in developing countries due to economic inference of a higher cost of EPO and high prevalence of anemia due to nutritional deficiency.^[3] The main cause of CKD identified world-wide are Hypertension and Diabetes and is more common in age group of 65 year or above. The study was carried out to know the etiological profile of anemia in CKD patients, the burden of disease on patient and describe severity of anemia.

MATERIALS AND METHODS

This prospective cross-sectional study was done in the Department of Internal Medicine and Nephrology in Shri Guru Ram Rai Institute of Medical & Health Sciences and SMIH (Shri Mahant Indiresch Hospital), Dehradun and included 100 subjects with CKD from OPD and IPD. Patients of chronic kidney disease was classified into stages based on National Kidney Foundation [KDOQI]. Patient of CKD stage 3, 4, 5 with HB < 12 were included in the study and classified into various types. History regarding diabetes mellitus, hypertension and any associated chronic illness was recorded after taking an informed consent from the patients. Various blood tests were performed including CRP, Iron profile, Vit B12, folic acid, renal functional tests, thyroid, lipid profile, USG abdomen and liver function.

Inclusion Criteria

CKD Stage 3 and above, Patient age >18 years and Anemia (HB<12 g/dl).

Exclusion Criteria

Age < 18 year, Pregnancy, Other conditions like: Blood disorders like leukemia, multiple myeloma,

Hemolytic anemia, Aplastic anemia and Patient who refused written consent.

Statistical Analysis

The data thus obtained was analysed by appropriate statistical tests. Quantitative data was expressed by mean and standard deviation and difference of means was observed by t test and qualitative data was expressed as percentages and difference between proportions was observed using appropriate test. 95% confidence level was used to quantify at risk values and factors. Significant factors in study were considered using multivariate logistic regression $p < 0.05$ was considered significant. To calculate the significance of results we used- Pearsons correlation, Anova test and Z- Square test.

RESULTS

The present was conducted on 100 subjects with CKD from OPD and IPD in the Department of Internal Medicine and Nephrology. The results were analysed and observed that mean age among all participants was 52.12 years, mean duration of illness was 3.16 years, mean HB was 8.13 gm/dl, mean urea 138.82, mean creatinine 7.89, mean serum iron was 48.74, mean serum vitamin B12 was 635.87 and mean albumin was 3.10. About 22% of the subjects were in the age group <40years, 47%

subjects fell under 41-60 years of age and 31% were in the age group of > 60 years. In the present study, males (65%) outnumbered the females (35%). It was found that 25% subject had severe anemia, 47% had moderate anemia while 28% were having mild anemia. Microcytic anemia was present in 21% cases, normocytic normochromic anemia in 74% cases and only 5% had macrocytic anemia. When analysed the on the basis of dialysis it was observed that 76% subject were on dialysis while 24% subjects were normal. Present study showed that 4% of subjects were in CKD stage-3, 47% of subjects were in CKD stage-4, 49% of subjects were in CKD stage-5. About 59% subjects had low serum iron and 41% had normal serum iron. In our study population, 67% had high ferritin levels which indicate chronic inflammation, 45% of study population had low TSAT which indicate Iron deficiency, 46% had normal while 9% had high TSAT (TSAT of >50% indicate iron overload). Low vitamin B 12 levels were in found in 7% of population which is due to reduced excretion due to renal failure. Upon GBP examination Normocytic normochromic profile was seen in 78% of study population, microcytic hypochromic was seen in 18% of population and macrocytic was seen in 4% of study population.

Table 1: Correlation between Haemoglobin and Albumin.

		S. Albumin
HB	Pearson Correlation	0.203
	p-value	0.043
	N	100

[Table 1] showed correlation between Haemoglobin and Albumin which was found to be positive and signifies that with decrease in serum albumin (which is a marker of nutrition) HB decreases and severity of anemia increases and found to be significant ($p < 0.043$).

Table 2: Distribution of mean HB levels in different stages CKD among study population

HB	N	Mean	Std. Deviation	Std. Error	F	p-value
Stage 3	28	9.71	1.082	.204	62.312	0.001
Stage 4	35	8.09	.943	.159		
Stage 5	37	6.97	.935	.154		
Total	100	8.13	1.467	.147		

[Table 2] showed that the decline of mean HB with increasing stage of CKD is found to be significant at P Value of 0.001.

Table 3: Description of duration of hospital stay among, mild, moderate and severe category of anemia.

	Severe (n=25)	Moderate (n=47)	Mild (n=28)	F	p-value
	Mean	Mean	Mean		
No. of Days of Hospitalisation	27.76	25.00	23.14	4.434	0.014

[Table 3] shows that with increasing severity of anemia duration of hospital stay was also increased. This result was found to be significant at P value of 0.014.

DISCUSSION

CKD prevalence in Indian population is estimated between 0.78 % to 0.87%. Renal failure produces

changes which dysregulates homeostasis for example Anemia which is a common complication of CKD and severity increases as kidney damage increases further. The most common cause of anemia in CKD is deficient erythropoietin production and is associated of increased hospitalisations and poor quality of life.^[1,2] We aimed for etiological profile of anemia in patient of CKD from Stage 3 to 5, finding correlation between

various parameters and impact of anemia on patients life in our hospital.

The study enrolled 100 CKD patients of stage 3 to 5. The mean age of patients was 52.12 \pm 13.58 years. Our result is similar to Neha Sundhir et al study, in this population of 100 CKD patients mean age of study participant was 52.4 years.^[4] While there are some studies with slight variation including, Sanjay vikrant et al study in which mean age was 55.4 years,^[5] Sawjib borphukn et al study in which mean age was 58.62 years,^[6] Ghalaut et al study in which mean age was 66.07 years.^[7] The variation may be because of geographical variation. In our study 65% were male and 35% were female (1.8:1) with male predominance. And a similar study described by Sawjib borphukn et al of 110 cases 64.5% were males,^[6] 35.5% were female (1.8:1). Ghalaut et al study 66% were males, 34% females (ratio 1.9:1).^[7] In our study patients with Hypertension were 63% which is similar to study done by neha sundhir et al in which 63% patients were Hypertensive.^[4] Study by Saeed Erfanpoor et al described that Hypertension is an independent risk factor for CKD.^[8]

In our study 57% were diabetic, which is different from results obtained in study by neha sundhir et al in which 34% patients were diabetic.^[4] Study by Saeed Erfanpoor et al described that Diabetes is an independent risk factor for CKD.^[8] The mean HB of patient in our study was 8.13 gm/dl \pm 1.47. A similar study was done by Neha sundhir et al Mean Hb was 8.39 \pm 1.71 g/dl.^[4] Vikrant et al mean Hb was 9.2 \pm 2.2,^[5] Ghalaut et al mean Hb was 7.88 \pm 2.17.^[7] Sawjib borphukn et al mean Hb was 9.07, Talwar et al study mean Hb was 7.1,^[9] Singh et al mean Hb was 6.9.^[10] This variation in mean Hb may be due to variation in treatment of different study population and dietary habits.

In our study we found the most common etiological profile of anemia on GBP was Normocytic normochromic which was 78%, Microcytic 18 %, macrocytic 4 %. The larger proportion of normocytic normochromic anemia is because of deficient erythropoietin deficiency, Iron deficiency, chronic inflammation and increased levels of hepcidin which leads to defective iron utilization.^[11] Neha sundhir et al profile of anemia on GBP was Normocytic normochromic 76%, microcytic hypochromic 22%. Ghalaut et al normocytic normochromic anaemia was seen in 53%, microcytic hypochromic was seen in 30% and macrocytic seen in 17%. Sawjib borphukn et al normocytic normochromic anaemia was seen in 53.6%, microcytic hypochromic was seen in 19.1%. In sanjay vikrant et al study of 584 patient normocytic normochromic in 65.4%, microcytic in 14.2%, macrocytic in 20.4%.^[12,13] The variation in results of our studies with these studies are mainly be due to different study population, variable treatment and different dietary habits among study population.

In our study we found that there was progressive decline in mean HB levels with increasing severity of CKD (stage 3,4,5) that is 8.45 ,7.93, 6.55 gm/dl respectively. This may be due to the fact that with progressive renal failure there is more erythropoietin hormone deficiency, increased loss of iron in patients receiving haemodialysis per year, blood trapping in dialysis apparatus.^[9,14,15] In few studies similar trend of fall in Hb with advancing stage of CKD was observed though there was variation in mean Hb levels in different studies. In sanjay vikrant et al study of 584 patients there was progressive decline of Hb that is 10, 9.4, 8.4 gm/dl in stage 3 ,4 ,5 respectively.^[5] In Sawjib borphukn et al with CKD progression from 3 to 5 the fall in HB was 10, 9.4, 8.4 respectively. In Khanan et al the fall in Hb was 10.8, 9.1 ,7.4.^[6]

In our study, we found that the patient in category of mild anemia were 28%, moderate anemia was 47% and severe anemia were 25%.^[15,16] Ghalaut et al study found 25% patient with mild anemia, 30% with moderate, 45% with severe anemia. The variation in result may be due to various dietary pattern and variable treatment at various population study.

In our study low serum iron was in 59% patient. Tabea Giesel et al study serum iron was low in 65% patient. What happens in CKD is the level of circulating protein-Hepcidin is increased due to inflammation, which leads to internalization of ferroportin (responsible for iron absorption) into the cells. The result of which is reduced iron absorption.^[17,18] The variation in result may be due to various dietary pattern and variable treatment in various population studies.

In our study absolute iron deficiency were in 17% patients, functional iron deficiency was in 43% patients. Sanjay Vikrant et al study,^[5] percentage of patients having functional iron deficiency were 52.6 and percentage of patients having absolute iron deficiency were 27.7. Sawjib et al study,^[6] found percentage of patients having functional iron deficiency were 78.2 and percentage of patients having absolute iron deficiency were 16.4. Iyawe Io et al study found percentage of patients having functional iron deficiency were 85.7 and percentage of patients having absolute iron deficiency were 14.3. The variation in result may be due to various dietary pattern and variable treatment at various population study.

In our study low vit b12 was in 7%. The chances of vit B12 deficiency are low in patients of CKD because of its reduced clearance from kidney due to renal failure. The results are not much different from that of Tabea Giesel et al study of 405 patient. Vit B12 was low in 5.9%. The variation in result may be due to various dietary pattern and variable treatment at various population study.

In the study of 100 ckd patients, the patient with complain of shortness of breath was 84%. which indicated the burden of anemia on patients morbidity. Ghalaut et al study of 100 CKD patients

,40% had shortness of breath. Putta Rajasekar et al study, 50 patient were studied out of them, out of them 58% patient had shortness of breath. The variation could be due variation in severity of anemia in different study population.

In our study we found that the mean serum albumin was 3.10 g/dl and the level of albumin decreases as Hb decreases or severity of anemia increases. Since low level of Albumin is indicator of poor nutrition. We applied Pearson correlation between Hb and albumin which was found to be positively correlated and statistically significant with P value of 0.043.while Ronit Katz et al described a study in which serum albumin <3.80 g/dl was associated with kidney function decline.

In our study duration of hospital stay was more in severe anaemia as compared to moderate and mild anaemia. The prolong hospitalization is required because of burden of anaemia which may require repeated blood transfusions. We use Anova test and found P value of 0.014 which is statistically significant. In a study by Eirini peleka et al stated that more severe anaemia was associated with prolonged hospitalization.

In our study we found that patients on haemodialysis were more anaemic than those not receiving haemodialysis and this was found to be significant at P value of 0.087. During dialysis due to retention of blood in dialysis circuit (dialyzer and tubings) patient may lose iron and can contribute to more iron deficiency which can lead to exacerbation of anemia. A similar study by Neha sundhir et al also reported more severely anaemic patients in group receiving dialysis than those in non-dialysis group. Sawjib Borphukan et al, described pre-dialysis CKD patients more in moderate category of anemia.

In our study we found that severely anaemic and moderately anaemic patients were more Hypertensive as compared to patients with mild anemia with P value of 0.032 which is significant. We could not found any study correlating Hypertension and Anemia. In our study we tried to see correlation between Haemoglobin and eGFR but could not found any correlation.

CONCLUSION

Patients with anaemia in Chronic kidney disease, there is male predominance. Hypertension and diabetes are commonest aetiology of chronic kidney disease. The most common pattern of anaemia observed our study in CKD patients is anaemia of

chronic disease. Iron deficiency was seen in majority of the patients (59%) in chronic kidney disease. Serum vitamin B12 deficiency was seen in very low percentage of patients in chronic kidney disease. The commonest morphological profile of anaemia on General blood picture was Normocytic normochromic. The severity of anaemia increases as the course of chronic kidney disease progresses severity if anaemia correlated with severity of ckd. Haemoglobin level decreases and severity of anaemia increases with the decline of Serum Albumin decreases. Severe anaemia was associated with prolonged duration of hospital stay and increased burden of symptoms.

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