Anemia in Chronic Kidney Disease Patients on Maintenance Hemodialysis
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ABSTRACT
Background: Anemia is one of the most important complications of chronic kidney disease. Anemia contributes to increased morbidity, mortality and poor quality of life of such patients especially those on maintenance hemodialysis. Multiple therapies are established in prevention and treatment of anemia of chronic kidney disease. Despite use of such measures, anemia is a common observation in these patients.
Objective: The objective of this study was to estimate the prevalence of anemia in our chronic kidney disease patients on hemodialysis.
Material & Methods: In this descriptive cross-sectional study, we examined the frequency of anemia in our chronic kidney disease patients on maintenance hemodialysis as well as the utilization of iron, erythropoiesis stimulating agents and blood transfusion among them. After permission from hospital ethical committee, blood indices were checked for each patient including hemoglobin and mean corpuscular volume prior to hemodialysis session. Data regarding iron and Erythropoietin treatments and blood transfusions was obtained from patients. Data was recorded on proforma and analyzed.
Results: A total of 110 patients were studied (male to female ratio: 1.4:1). Mean age was 41.14 years (SD ± 16.52). Anemia was found in 87% of patients. Mean hemoglobin was 7.95 (SD ± 1.65). Around two third (74.5%) patients were taking erythropoietin therapy and 61% were on intravenous iron therapy. Majority of patients (89%) had received blood transfusions in the past.
Conclusion: Based on our study we conclude that anemia is highly prevalent in our chronic kidney disease patients. Blood transfusions are frequent despite use of iron and erythropoietin therapy.
Key Words: Anemia, Chronic kidney disease, CKD., Hemodialysis, Blood transfusion, Erythropoietin, EPO, Iron replacement therapy

INTRODUCTION
Anemia is common in patients with chronic kidney disease (CKD). Anemia in CKD primarily occurs due to reduced erythropoietin production by the diseased kidneys.¹ ² The severity and prevalence of anemia increase with decreasing glomerular filtration rate (GFR).³ Other factors involved in causation of anemia in CKD patients include iron deficiency, blood loss during dialysis, gastrointestinal bleeding, deficiency of other hematinics such as vitamin B12 and folic acid and reduced survival of red blood cells.⁴ ⁵

Anemia is one of the major factors responsible for the poor quality of life in chronic kidney disease patients. It contributes significantly to the increased morbidity and mortality observed in chronic kidney disease patients especially the patients who are on maintenance hemodialysis therapy.

The national health and nutrition examination survey (NHANES) III study concluded that the prevalence of anemia increased proportionately in patients with decreasing GFR. Their data showed that anemia was twice as common in CKD patients (15.4%) as compared to the general population (7.6%). The prevalence increases with progressive CKD stages, from 8.4% at stage I CKD to 53.4% at CKD stage V.⁶ Diabetic CKD patients are at a greater risk of developing anemia earlier in the course of their disease as compared to non-diabetic patients.⁷

Data regarding the prevalence of anemia in our end-stage renal disease patients who are on maintenance hemodialysis is not available. Based on the observations of frequent blood transfusions, irregular use of erythropoietin, inadequate hemodialysis dose, and poor nutritional status of our patients a higher prevalence of anemia is expected in our patients. This study aims to find the exact prevalence of anemia in our local dialysis dependent patients. Based on this study further recommendations could be made to improve our local patient management practices ultimately resulting in decreased prevalence of anemia, improved quality-of-life and reduced morbidity and mortality in our hemodialysis dependent end-stage renal disease patients.
MATERIALS AND METHODS
This study was a descriptive cross-sectional study, utilizing non-probability convenient sampling technique. Prior permission was obtained from the hospital ethical and research committee. Anemia was defined as hemoglobin value of less than 10gm/dl. A total of 110 patients undergoing maintenance hemodialysis at Nephrology department, Khyber teaching hospital Peshawar, were selected. Dialysis dependence of a patient was defined as any patient who was being managed by regular hemodialysis for end-stage renal disease for at least three months. Other inclusion criteria included age more than 18 years and both genders. Patients with recent history of blood loss through epistaxis, hematemesis, Melena, hemoptysis, menorrhagia and any other focus of blood loss were excluded from the study. Patients known to have hemoglobinopathies were also excluded from the study. Each patient was counseled regarding the procedure and nature of the study. After taking informed consent the general bio-data of the patients was collected on a prescribed proforma and a 2ml blood sample was collected from each study subject in EDTA-tubes and was immediately sent to the laboratory for analysis including indices such as hemoglobin, mean corpuscular volume, mean corpuscular hemoglobin concentration and other components of blood. Inquiry was also made about the use of intravenous iron, erythropoietin, other hematinics and blood transfusion practices. All the data was recorded on a Performa. Data was tabulated and analyzed using SPSS version 17. Mean, median, mode and standard deviations was calculated for quantitative variables like age, hemoglobin concentration and mean corpuscular volume. Percentages were calculated for categorical variables like gender, utilization of iron, erythropoietin and blood transfusion.

RESULTS
This study was conducted in department of Nephrology, Khyber Teaching Hospital Peshawar, in which patients were studied to determine the frequency of anemia among chronic kidney disease patients on maintenance hemodialysis. The results are presented as follow.

A total of 110 patients were studied, among which 64 (58%) were male and 46 (42%) were female (male to female ratio: 1.4:1). Mean age of male patients was 40.84 years (SD ± 17.28) while the mean age of female patients was 41.54 years (SD ± 15.57). The overall mean age among 110 patients was 41.14 years (SD ± 16.52, Median age 40 and mode 40).

We defined anemia as hemoglobin value of less than 10gm/dl. Among 64 male patients, 56 (87.5%) patients had hemoglobin of less than 10g/dl and therefore had anemia. Only 8 (12.5%) patients had a hemoglobin value of more than 10g/dl. Among 46 female patients, 40 (87%) patients had anemia and only 6 (13%) patients had acceptable level of hemoglobin. Mean hemoglobin among males was 7.96 (SD ± 1.76) and among females was 7.94 (SD ± 1.51).

In total 110 patients, 96 (87%) were found to have hemoglobin less than 10g/dl. Only 14 (13%) patients had acceptable hemoglobin of more than 10g/dl. Mean hemoglobin among all 110 patients was 7.95 (SD ± 1.65, Median 7.7, Mode 7.7).

Table 1: HEMOGLOBIN LEVEL (n=110)

<table>
<thead>
<tr>
<th>Hemoglobin</th>
<th>Male</th>
<th>Female</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 10g/dl</td>
<td>56 (87.5%)</td>
<td>40 (87%)</td>
<td>96 (87%)</td>
</tr>
<tr>
<td>10 or more</td>
<td>8 (12.5%)</td>
<td>6 (13%)</td>
<td>14 (13%)</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>46</td>
<td>100%</td>
</tr>
</tbody>
</table>
Around 98 (89%) of the total 110 patients, had received blood transfusions in the past. Of the 64 male patients, 55 (85%) patients had received blood transfusions and of the 46 females, 43 (93%) patients had received blood transfusions in the past. Figure 1.

Regarding erythropoietin (EPO), among total 110 patients, 82 (74.5%) patients were taking erythropoietin therapy. Of the 64 male patients, 59 (92%) patients and among 46 females, 23 (50%) patients were on EPO therapy. Table 2.

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<th>Table 2. EPO RECEIVED (n=110)</th>
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<tr>
<td>EPO</td>
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<tr>
<td>Received</td>
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<tr>
<td>Not Received</td>
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<td>Total</td>
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Regarding intravenous iron, among total 110 patients, 67 (61%) were on intravenous iron therapy. Among 64 males 51 (80%) patients and among 46 females 16 (35%) patients were given intravenous iron therapy. Table 3.

<table>
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<th>Table 3: IRON REPLACEMENT THERAPY (n=110)</th>
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<td>IRON</td>
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<tr>
<td>Received</td>
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<td>Not Received</td>
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<td>Total</td>
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Regarding mean corpuscular volume (MCV), 70 (63.6%) of the total 110 patients had low MCV (normal 76-105). Among 64 males, 39 (61%) patients and among 46 females, 31 (67.4%) patients had lower than normal MCV. Mean MCV among all 110 patients was 78.94 (SD ± 8.37, Median 79.65 and Mode 79.6). Mean MCV in males was 79.5 (SD ± 5.99) and MCV in females was 78.66 (SD ± 10.75). Table 4.

<table>
<thead>
<tr>
<th>Table 4: Mean corpuscular volume (MCV). (n=110)</th>
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<tr>
<td>MCV</td>
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<tr>
<td>LOW</td>
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<tr>
<td>NORMAL</td>
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<tr>
<td>Total</td>
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DISCUSSION
Anemia is a common occurrence in patients with chronic kidney disease especially end-stage renal disease when the patient is being managed with hemodialysis. The prevalence and severity of anemia in chronic kidney disease patients increases progressively with the declining renal function especially below a GFR of 60 ml/min. Less than 10% patients with stage I and II CKD have anemia. This prevalence increases with a falling GFR such that more than 70% patients with stage 5 CKD are anemic.

Different studies are conducted in our country to know the prevalence of anemia in chronic kidney disease on maintenance dialysis. In one study of rizvi et al, the prevalence was found to be 48.9% while in another study the prevalence was 53.3%. One study conducted at Shiekh Zaid hospital Lahore, the prevalence of anemia was found to be 90%.

In our study among total 110 patients, 87% were found to be anemic with hemoglobin level below 10 g/dl with mean Hb 7.94 (SD ± 1.65). Thus a great majority of our ESRD patients have suboptimal hemoglobin levels. Anemia was prevalent in both sexes with almost equal magnitude.

Anemia is thought to be one of the major factors responsible for multiple symptoms of chronic kidney disease patients such as fatigue, dyspnea and therefore contributes adversely to the quality of life of these patients. Chronic anemia is also associated with chronic fluid overload and cardiomyopathy in CKD patients especially those being managed with hemodialysis. Chronic anemia therefore contributes to the poor outcome and poor long-term survival of chronic kidney disease patients.

Correction of anemia results in a reversal or arrest of progression of the aforementioned cardiovascular abnormalities especially uremic cardiomyopathy, improvement in the quality of life, cognitive function, platelet function, immune responsiveness. It can be contemplated that high prevalence of anemia is playing a major role in persistent poor prognosis, poor functional ability and poor quality of life of our ESRD population. Measures should be taken to reduce the prevalence of anemia in our patients to improve their prognosis. A complete correction of anemia however has not been shown to provide any significant survival benefit and rather it may predispose to frequent cerebrovascular events and AV fistula thrombosis. An acceptable target is to keep hemoglobin of such patients above 10gm/dl.

Low MCV in majority (63.6%) of our patients suggests a predominant role of iron deficiency in causation of anemia. This is despite the fact that most of the patients (61%) reported use of iron replacement therapy.

In our study 89% patients reported receiving blood transfusions. This highlights the failure of current anemia prevention practices in our setup. A significant, 74.5% patients reported receiving EPO therapy and 61% patients reported iron replacement therapy. Despite these prevention steps, anemia is significantly prevalent in our patient population. This suggests that factors other than EPO and Iron deficiency might also be contributing to anemia in our patients.

In addition to iron and Erythropoietin deficiency, multiple additional factors are involved in the causation of anemia in chronic kidney disease patients. These factors include blood loss during dialysis, infections, inflammation, vitamin B12 and folate deficiency, hyperparathyroidism, gastrointestinal bleeding and under-dialysis due to poor quality and quantity of renal replacement therapy. In chronically under-dialyzed patients, the presence of uremic inhibitors of erythropoiesis may also contribute to anemia. It is a common observation that our patients receive twice per week dialysis instead of minimum recommended thrice per week regimen. This results in majority of our patients being under-dialyzed. This exposes our patients to chronic uremia and possibly to uremic inhibitors of erythropoiesis. This might be one of the major contributory factors responsible for anemia in our ESRD patients.

CONCLUSION
Based on our study we conclude that there is high prevalence of anemia in our ESRD patient population. Blood transfusions are frequent despite use of Iron and EPO therapy. Therefore, further research should be done to provide recommendations to improve our local patient management practices ultimately resulting in decreased prevalence of anemia, improved quality-of-life of the patients and reduced morbidity and mortality in our local end-stage renal disease patients on maintenance hemodialysis.
REFERENCES


