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Appropriateness and Efficacy of the Use of Erythropoietin in Hemodialysis Patients in an Eastern Indian population

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ABSTRACT

This was a prospective observational study including inpatients and outpatients undergoing hemodialysis in Vision Care Hospital (AMRI Group of Hospitals), Kolkata. Data was collected from 50 hemodialysis patients, with approximately equal ratio (14:11) of male and female patients, by personal interviews and from dialysis records and patient files. Analysis was done from data recorded systematically in the data collection form. 64% patients had received dialysis for less than or 1 year and most of them received dialysis twice weekly. 86% patients were treated with EPO. 50% patients had hemoglobin (Hb) level between 8-10 g/dl whereas 20% had 11g/dl. 73% of the study population with C-reactive protein (CRP) value less than 6, i.e., without inflammation, had hemoglobin level between 8 to10. 43% of the study population with optimal parathyroid hormone (PTH) value, i.e., between 150 to 300, had hemoglobin level between 8 to 10 and only 14% had Hb level>11. 55% of the study population with hyperthyroidism (<5mIU/L) had hemoglobin level between 8 to 10, whereas no patient had hemoglobin level above 11. 64% of the study population with hypothyroidism (>5mIU/L) had hemoglobin level between 8 to 10, whereas about 10% had hemoglobin level more than 11. 80% of the study population with ferritin value>200 had hemoglobin level between 8 to 10. Only a small percentage of the patients could maintain haemoglobin level as per the international (Dialysis Outcomes Quality Initiative, DOQI) recommendations. Patients with adequate iron profile show more effective results with EPO and better hemoglobin level. Patients with hyperthyroidism and secondary hyperparathyroidism could not maintain hemoglobin level despite use of EPO. Patients with chronic inflammation showed some refractoriness to EPO. Most patients could not increase the dose of EPO, as would have been ideal, due to financial

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constraints, as EPO is very expensive. Other ancillary tests could not be performed to maximize the benefit of EPO, again due to financial constraints.

Key words: Efficacy, erythropoietin, eastern India

1. INTRODUCTION

Erythropoietin, or EPO, is a glycoprotein hormone that controls erythropoiesis, or red blood cell production. Human EPO has a molecular weight of 34 kDa. It is produced by interstitial fibroblasts in the kidney in close association with peritubular capillary and tubular epithelial cells and in perisinusoidal cells in the liver. While liver production predominates in the fetal and perinatal period, renal production is predominant during adulthood. EPO plays an important role in the brain's response to neuronal injury and is also involved in the wound healing process. EPO is highly glycosylated (40% of total molecular weight), with half-life in blood for around five hours. Additional glycosylation or other alterations of EPO via recombinant technology have led to the increase of EPO's stability in blood (thus requiring less frequent injections). EPO binds to the erythropoietin receptor on the red cell progenitor surface and activates a JAK2 signaling cascade. Erythropoietin receptor expression is found in a number of tissues, such as bone marrow and peripheral/central nervous tissue. In the bloodstream, red cells themselves do not express erythropoietin receptor, so cannot respond to EPO. However, indirect dependence of red cell longevity in the blood on plasma erythropoietin levels has been reported, a process termed neocytolysis.

A decreased level of erythropoietin is found in patients with Chronic Kidney Disease or End Stage Renal Disease. As a result the hemoglobin level in their body is decreased and they become anemic. So externally EPO is given to them to retain the hemoglobin level. Recombinant human erythropoietin (rHuEPO) has revolutionized the treatment of anemia of chronic renal failure. rHuEPO has been shown to increase survival, decrease hospitalizations, improve brain and cognitive function, and improve quality of life for renal patients. However, additional work is needed in better defining the sites of production of endogenous EPO as well as the nature and control of the oxygen sensor(s) in the kidney; predicting and overcoming resistance; avoiding iron deficiency; determining the appropriate target hemoglobin; increasing the use strategies such as subcutaneous administration to increase efficiency; and devising a more rational payment scheme. In medicine, hemodialysis is a method that is used to achieve the extracorporeal removal of waste products such as creatinine and urea and free water from the blood when the kidneys are in a state of renal failure. Hemodialysis utilizes counter current flow, where the dialysate is flowing in the opposite direction to blood flow in the extracorporeal circuit, thus maintaining the concentration gradient across the membrane at a maximum and increasing the efficiency of the dialysis. Before beginning EPO treatment in hemodialysis patients, it is essential to evaluate anemia (Hb < 11g/dl) by the following measurements:

-Hb concentration.
-Red blood cell indices (MCV, MCH, MCHC).
-Iron stores and availability.
-C-reactive protein (CRP).

The upper limit is established individually on a clinical basis. It is advisable to maintain and not exceed 12 g/dl for patients with cardiovascular disease, diabetes, and graft access. EPO is an expensive molecule and its starting dose is about Rs. 6000-12000 per month. Its efficacy depends on many variables which again involves blood tests at regular intervals and titration of the dose of EPO to achieve therapeutic level and deliver optimal results. So the purpose of this study is to observe whether this expensive medication is utilized appropriately to deliver optimal outcome in patients with CKD in hemodialysis.

2. MATERIALS AND METHODS

This prospective observational study including inpatients and outpatients undergoing hemodialysis was carried out in the Dialysis unit of Vision Care Hospital (AMRI Group of Hospitals, Kolkata. 50 patients were studied during the study period commencing from June 2013 to January 2014. All patients on hemodialysis in Vision Care Hospital were included in the study and patients who were not on haemodialysis but receiving erythropoietin, were excluded. Due to the observational nature of the study, formal consent form was waived by the Ethics Committee.

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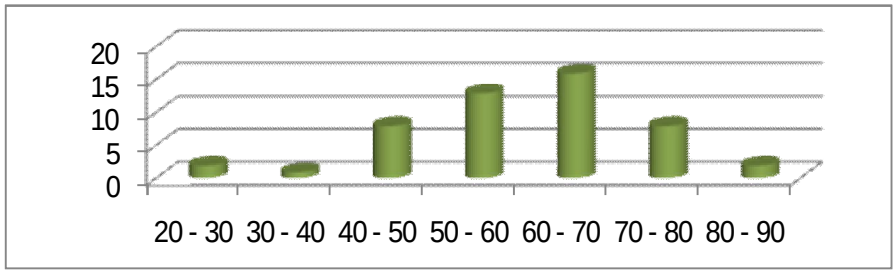

Figure 1

Age Wise Classification of Study Population

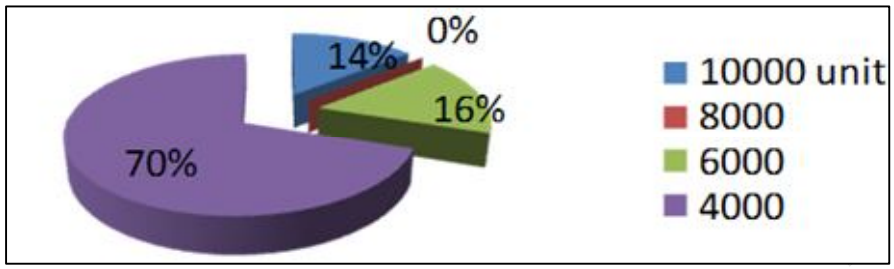

Figure 2

Graphical representation of study population according to dose of EPO

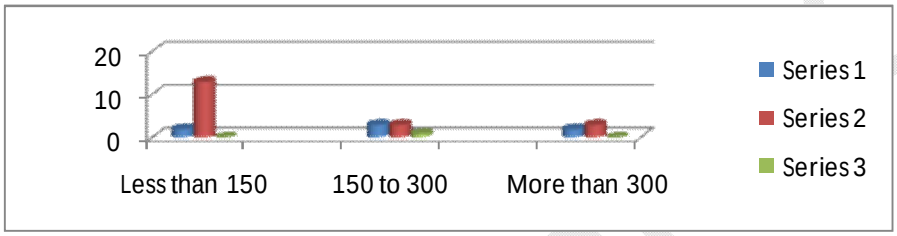

Figure 3

Classification of Study Population according to Hemoglobin Level in Patients with Normal and Abnormal PTH Value

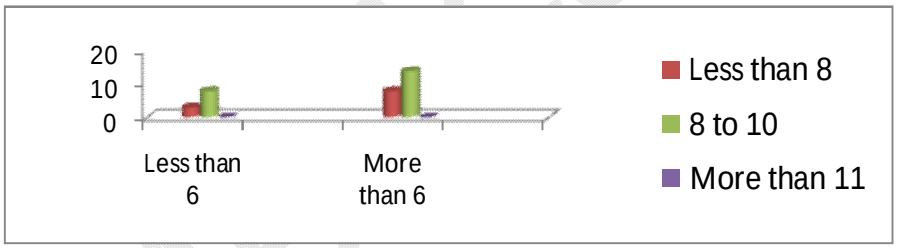

Figure 4

Classification of Study Population according to hemoglobin level in Patients with Normal and Abnormal CRP Value

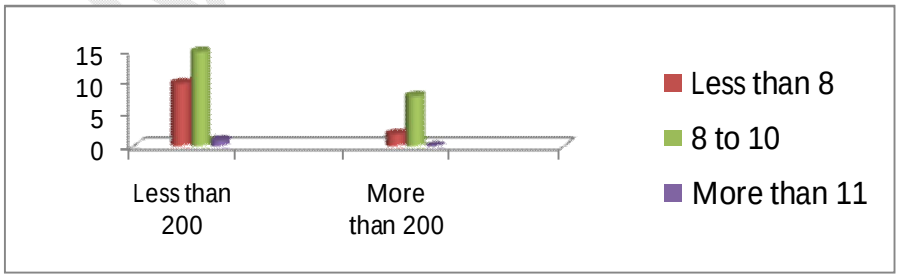

Figure 5

Classification of Study Population according to Hemoglobin Level in Patients with Normal and Abnormal Ferritin Value

2.1. Methodology

1. Data were collected from the patients (by personal interviews and perusal of dialysis records and patient files) and then documented.
2. Patients demographics-- name, age and gender were recorded.
3. The nature of his or her kidney disease and other co-morbidities like hypertension or diabetes, etc. were noted.
4. Information was collected regarding the period, duration and frequency of haemodialysis.
5. Hemoglobin level of the patient was checked and recorded.
6. Type of anemia, vit B_{12} and folate level of the patient was recorded.
7. A record of patient's iron profile, ferritin and TIBC was kept.
8. Thyroid function testing was done. T_3, T_4 level was noted.
9. A record of Ca^{++}, PO_4^{-} and iPTH level, was maintained.
10. The dose, frequency and route of administration of EPO to the patient were documented.
11. If the patient was not treated with EPO then the reason behind it was enquired- whether due to a financial reason, lack of awareness or something else.
12. All these information was documented in a data collection form, as shown in Figure 1.

3. RESULTS

Data collection project for this project was started in June 2013 and continued till January 2014. 50 patients were included in the study out of which 28 were male patients (56%) while the remaining 22 patients were female (44%). Male and Female ratio is 14:11. Table 1 shows the relationship between the study population and the age group of patients. It was found that maximum number of patients (16) was in the age group 60 – 70 and least number of patients (1) were in the age group 30 – 40. Figure 1 shows the graphical representation of age wise classification of study population. Maximum patients (31) were diabetic (63%) while the remaining 19 patients were non-diabetics (38%). Maximum patients (11) had normocytic anemia (92%), 1 patient had microcytic anemia (8%) and no patient was with macrocytic anemia. Remaining 39 patients were not tested for type of anemia. Maximum patients (32) received dialysis for less than 1 year (64%), 14

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Table 1
Age Wise Classification of Study Population

AGE OF PATIENTS	NUMBER OF PATIENTS
20 -30	2
30 - 40	1
40 - 50	8
50 - 60	13
60 - 70	16
70 - 80	8
80 - 90	2

Table 2
Classification of Study Population according to Dose of EPO

10000 Unit twice weekly	1
10000 Unit ones weekly	5
8000 Unit	0
6000 Unit twice weekly	7
4000 Unit twice weekly	28
4000 Unit ones weekly	2

Table 3
Classification of Study Population according to Hemoglobin Level in Patients with Normal and Abnormal PTH Value

Hemoglobin level	Less than 150	150 – 300	More than 300
Less than 8	2	3	2
8 to 10	13	3	3
More than 11	0	1	0

patients received dialysis for 1 to 3 years (28%) and remaining 4 patients received dialysis for more than 3 years (8%).

Only 1 patient received dialysis once per week (2%), maximum patients (36) received dialysis twice per week (72%) and remaining 13 patients received dialysis thrice per week (26%). 25 patients had adequate dialysis and 6 patients had inadequate dialysis. Remaining 19 patients were not tested for URR (Urea reduction ratio). But by this URR%, the term adequacy of dialysis is not justified. It is justified if patients having dialysis thrice weekly is considered. So adequate dialysis means URR% is more than 65 in patients having dialysis thrice weekly. By this, only 29% study population received adequate dialysis and 71% patients received inadequate dialysis. Maximum patients (43) received EPO (86%) while the remaining 7 patients did not receive EPO (14%). Table 2 shows the relationship between the study population and dose of EPO. It was found that maximum patients (28) received 4000 unit dose of EPO twice weekly and no patient received 8000 unit dose of Erythropoietin. Figure 2 shows the graphical representation of study population according to dose of EPO.

15 patients had hemoglobin level less than 8 (30%), 25 patients had hemoglobin level between 8 to 10 (50%) while the remaining 10 patients had hemoglobin level more than 11 (20%). So it was found that maximum patients had hemoglobin level less than 8. According to international guideline, the concentration of hemoglobin after treatment with EPO should be between 11 to 12 g/dl. But most study patients showed hemoglobin level less than 8 g/dl and only 20% patients had hemoglobin level above 11 g/dl. Of patients receiving adequate dialysis, 2 patients had hemoglobin level less than 8 (22%), maximum patients (6) had hemoglobin level between 8 to 10 (67%) while the remaining 1 patient had hemoglobin level more than 11 (11%). Of patients receiving inadequate dialysis, 13 patients had hemoglobin level less than 8 (32%), maximum patients (19) had hemoglobin level between 8 to 10 (46%) while the remaining 9 patients had hemoglobin level more than 11 (22%).

20 patients had hyperthyroidism of which 9 patients had hemoglobin level less than 8, 11 patients had hemoglobin level between 8 to 10 while no patient had hemoglobin level more than 11. Again, 11 patients had hypothyroidism of which 3 patients had hemoglobin level less than 8, 7 patients had hemoglobin level between 8 to 10 while only 1 patient had hemoglobin level more than 11. Table 3 shows comparison of hemoglobin level of patients with value of PTH. 15 patients had PTH value less than 150, 7 patients had PTH value between 150-300 and 5 patients had PTH value more than 300. Figure 3 shows the graphical representation of study population according to

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Table 4
Classification of Study Population according to hemoglobin level in Patients with Normal and Abnormal CRP Value

Hemoglobin level	CRP less than 6	CRP more than 6
Less than 8	3	8
8 to 10	8	14
More than 11	0	0

Table 5
Classification of Study Population according to Hemoglobin Level in Patients with Normal and Abnormal Ferritin Value

Hemoglobin level	More than 200	Less than 200
Less than 8	10	2
8 to 10	15	8
More than 11	1	0

hemoglobin level in patients with normal and abnormal PTH value. Table 4 shows comparison of hemoglobin level of patients with value of CRP. 11 patients had CRP value less than 6 whereas 22 patients had CRP value more than 6. Figure 4 shows that graphical representation of study population according to hemoglobin level in patients with normal and abnormal CRP value.

Table 5 shows comparison of hemoglobin level of patients with value of ferritin. 26 patients had ferritin value more than 200 whereas 10 patients had ferritin value less than 200. Figure 5 shows the graphical representation of study population according to hemoglobin level in patients with normal and abnormal ferritin value. 20 patients had value of Thyroid-stimulating hormone (TSH) less than 5 m IU/L (65%) while the remaining 11 patients had value of TSH more than 5 m IU/L (35%). So it was found that maximum patients had hyperthyroidism. Maximum patients (33) had value of calcium less than 9 (70%) while the remaining 14 patients have value of calcium more than 9 (30%). Maximum patients (25) had value of PO_4^{---} less than 5.5 (53%) while the remaining 22 patients had value of PO_4^{---} more than 5.5 (47%). Maximum patients (15) had value of PTH less than 150 p mol/L (56%), 7 patients had value of PTH between 150 to 300 p mol/L (26%), while the remaining 5 patients had value of PTH more than 300 p mol/L (18%). 11 patients had value of CRP less than 6 mg/L (32%) while the remaining maximum patients (23) had value of CRP more than 6 mg/L (68%). 10 patients had value of ferritin less than 200 ng/ml (28%) while the remaining maximum patients (26) had value of ferritin more than 200 ng/ml (72%).

4. DISCUSSION

Prior to the introduction of recombinant human erythropoietin (EPO), red blood cell (RBC) transfusions were frequently required when iron and anabolic steroids failed to improve the clinical symptoms of anemia associated with hemoglobin (Hb) levels that were commonly less than 7 g/dL. After the approval of EPO by the FDA in the US in 1989, the Hb levels of patients on hemodialysis dramatically improved and the need for RBC transfusions and the inherent risk there with decreased significantly. The need for RBC transfusion remains only for patients who require an immediate increase in their RBC mass due to symptomatic anemia (Yvette and Berns, 2012). The primary purpose of this study was to determine the appropriateness and efficacy of use of EPO in hemodialysis patient in India. By appropriateness we wished to assess whether EPO was used where indicated and if not what was the reason. If it was used could it be used at the requisite dosage? Could ancillary tests like iron profile, B12, thyroid and parathyroid profile be done so that EPO use was efficient? Finally the hemoglobin levels of current patient were documented.

The dialysis population was a generally elderly population with approximately equal ratio (5:4) of male and female patients. Maximum number of patients on hemodialysis was in the age ranges from 60 to 70 and minimum in the age range from 30 to 40. This is a trend seen all over the world. In order to identify factors potentially affecting anaemia management, Claudine M Mathieu et al., on 2008 in Switzerland assessed the effect of age, gender, etiologies of end stage renal disease (ESRD) and co-morbidities on Hb level and EPO dose. Gender had a significant impact on Hb, but not on EPO dose. However, tendency for females to benefit from higher EPO doses, suggested a fair attempt by nephrologists to equalize Hb between males and females. There was no obvious effect of age. However, younger age (<50 years) in women tended to influence Hb towards lower levels and, as a possible physician's response, towards higher EPO doses. On the other hand , older men (>60 years) tended to have lower Hb than younger men (Claudine et al., 2008). Etiologies of ESRD and co-morbidities were documented to assess anemia control in these populations. Almost 62% of patients on hemodialysis have diabetes as co morbidity. Diabetes is becoming more prevalent in

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Asians. India comes second only to China. Therefore diabetes is emerging as a predominant cause of CKD in India. Diabetics (as a primary renal diagnosis and concomitant disease) were found to have Hb level of higher values and lesser EPO requirement. Patients with chronic Glomerulonephritis needed EPO at a higher dose, to maintain Hb. These findings were unexpected. ESAM 2003 showed that patients with diabetes were less likely to achieve Hb ≥ 11 g/dL than those with other primary renal diagnosis and concomitant diseases (Claudine et al., 2008). It is possibly that ongoing inflammation in some instances of glomerulonephritis may blunt EPO response.

More over observational studies have shown that diabetes is a contributory comorbid factor that increases mortality risk among anemic CKD patients (Vlagopoulos et al., 2005). Among Type 2 diabetes CKD patients, anemia is associated with an increased risk of cardiovascular events (Vlagopoulos et al., 2005; Tong et al., 2006). At high erythropoiesis-stimulating agent ESA levels, diabetic hemodialysis patients could be at a higher risk for adverse outcomes when compared to their nondiabetic counterparts due to the increased presence of hypertension in this group (Suh et al., 2009). Most i.e. 92% patients on hemodialysis had normocytic normochromic anemia while no patient was observed with microcytic anemia. Normocytic normochromic anemia is the type seen in anemia due to chronic disease. This is due to inability at the kidney to produce EPO. Increased hepcidin levels also decrease iron absorption from gut and utilization, in chronic disease.

Most patients had period of dialysis less than 1 year and only 8 % patient had period of dialysis more than 3 years. As dialysis is generally self funded in India many patients cannot carry on long term treatment due to socioeconomic reasons. Most patients had frequency of dialysis 2 times a week and only 2% patients had frequency once per week. Only 26% had thrice a week which is considered to be adequate in developed countries. The reason is again financial constraints. Adequacy is measured by URR and recommendation is >65%. Therefore only 29% patient one can say had truly adequate dialysis that is they had dialysis thrice per week with an URR value more than 65 % (As recommended by DOQI guidelines).

Patients with chronic kidney disease (CKD), including those with end-stage renal disease (ESRD) produce insufficient amounts of EPO to maintain normal hemoglobin levels. The primary treatment for the anemia caused by CKD is human recombinant erythropoietin (EPO). Treatment with EPO has been shown to increase hematocrit levels and reduce the need for blood transfusions in CKD patients with anemia (Besarab et al., 1998; Eschbach et al., 1989). However, managing EPO therapy is complicated because of the great within- and between-person variability in the erythropoietic response to EPO (Singh et al., 2006; Lacson et al., 2003). The within-person variability in response leads to fluctuating hemoglobin levels, which may adversely affect patient outcomes (Berns et al., 2003; Fishbane and Berns, 2005; Ebben et al., 2006; Fishbane and Berns, 2007; Gilbertson et al., 2007). An improved understanding of factors that influence EPO responsiveness could lead to greater hemoglobin control and thus safer and more effective anemia management strategies for CKD patients.

About 86% of the study population received EPO and only 14% were not treated with EPO. Patient education was adequate and all were aware of EPO. In a similar study by Jairam et al., (2010) in India only 25% patients had received EPO, with most getting only a few doses. However 70% of the study population received 4000 unit of EPO twice weekly (8000 U/wk). This is the starting dose and few could increase the dose to requisite level due to financial constraints. Another similar study was done at a low dosage 5000 unit thrice weekly (15,000 U/wk), medium dosage 10000 unit thrice weekly (30,000 U/wk), and high dosage 15000 unit thrice weekly (45,000 U/wk), based on the primary analysis which imputes EPO for patients with a hospital stay (Zhang et al., 2011). One factor that may illuminate the interrelations of the many factors involved with EPO response is the altitude at which a patient lives. At higher altitudes, patients are exposed to a lower partial pressure of oxygen; thus, altitude can influence tissue hypoxia (similar to anemia) and the array of physiologic responses to hypoxia involved in erythropoiesis (Brookhart et al., 2008). Our study was of course carried out at sea level, so this factor is irrelevant to our study.

In 1997, the National Kidney Foundation's Dialysis Outcomes Quality Initiative (DOQI) guidelines recommended as ideal hemoglobin, a goal of 11–12 g/dl in patients using EPO (Yvette and Berns, 2012). Only 20% of patients in our population could meet the DOQI guidelines. These were usually patients who were well to do, have corporate sponsorship or insurances. The other patients were funding their hemodialysis and EPO themselves. In them it was not possible to reach international guidelines. However none of the patients were symptomatic from anemia as compared to patients in developed nature. A study was done in 2008 by Claudine et al. from Switzerland where the overall mean Hb concentration was 11.9 ± 1.0 g/dL.

About half of the study population had hemoglobin level between 8 to 10 and only 20 % patient had hemoglobin level above 11. It is found that dialysis patients of India do not usually reach the target hemoglobin level as per DOQI. It is mainly due to financial reasons. Most patients can not increase dose of EPO, as would have been ideal, due to financial constraints, as EPO is very expensive medicine. Again other ancillary tests could not be performed to maximize the benefit of EPO, again due to financial constraints. In another similar study done in 2002 by Anuradha, N. P. Singh and S. K. Agarwal from Lok Nayak and G.B. Pant Hospitals, Maulana Azad Medical College, New Delhi, India the mean hemoglobin (g/dL) in the patients at baseline and at 12 weeks was 8.28 ± 0.57 and 9.22 ± 0.44 respectively

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(Anuradha et al., 2002). Again another study by Rathod et al., in 2006 from Govt. Medical College, Aurangabad, India observes a baseline hemoglobin level of 7.22 ± 0.91 g/dL. Most(67%) patients with adequate dialysis, that is thrice per week and URR more than 65% maintained Hb level between 8 to 10g/dl and 11% had a Hb level more than 11g/dl.

Only 46% of the study population having inadequate hemodialysis could maintain hemoglobin level between 8 to 10g/dl and only very few above 11g/dl. Adequacy of dialysis is a vital factor essential for EPO response. Hypothyroidism is an important factor contributing to anemia of chronic disease. 64% of the study population with hypothyroidism had hemoglobin level between 8 to 10 where about 10% patient had hemoglobin level >11. 55 % of the study population with hyperthyroidism on the other hand had hemoglobin level between 8 to 10 where as no had hemoglobin level more than 11. 38% patients were not tested for TSH.

Hyperparathyroidism shows an imoprtant effect on the Hgb response to EPO (Drueke and Eckardt, 2002; Gaweda et al., 2008). Hyperparathyroidism may lead to bone marrow fibrosis and suppression of erythroid precursors which contribute to anemia in CKD patients. Patients with CKD commonly have secondary hyper parathyroidism due to phosphate retention or hypocalcemia. 70 % of the study population had normal calcium values more than 9.53 % of the study population had normal PO_4^{---} value that is less than 5.5. 56 % of the study population had value PTH less than 150 p mol/L.VitD3 deficiency (which is not activated due to lack of 1 alfa hydroxylase deficiency in failing kidneys). PTH values could be checked in only a few patients as it is an expensive test. Our study shows that increased PTH level is associated with a decreased erythropoietic response. DOQI guidelines recommended PTH values between 150-300. 56 % of the study population had value PTH less than 150 p mol/L. 86% of the study population with PTH value less than 150 had hemoglobin level between 8 to 10, 43% of my study population with PTH value between 150 to 300 had hemoglobin level between 8 to 10 and again 43% with hemoglobin level more than 11 and 60% of my study population with PTH value more than 300 had hemoglobin level between 8 to 10 but no patient above 11g/dl. About 46% patient were not tested for level of PTH.

Active inflammation inflammatory activation is evident in the ESRD patients as shown by the significantly higher CRP, IL-6, and TNF-α level. Chronic inflammation causes increased hepcidin level and refractoriness to EPO. The cause of inflammation is activation of immune cells (monocytes and T cells); reduced antioxidant activity; reduced clearance, and coexistent subclinical infections or autoimmune diseases (Jairam et al., 2010). 73% of the study population with normal CRP value less than 6 indicating inflammation had hemoglobin level between 8 to 10 where as 64 % of my study population with CRP value more than 6 had hemoglobin level between 8 to 10. Patient with less inflammation could reform EPO effectiveness. 32% were not tested for CRP value.

It is also important to stress the need for careful determination of baseline iron status of all patients before commencing EPO therapy. In the long term the extremely high iron stores of transfusion dependent patients cause secondary haemosiderosis and harm. In the short term, however, the majority of the patients on EPO whose serum ferritin is less than 200 ng/ml require iron supplementation to allow an appropriate hemoglobin response. Alternatively, a fall in transferrin saturation to less than 20% is certainly an indication for iron supplementation and if oral iron therapy is not adequate then intravenous preparations may have to be considered. Although the anaemia of renal failure can be fully corrected by EPO adequate iron storage are essential (Macdougall et al., 1991). Due to high hepcidin level oral iron is often not absorbed and IV route is preferred.

Without adequate iron storage, assesed by ferritin levels EPO cannot work. This was evident in my study as 58% of my study population with ferritin value less than 200 had hemoglobin level between 8 to 10 and 80 % of the study population with ferritin value more than 200 had hemoglobin level between 8 to 10. By this our analysis shows that the impaired EPO response in present when Ferritin level is below 200 ng/ml. 28% of patients could not be tested for ferritin level. 72 % of the study population had normal value of ferritin that is more than 200 ng/ml (recommended when use EPO). In a similar study done in 2002 by S. Anuradha, N. P. Singh and S. K. Agarwal from Lok Nayak and G.B. Pant Hospitals, Maulana Azad Medical College and Associated, New Delhi, India observed that the mean serum ferritin (ng/mL) baseline value is 218.43 ± 15.66 at 12 weeks (Anuradha et al., 2002). Another similar study was carried out in 2010 by Adam E. Gaweda et al., where maximum response to EPO was achieved for serum ferritin level between 350 and 500 ng/ml (Jairam et al., 2010).

5. CONCLUSION

This study carried out in a tertiary care hospital in Kolkata revealed the vagaries of managing anemia in patients of CKD on haemodialysis in India. EPO is the key treatment for anemia in these patients, with ESRD on dialysis. Only a small percentage of patients could maintain haemoglobin level as per the international (DOQI) recommendations. Though most patients do not meet the DOQI guideline of 11 – 12 gm/dl, few are symptomatic. It might be worthwhile to have separate guidelines for Indian patients. Most patients could not increase the dose of EPO, as would have been ideal, due to financial constraints, as EPO is a very expensive medicine. Other ancillary tests could not be performed to maximize the benefit of EPO due to financial difficulties. The most common performed tests were iron profile.

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Patients with adequate iron profile showed more effective results with EPO and better hemoglobin level. Patients with hyperthyroidism and secondary hyperparathyroidism could not maintain hemoglobin level despite use of EPO. Patients with chronic inflammation showed some refractoriness to EPO. Appropriate use of EPO and management of anemia in CKD in India may be limited not by the lack of education or awareness but mainly the socio economic status and the health care system in our country where hemodialysis and medications are self funded with no insurance cover. Dialysis and EPO require chronic long term treatments, which most families cannot cope with in the long time.

SUMMARY POINTS

1. Though most patients do not meet the DOQI guideline of 11 – 12 gm/dl, and have hemoglobin level between 8 -10 gm/dl, few are symptomatic. It might be worthwhile to have separate guidelines for Indian patients.
2. Most patients could not increase the dose of EPO, as would have been ideal, due to financial constraints, as EPO is a very expensive medicine.

FUTURE ISSUES

Appropriate use of EPO and management of anemia in CKD in India may be limited not by the lack of education or awareness but mainly the socio economic status and the health care system in our country where hemodialysis and medications are self funded with no insurance cover. So there must be a separate guideline for Indian patients and the government should take steps for its betterment.

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