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EVALUATION OF ANEMIA IN CHRONIC RENAL FAILURE PATIENTS

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ABSTRACT

The aim of the study was to find the frequency of anaemia in different stages of chronic renal failure, and to evaluate the therapeutic outcome. A cross sectional study was conducted in 118 CKD patients who underwent haemodialysis in a multi-specialty hospital for a period of 6 months from January to June 2018. All patient demographics, laboratory values, co- morbidities and treatment plan were collected and the data was compiled and was subjected to statistical analysis. Male patients (57.62%) were slightly more compared to female patients (42.37%) in developing kidney disorders and majority of the patients belonged to the age group of 60 to 70 years (46.60%). Majority were in stage V CKD (80.50%). Anaemia was present in all, 88 patients (74.57%) had haemoglobin between 7g/dl - 11g/dl. It was also observed that the prevalence of anaemia increased from stage 3(9.32%) to stage 5(80.50). Drugs used for management of anaemia were ESA, Iron Sucrose or their combination. Most of them had haemoglobin between7-11 and maximum used dose in this group was between 6000U - 8000U. Prescribed doses of EPO were calculated based on body weight, prescribed EPO dose (29665U) was significantly less than the recommended dose (37771U) suggesting the treatment is not in accordance with the KDIGO guideline. Prevalence of anaemia in CKD increases from stage 3 to 5. Adherence to the guidelines will improve anaemia in HD individuals.

KEYWORDS

Anaemia, CKD, EPO, Haemodialysis and KDIGO.

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INTRODUCTION

Renal failure is the condition in which the kidneys loss the ability to remove waste and balance fluids, which leads to the build-up of toxic nitrogenous waste materials[1]. One among the major complication of chronic kidney disease (CKD) is anaemia, which is associated with increased morbidity and mortality. A major cause of

anaemia of chronic kidney disease (CKD) is a reduction in erythropoietin production due to kidney damage[2]. Anaemia begins to manifest when GFR falls below 60 ml/min/1.73 m^2. [3]Anaemia is defined as the condition in which both the quality and quantity of circulating red blood cells are below the normal range. As CKD progresses anaemia gets worsened[2].

Studies showed that the global prevalence of anaemia in patients with CKD is about 15.2%[4]. Recommended target of haemoglobin in haemodialysis (HD) patients is 11-12g/dL. This should not exceed the target due to risk of hypertension, stroke and vascular access thrombosis. Anaemia management is a potentially high risk challenge for both patients and health care professionals where inappropriate treatment leads to an increase in mortality and morbidity. Therefore, controlling haemoglobin level is one of the most important factors in management of HD patients.

Objectives

The aim of the study is to manage anaemia in chronic renal failure patients in a tertiary care hospital and to evaluate the frequency of anaemia in different stages of chronic renal failure, association of other biochemical parameters with anaemia in chronic renal failure patients and to evaluated the therapeutic outcome of management of anaemia in chronic renal failure patients.

PATIENTS AND METHODS

Target population

A prospective, observational study was conducted for a period of six months at a multi speciality hospital, Chennai. An individual who was above the age of 18 with Chronic Kidney Disease and was on Haemodialysis and also having potentially low haemoglobin values with CKD was included for the study. 120 patients were selected for the research work to be conducted from the patients who visited the dialysis unit. Data collection included demographic details, patient's Hb, iron levels, TIBC, ferritin, TSAT, serum creatinine and other relevant data was collected and follow up was done. Erythrocyte Stimulating Agents was given to patients with haemoglobin less than 11g/dl and the intravenous iron supplements to subjects who had anaemia in CKD. We also evaluated the use of ESAs in CKD stage 3 to stage 5 patients having haemoglobin less than 10g/dl, and the use of intravenous iron agents in patients with TSAT <20.0% or ferritin <100ng/ml. The response to the drug therapy was monitored by comparing with the baseline values. EPOs dose was between 2000U-10000U. It was given once, twice, or thrice weekly based on the haemoglobin values of the individual patients. Iron sucrose in parenteral form was added along with EPO therapy. It was given at doses of 100mcg/200 mcg once or twice a month based on Iron and Ferritin values of individual patients. However the haemoglobin value was allowed to increase only till 11.0g/dl in patients. Patients were categorized based on their CKD stages and haemoglobin distribution then stage wise categorization of anaemic therapy was done. The biochemical parameters were analyzed on monthly basis using student T-test. Almost all the patients were kept on renal diet, protein was avoided and also had fluid restrictions.

Statistical Analysis

Statistical analysis of the data was done by Graph Pad Prism software. Percentage frequency was done with 95% confidence interval. Statistical significance was determined at a p-value lower than 0.05 and Student T-Test was done to compare the baseline and the final values. All other data were analyzed descriptively and expressed in percentages.

Ethical permission

The research was approved by the ethical committee of the hospital.

RESULTS

A total of 120 patients were selected for the study, 2 were dropped out due to incomplete data. Amongst 118 patients, 58% were male and 42% were female indicating male are prone to develop anaemia in CKD. Age distribution indicated that majority of the patent population was between the age group 60 to 70 and had a normal body mass index. Majority of them were non-smokers and non-alcoholic. Diabetes mellitus and Hypertension coexisted in most cases as co morbidity (31%) followed by hypertension (19%).

The study results indicated that most of them were in Stage 5 CKD and were on dialysis (81%). Mean haemoglobin value 7-11 g/dl, (75%) was found in majority of the patient population as per recommended by KDOQI guideline for the treatment of anaemia in CKD, similar outcome was observed in different stages of CKD, showing the maximum number of patents had a Haemoglobin value between 7 to 11gm/dl. There was a progressive improvement in the haemoglobin values after treatment in all the groups and in different stages of CKD, and the Hb values were maintained not to exceed beyond 11gm/dl as per KDIGO guidelines (Figure No.1).

Comparison was made with the first and the last month in the haemoglobin values after the initiation of treatment for anaemia, a progressive improvement in the values of haemoglobin was observed in all stages of CKD (Table No.1). Significant improvement in the iron values and TSAT values was observed after treatment.

Treatment of anaemia was based on the levels of haemoglobin, the study population received Erythropoietin stimulating agent or a combination of ESA and iron sucrose as the treatment. Majority of ESA was erythropoietin (EPO) and a smaller percentage received darbepoetin and combinations of EPO and darbepoetin. The drug usage pattern of EPO based on Hb values indicated that population with the Hb value between 7 to 11 used 6000 to 8000 units of EPO at the maximum level (Figure No.2).

The recommended dose of EPO was based on the body weight, the results of the study shows that the prescribed EPO dose was significantly less than the recommended dose, indicating the treatment was not in accordance with the KDIGO guidelines (Figure No.3). By comparing the effect of EPO on the haemoglobin value, 39% of the population did not achieve the targeted haemoglobin level, this indicates that adherence to the recommended dose according to the KDIGO guidelines is essential (Table No.2), similarly the effect of EPO on iron levels also showed 39% of the population did not achieve the targeted range of iron values (Table No.3). Only a smaller population of 12% did not reach the targeted TSAT values but more than 89% had a targeted TSAT value which showed significance in the treatment given (Table No.4). The final results indicate that the prescribed dose is less than the recommended dose of EPO, which might lead to under treatment of anaemia in CKD (Table No.5).

DISCUSSION

Gender wise distribution

Poudel B *et al*, reported prevalence of anaemia was significantly greater in male than in female patients[5,6], in our study, more than half of the selected population (57.62%) was male who were diagnosed to have anaemia of CKD.

Co-morbid conditions

Sathyan S *et al*, in his study on Prevalence of anaemia and cardiovascular diseases in chronic kidney disease patients reported that correlations between CKD with diabetes and hypertension were statistically significant. He reported that the major co-morbidity noted was hypertension followed by Diabetes Mellitus[7]. The present study indicates CKD is more common in participants with both DM and Hypertension as co-morbid condition.

Age wise distribution

Finkelstein *et al*, reported in their study that people over 64 years were at a high risk of developing anaemia of CKD due to compromised body functions and presence of other co-morbid conditions which can be attributable to various factors associated with the development of anaemia in CKD, such as erythropoietin insufficiency, iron and vitamin deficiency, malnutrition, inflammation, platelet dysfunction, reduced red blood cell survival, and haemolysis As per the study we carried out, we observed more number of participants between the ages of 61-70 years (46.60%)[8,9].

Mean Hb

George S *et al*, in his study classified the participants into 3 major groups based on haemoglobin values as mild anaemic (>11mg/dl), moderately anaemic (between 7g/dl and 11g/dl) and severe anaemic (<9mg/dl) and concluded that more participants belonged to group with mean Hb between 7 to 11mg/dl. In this study also similar result was observed with 74.57% participants in category of moderate anaemic[10].

Stage wise mean Hb

Sathyan S *et al*, stated that the prevalence of anaemia increased from stage 3 to stage 5. In our study also similar prevalence rate in anaemia was noticed[7].

Use of ESA

Stack G *et al*, has stated that Epoetin is more effective when compared to other ESA. In this study also more than 80% of participants are on drug epoetin prescribed based on their body weight and age[11,12].

Pattern of usage of epoetin based on haemoglobin values[9]

Sang R *et al*, from his study concluded that the ESA treatment of anaemia was not enough based on the current guidelines. The recent KDIGO guidelines suggested physicians to make a decision when to initiate ESAs considering the risk and benefit in dialysis CKD patients with haemoglobin less than 10.0 g/dl[5,13]. In his study he also mentioned that in CKD stage 4-5 patients haemoglobin can be maintained up to 11.0g/dl. Akel M *et al*, also concluded that the increase in EPO dosage is not in a linear pattern to achieve target haemoglobin concentration, as observed in a similar study done in Saudi Arabia evaluating anaemia management in HD patients.

As shown in this study, dose adjustment of EPO depending on haemoglobin level was not adequately done[4]. In our study most commonly use EPO dose was 4000U that was purely based on the individual weight of patient and it did not showed a linear pattern.

Comparison between prescribed and recommended EPO dose

Akel M *et al*, from his study concluded that the prescribed dose of erythropoietin was significantly less than the recommended EPO dose that is calculated based on the individual weights of the patients[14]. In our study also prescribed EPO dose was less than the recommended EPO dose.

Table No.1: Comparison between the first and last month haemoglobin values

S.No	Haemoglobin value	Stage 3		Stage 4		Stage 5	
		Baseline	Final	Baseline	Final	Baseline	Final
1	<7	-	-	-	-	7	4
2	7 to 11	9	6	7	8	50	46
3	>11	2	3	5	4	15	22

Table No.2: Effect of EPO therapy on haemoglobin values

S.No		Targeted	Not Targeted	P value
1	Mean	11.33	8.57	<0.0001
2	Standard deviation	1.14	0.95	
3	Number of patients	72 (61%)	46(39%)	

Table No.3: Effect of EPO therapy on iron values

S.No		Targeted	Not Targeted	P value
1	Mean	85.19	41.23	<0.0001
2	Standard deviation	23.33	11.76	
3	Number of patients	72(61%)	46(39%)	

Table No.4: Effect of EPO therapy on TSAT values

S.No		Targeted	Not Targeted	P value
1	Mean	36.58	10.91	<0.0001
2	Standard deviation	18.36	2.52	
3	Number of patients	104(89%)	14(11%)	

Table No.5: Comparison between Recommended and Prescribed dose of EPO

S.No	Table analysed	Paired T test data
1	Column B	Recommended dose
2	v/s	v/s
3	Column A	Prescribed dose
4	P value	0.0454

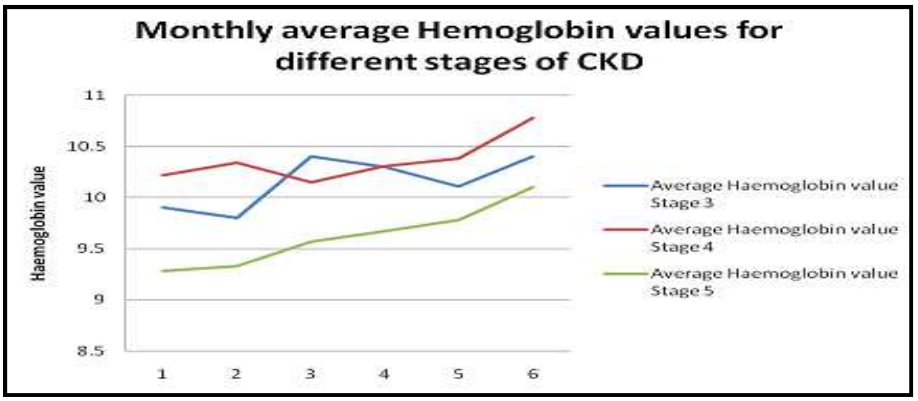

Figure No.1: Monthly Average Hemoglobin values for different stages of CKD

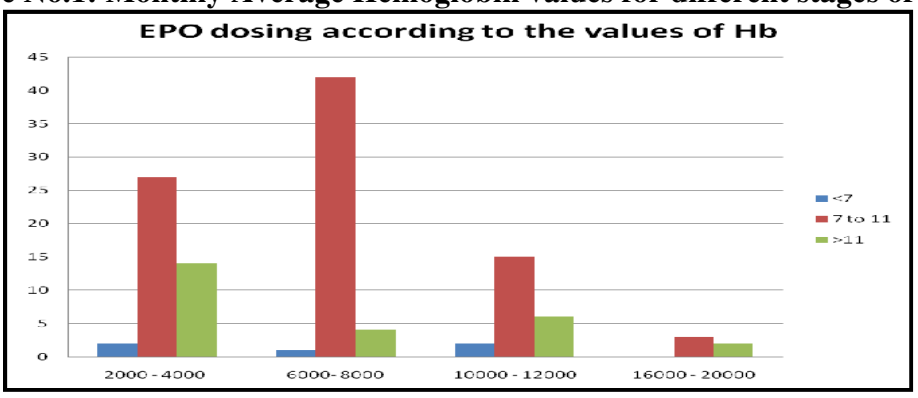

Figure No.2: EPO dosing according to the values of Hb

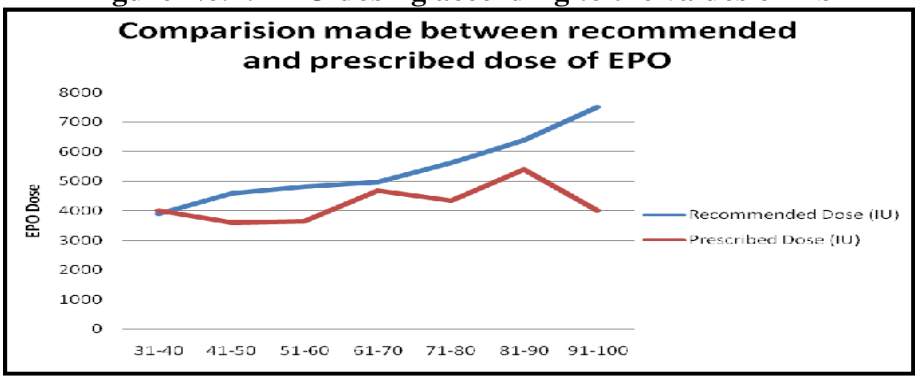

Figure No.3: Comparison made between recommended and prescribed dose of EPO

CONCLUSION

The prevalence of CKD in India is escalating and is being presumed that CKD represents a major public health problem in India. There is a high prevalence of anaemia in CKD patients. Anaemia is twice as prevalent in people with CKD as in the general population. From our study it was concluded that mainly people of age greater than 60 years were more prone to develop anaemia of CKD as compared to other population. Mainly the haemoglobin values of the patients presented with the condition were between 7g/dl to 11g/dl for which Erythropoietin Stimulating Agents was prescribed along with or without Iron supplements to maintain the haemoglobin levels based on the individual patient conditions. From the study it is concluded that the doses of EPO prescribed for the participants are significantly less than the recommended doses as per the KDIGO guidelines. Proper Adherence to the KDIGO recommendations and management with proper compliance improves anaemia in HD individuals. Moreover, ineffective treatment of anaemia enhances risk of morbidity. Lack of patient compliance to the prescribed regimens highlights the need for involvement of clinical pharmacist in HD centre for counseling, monitoring and intervening.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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