A STUDY OF ANEMIA PREVALENCE IN CKD PATIENTS ON MAINTENANCE HEMODIALYSIS: A SINGLE CENTRE STUDY
Rajaram Barde¹, Himanshu V. Patel², Pankaj R. Shah³

ABSTRACT: BACKGROUND: The aim of this study was to assess anemia prevalence and types of anemia in chronic hemodialysis patients. METHODS AND MATERIALS: We performed a prospective study of Anemia Prevalence and iron deficiency Anemia in patients undergoing maintenance Hemodialysis at our Institute. Data Abstracted from 150 patients Medical history and Investigations. Hemoglobin, & Iron, Ferritin, TIBC, MCV, Transferrin saturation were used to study Anemia prevalence and iron deficiency anemia. RESULTS AND CONCLUSION: 150 patients undergoing hemodialysis were included in our study. Of them 97(64.66%) were male and 53 (35.33%) were female. Large number of patient’s age between 40-60 year (48.66%).our studies showed prevalence of anemia 77.33% and iron deficiency 25.33%
KEYWORDS: ANEMIA, CKD, TIBC, TSAT, FERRITIN, HEMODIALYSIS, EPO.

INTRODUCTION: Chronic kidney disease is a prevalent worldwide condition in both developed and developing countries. In India alone there are about 55,000 patients on dialysis and this number is growing at the rate of 10-20% Each year.(1) prevalence of CKD continues Increase in India and US.(2,3)

Anemia is major complication in chronic Kidney Disease. During the progression of CKD, the kidneys produce lower amounts of erythropoietin (EPO) a protein signaling molecule for Red cell (RBC) precursors in Bone marrow and control RBC production.(4)

A deficiency of EPO in Body leads to increasing apoptosis among RBCs and leading to Anemia.(5) Kidney disease patients develop Anemia at an early stage and it worsens as kidney function deteriorates. Nearly half of patients with stage three CKD have clinical Normocytic, Normochromic Anemia, which becomes a universal problem by stage four(6) an even greater proportion of patients requiring Hemodialysis are Anemic.(6,7)

Hemodialysis is one of the Renal Replacement therapies to remove Nitrogenous waste such as urea, creatinine when kidney has failed. Anemia continue to be major problems in CKD patients on Hemodialysis and contributes to the Incidence of Ischemic heart disease (IHD)(8,9) In patients Receiving dialysis and especially those on hemodialysis, chronic blood loss resulting from frequent phlebotomy for laboratory studies and loss of blood in the dialysis tubing and dialyzer in the dialysis tubing and dialyzer after each hemodialysis treatment may also contribute to declining Hb values.

According to National Kidney foundation recommendation hemoglobin Range for hemodialysis patients is 11 to 12 g/dL(10) Sub target Hb level still a very common problem in children on dialysis even after therapy(11) Iron deficiency may be one of the causes for anemia in hemodialysis patients.
Iron deficiency increases the severity of anemia and impairs the patient’s response to erythropoietin. Evaluation and management of correctable causes of inadequate response rate and better monitoring and management of iron status gives opportunity to improve anemia management in hemodialysis patients. Measurement of hemoglobin is the preferred method for assessing anemia and it is not affected by changes in plasma water and low serum ferritin levels are helpful in diagnosing iron deficiency. To know the prevalence of anemia and iron deficiency anemia in hemodialysis patients, we performed a prospective study of hemoglobin and iron profile in CKD patients on hemodialysis.

MATERIALS AND METHODS: This is a prospective cross-sectional study in which 150 hemodialysis patients involved, who attended Dialysis units of Department of Nephrology, at Smt. G. R. Doshi & Smt. K. M. Mehta Institute of Kidney Diseases and Research Centre, Dr. H. L. Trivedi Institute of Transplantation Sciences, Ahmedabad (Gujarat).

All requiring data were collected from patient medical record after getting approval from Institutional Ethical Committee.

Inclusion Criteria:
   I. Age more than 18 years.
   II. CKD Stage 5 patients undergoing chronic hemodialysis.

Exclusion Criteria:
   I. Age less than 18 years
   II. Acute kidney injury patients undergoing hemodialysis.
   III. Individual with irregular follow-up.

Patients who satisfied inclusion criteria were selected for this study. A total 150 patients who were attended Dialysis unit of department of nephrology at Smt. G. R. Doshi & Smt. K. M. Mehta IKD & R. C, Dr. H. L. Trivedi ITS Ahmedabad, (Gujarat).

The analysis. Age, sex, duration of chronic hemodialysis for all participants were recorded. Lab parameters included were hemoglobin, iron, ferritin, TIBC, transferrin, MCV, Urea, creatinine and data regarding iron therapy (oral, IV) collected. The average value of each test observation was calculated for each patients, and this mean quantity was used for subsequent analysis. Thus, final sample with complete laboratory data was used to analyze the prevalence of anemia and iron deficiency of anemia. Patients were diagnosed to be having anemia based on Hb values less than 11gm% and serum ferritin value less than 200 ng/ml and transferrin saturation <20% were used to confirm iron deficiency anemia.

Study subjects were divided into Anemic and non-Anemic groups and anemic subjects into iron deficient and none iron deficient using cut off values mentioned above. While entering in SPSS given score 1 for Anemia and Iron deficient, score 0 for Normal.

OBSERVATIONS AND RESULTS: Altogether, we had a total of 150 patients identified as CKD stage 5 as undergoing dialysis. This simple included 97 male and 53 female. About 49% are of
between age group 40-60 years. Only 34(22.66%) patients had HB% >11gm%. Majority of patients having creatinine values more than 6 mg./dl. Our study showed overall prevalence of anemia was 77.33%. Mean of studied parameters are presented in Table 4. 75 patients were on various formulation of recombinant erythropoietin therapy and 50 were on iron therapy. We performed iron profile in all of the patients, 112(74.66%) showed TSAT% >20% and 38(25.33%) patients had TSAT% <20%. Based on this prevalence of iron deficiency anemia is 25.33%.in our study we also observed 60(40%) patients below age of 40 year, its showing kidney disorders growing-up in young population also.

<table>
<thead>
<tr>
<th>Gender</th>
<th>N=150</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>97</td>
<td>64.66%</td>
</tr>
<tr>
<td>Female</td>
<td>53</td>
<td>35.33%</td>
</tr>
</tbody>
</table>

**Table 1: Gender wise distribution**

<table>
<thead>
<tr>
<th>Age</th>
<th>N=150</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;40</td>
<td>60</td>
<td>40%</td>
</tr>
<tr>
<td>40-60</td>
<td>73</td>
<td>48.66%</td>
</tr>
<tr>
<td>&gt;60</td>
<td>17</td>
<td>11.33%</td>
</tr>
</tbody>
</table>

**Table 2: Age wise distribution of subjects**

<table>
<thead>
<tr>
<th>HB%</th>
<th>N=150</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;11 gm%</td>
<td>116</td>
<td>77.33%</td>
</tr>
<tr>
<td>&gt;11gm%</td>
<td>34</td>
<td>22.66%</td>
</tr>
</tbody>
</table>

**Table 3: HB% wise distribution of subjects**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean</th>
<th>Normal value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin (gm%)</td>
<td>9.42</td>
<td>12.5-15.5</td>
</tr>
<tr>
<td>Urea (mg %)</td>
<td>93.8</td>
<td>8-40</td>
</tr>
<tr>
<td>Creatinine (mg %)</td>
<td>7.87</td>
<td>0.6-1.4</td>
</tr>
<tr>
<td>Sodium (mEq/L)</td>
<td>135.39</td>
<td>135-145</td>
</tr>
<tr>
<td>Potassium (mEq/L)</td>
<td>5.066</td>
<td>3.5-5.0</td>
</tr>
<tr>
<td>TIBC(mg%)</td>
<td>212</td>
<td>200-430</td>
</tr>
<tr>
<td>Ferritin (ng/ml)</td>
<td>502</td>
<td>27-300</td>
</tr>
<tr>
<td>Transferrin saturation (%)</td>
<td>42.85</td>
<td>30-40</td>
</tr>
<tr>
<td>Iron (mg%)</td>
<td>84.71</td>
<td>60-175</td>
</tr>
</tbody>
</table>

**Table 4: Mean values of studied parameters in all subjects**

**DISCUSSION:** Anemia continues to becoming problem of great concern in hemodialysis patients with chronic renal failure. Our prospective study has shown that as high as 77.33% chronic hemodialysis patients had hemoglobin value below 11 gm %. By considering hemoglobin value < 11 gm% as an indication of anemia\(^{(5)}\) the prevalence of anemia in our study is 77.33%. Out of
these 87 patients were on EPO therapy. Studies showed that even though recombinant erythrocyte growth factor, erythropoietin alfa is commonly used as therapy some of the hemodialysis patients fail to achieve target hemoglobin. This is mainly because secondary conditions that exacerbate the severity of anemia impair responsiveness to treatment with erythropoietin alfa. Iron deficiency is the other common cause of anemia in hemodialysis patient due to loss of blood. Iron deficiency both absolute and functional is the most frequent cause of low red blood cell production despite treatment with erythropoietin therapy.\(^{(15)}\) We studied iron profile which included serum ferritin, transferring saturation and total iron binding capacity in 150 patients. In that more than 50% of studied samples were on iron therapy. We found only 38 patients with decreased serum ferritin and transferring saturation. By considering decreased ferritin level and transferrin saturation as indication of iron deficiency, prevalence of iron deficiency is 25.33% in hemodialysis patients with anemia in our study. Serum ferritin is an acute phase protein which also increases during any inflammation. Therefore determining iron status by measuring ferritin is not reliable as high serum ferritin levels may confound ruling out iron deficiency. In our study we used both Transferrin saturation and serum ferritin for confirming iron deficiency. Reticulocyte Hb content should be used to measure adequacy of iron availability for erythropoiesis.\(^{(16)}\) The accurate diagnosis of anemia and iron deficiency is essential in hemodialysis patients, since these conditions are prevalent during chronic disease. Understanding the etiology of anemia and iron deficiency in hemodialysis patients can help healthcare providers in managing the anemia which in turn improves their quality of life.

CONCLUSION: Anemia continues to be a major obstacle for hemodialysis patients with chronic kidney disease. Prevalence of anemia is high despite of EPO therapy. Prevalence of iron deficiency anemia is less compared to anemia as most of the patients were on iron therapy. The accurate diagnosis of anemia is needed as it leads to further damage. Therefore accurate laboratory parameters like reticulocyte hemoglobin may be required for diagnosing iron deficiency. In our study we also observed young population suffering from chronic kidney disease with anemia and they were on hemodialysis. It seems that in young population with anemia kidney function test should be performed to diagnose CKD as cause of anemia.

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