

REVIEW ARTICLE

PREVALENCE OF ANEMIA IN CKD PATIENTS OF EASTERN INDIA ON MAINTAINED HAEMODIALYSIS.

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Abstract

Anaemia is a common comorbidity of chronic kidney disease (CKD). As the diseased kidney loses its ability to produce the erythropoietin essential to the production of haemoglobin, anemia ensues. Progression of chronic kidney disease (CKD) is often associated with severe anemia, and epidemiological studies have shown that haemoglobin levels are correlated with creatinine clearance. Diabetes is one of the most common causes of CKD. The objective of our study is: 1.To understand the prevalence of anemia in chronic kidney disease (CKD) patients on maintenance hemodialysis. 2.To understand the prevalence of viral infections like HIV, HBV, HCV in Blood Transfusion patients. 3.To understand the treatment pattern of anemia in the chronic kidney disease patients on maintenance hemodialysis in relation to Blood Transfusion. Out of 100 recruited patients, 92% were found to be anemic where as only 8% were found to be non anemic. There were 52 male anemic CKD patients and 40 female CKD patients. Maximum (47%) number of patients have Hb value between 6.1 to 9 g/dl while only 8% have Hb value above 11 g/dl which is expected as per guideline. Here it is shown that prevalence of anemia is more in male diabetic CKD patients than in female diabetic CKD patients. With increasing age, the anemia prevalence increases due to gradually decreasing renal function in CKD patients 15% of the patients are on maintenance hemodialysis for more than 2 years. 14 received Blood Transfusion, of which, 8 patients got seropositive. Among those, who did not receive Blood Transfusion it was observed that 16 got converted to seropositive. This study concludes that anemia is prevalent among CKD patients where the degree of anemia was severe in female as compared to male. Across CKD stages, the proportion of patients with anemia was varying among diabetic patients, in which male diabetic patients had more prevalence of anemia. In the vast majority of patients, this study showed evidence of increase in the prevalence of anemia with age. 24% patients were found to be seropositive with HBV & HCV infections. These observations may have clinical implication as in most instances intravenous iron, combined in selected cases with subcutaneous recombinant human ESAs would represent a rational therapeutic approach to these anemic CKD patients, over traditional Blood Transfusion.

Keywords: Anemia, Chronic kidney disease (CKD), Blood transfusion, Erythropoietin Stimulating Agent, Diabetes.

Introduction

With the ongoing pandemic of obesity, diabetes and hypertension, chronic kidney disease (CKD) is becoming a leading global health problem. Diabetes is currently the most common cause of chronic kidney disease. Patients with diabetes and chronic

kidney disease have an increased risk for anemia. Anemia is a risk factor for cardiac dysfunction and is potentially modifiable. Therefore it should be screened for readily in the diabetic population, a particularly vulnerable population, and it should be

identified and rectified promptly. However all too often this is not the case.

Definition of Anemia

According to the National Kidney Foundation Kidney Disease Outcomes Quality Initiative (NKF KDOQI), anemia is defined as hemoglobin levels of less than 13.5g/dL (135 g/L) for men and less than 12.0g/dL (120 g/L) for women. The WHO criteria defines anemia to be less than 13.0g/dL (130 g/L) for men and less than 12.0g/dL for premenopausal women (National Kidney Foundation, 1997; K/DOQI clinical practice guidelines, 2006; WHO: Global data base on anemia).

Risk factors for anemia in CKD patients

1. Diabetes
2. Chronic Kidney Disease
3. Cardiovascular Disease
4. Low Education Levels
5. Hypertension

Traditional risk factors	Non Traditional risk factors
Diabetes	Chronic inflammation
Dyslipidemia	Anemia
Hypertension (HTN)	Oxidative stress
Central Obesity	Hyperparathyroidism
Smoking	Hyperhomocysteinemia
Male or Postmenopausal female	Endothelial Dysfunction
Family History of MI Event	Prothrombotic states

Pathophysiology of Anemia in Diabetics with Chronic Kidney Disease.

There are several factors which have been implicated in the development of anemia in CKD which include erythropoietin deficiency, iron deficiency, decreased lifespan of red blood cells, chronic blood loss, secondary hyperparathyroidism, chronic inflammation, oxidative stress, nutritional folate deficiency, uremia and chronic suppression of erythropoiesis. Diabetes exacerbates many of these factors, leading to a higher degree of anemia in patients with diabetic nephropathy than in patients with kidney disease from other causes.

Reasons to treat Anemia

Type 2 diabetes mellitus and chronic kidney disease frequently coexist, and each disease independently increases the risk of cardiovascular events and end stage renal disease. Intensive treatment of risk factors such as hypertension and elevated LDL reduces cardiovascular morbidity and mortality and slows the progression of the kidney disease. Anemia is a risk factor for cardiovascular morbidity and mortality, and is evolving as an attractive target and potentially correctable risk factor.

Study objective

Primary objective

To understand the prevalence of anemia in chronic kidney disease (CKD) patients on maintenance hemodialysis.

Secondary objectives

To understand the prevalence of viral infections like HIV, HBV, HCV in Blood Transfusion patients.

To understand the treatment pattern of anemia in the chronic kidney disease (CKD) patients on maintenance hemodialysis in relation to Blood Transfusion.

Study methodology

Description of study design

This is a type of non-randomized, cross sectional, observational study in East Indian population where questionnaire method was used for collection of data. Data was collected from Dialysis patients in Medica Superspecialty Hospital during 3 months of study period. Data was collected to understand & assess the prevalence of anemia in CKD patients on maintenance hemodialysis, and also to understand the prevalence of viral infections like HIV, HBV, and HCV in Blood Transfusion patients and to study their treatment pattern.

In this, 100 patients were recruited. The entire data will be analyzed which will further help in the understanding for the doctors in management of the prevalence of anemia in CKD patients on maintenance hemodialysis.

Inclusion criteria

- Male or Female above 18 years of age
- Having CKD
- On maintenance Hemodialysis
- Having both positive & negative status of serology.

Exclusion criteria

- Child
- Pregnant woman
- Fully psychic person
- Do not have CKD
- Person unable to speak read and write (Physically incapable)
- Having uncontrolled blood pressure.

Description of statistical method employed.

For this study, a Questionnaire is used for the collection of data from the recruited patients. It has few questions in it and on the basis of the collected data, the prevalence of anemia in the patients can be analyzed. The data collected will also be analyzed to understand the prevalence of viral infections like HIV, HBV, and HCV in Blood Transfusion patients and to study their treatment pattern. Statistical analysis and data interpretation will be done from the collected data using MS EXCEL, pie charts and tables.

Results

The fig 1 given below indicates that out of all the 100 recruited patients, 92% were found to be anemic where as only 8% were found to be non anemic. There were 52 male anemic CKD patients and 40 female CKD patients.

From figure 2 the given data it is clear that prevalence of anemia is more in female CKD patients than in male CKD patients. This is because women have lower Hb levels than men. Maximum (47%) number of patients have Hb value between 6.1 to 9 g/dl while only 8% have Hb value above 11 g/dl which is expected as per guideline.

Fig 3 shows that prevalence of anemia is more in diabetic CKD patients than in non diabetic CKD patients. Here it is shown that prevalence of anemia is more in male diabetic CKD patients than in female diabetic CKD patients.

Fig 4 shows that prevalence of anemia increases with age. With increasing age, the anemia prevalence increases due to gradually decreasing renal function in CKD patients.

This chart (fig 5) is about the duration of dialysis of the patients in Medica Superspecialty Hospital, Kolkata. It shows that 39% patients are on dialysis for nearly 1 to 1.5 years whereas 28% for 1.5 to 2 years and 18% for 6 months to 1 year. 15% of the patients are on maintenance hemodialysis for more than 2 years.

According to fig 6 given below, we get to know about the serology status of the patients on maintenance hemodialysis in Medica Superspecialty Hospital, Kolkata. While 76 patients are seronegative, 24 were found to be serologically positive. Out of the seropositive patients, 12 were found to be infected by Hepatitis-B Virus (HBV) and the rest 12 were found to be infected by Hepatitis-C Virus (HCV).

From the fig 7, it is clear that out of all the recruited patients, 14 received Blood Transfusion, of which, 8 patients got seropositive. Among those, who did not receive Blood Transfusion it was observed that 16 got converted to seropositive

This chart is about the treatment pattern of anemia. Though Blood Transfusion is a convenient way to treat anemia in CKD patients but ESA Therapy is the most prevalent treatment. In ESA Therapy, the patients are administered weekly dosage of recombinant human erythropoietin (rHuEPO) in order to treat their anemic condition. Another way of treating is Iron Therapy, in which the patients are administered iron supplements to balance their iron deficiency. Few other techniques are also applied for anemia treatment, which includes the administration of Folic Acid and Vitamin B12 to reduce their vitamin deficiency.

Discussion

The main purpose of the study is to understand the prevalence of anemia in approximately 100 patients with chronic kidney disease (CKD), a condition characterized by a gradual loss of kidney function over time, on maintenance hemodialysis. Anemia is a common comorbidity of chronic kidney disease (CKD). As the diseased kidney loses its ability to produce the erythropoietin essential to the production of haemoglobin, anemia ensues.

Figure 1. Prevalence of anemia in CKD patients

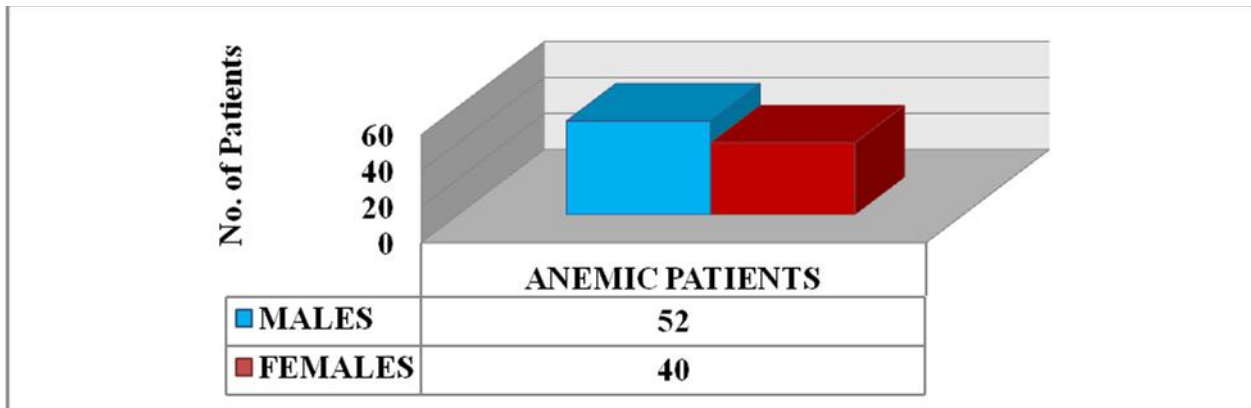
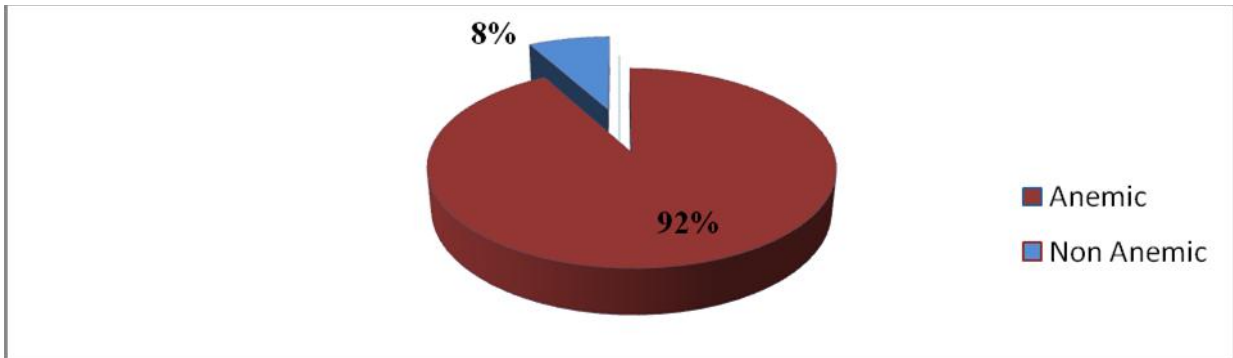


Figure 2. Haemoglobin level in patients

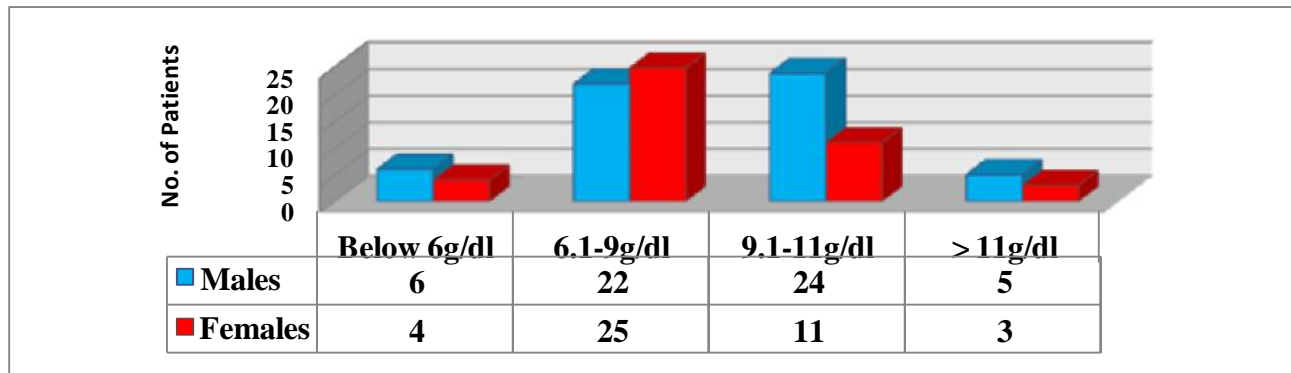
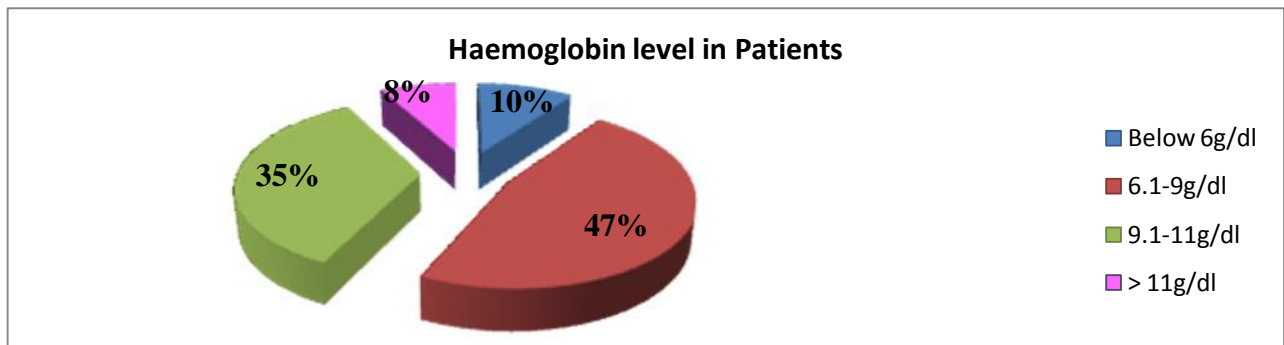


Figure 3. Patients according to diabetes as CO-Morbidity

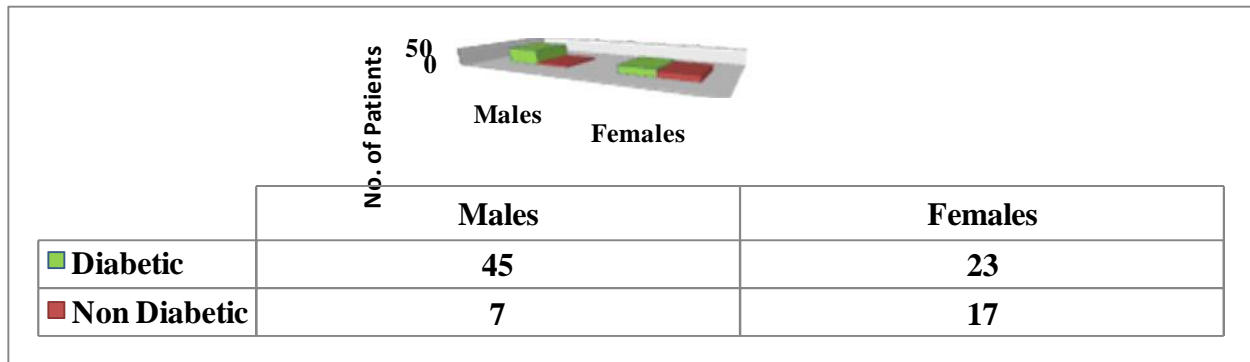
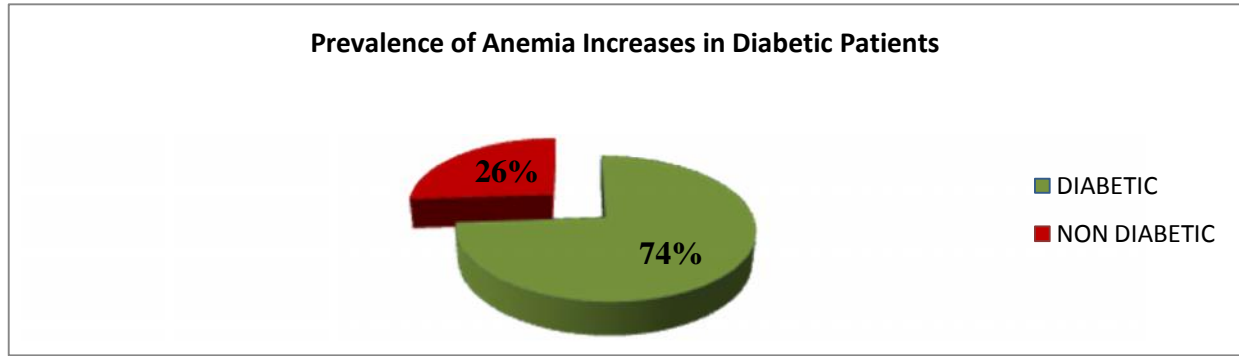


Figure 4. Relationship between age of patients with Anemia

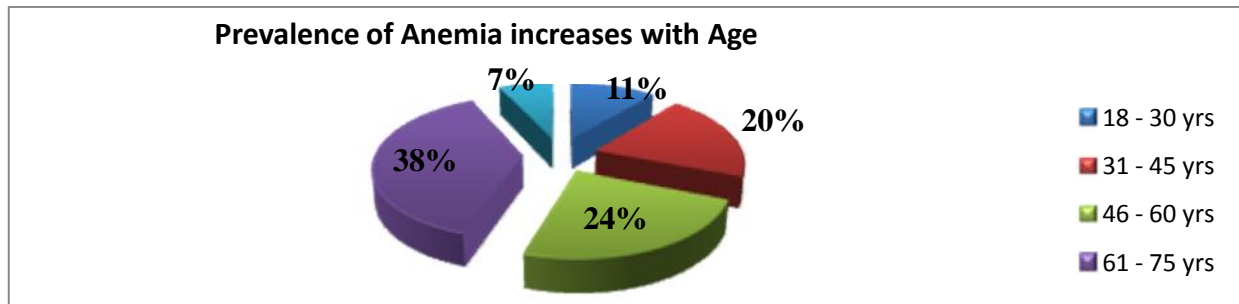


Figure 5. Duration of dialysis in Medica Superspecialty hospital

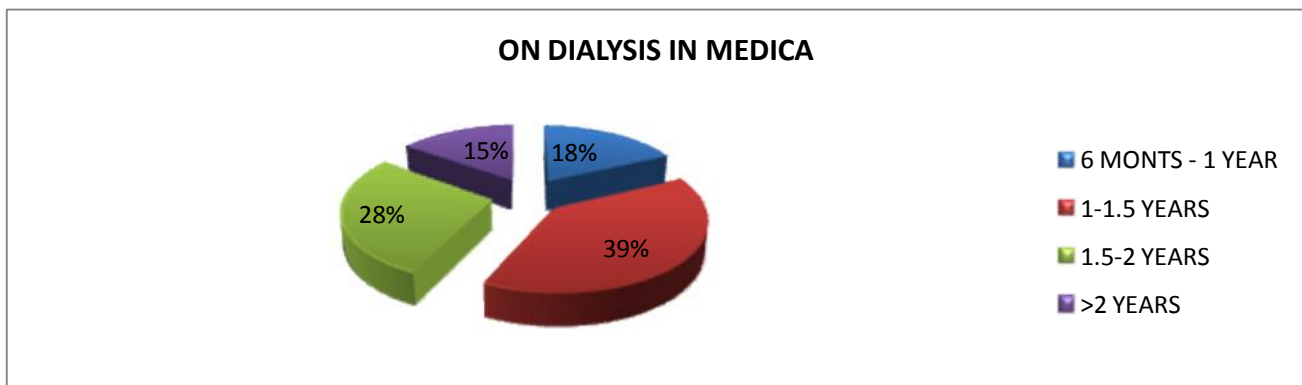


Figure 6. Serology status of the patients

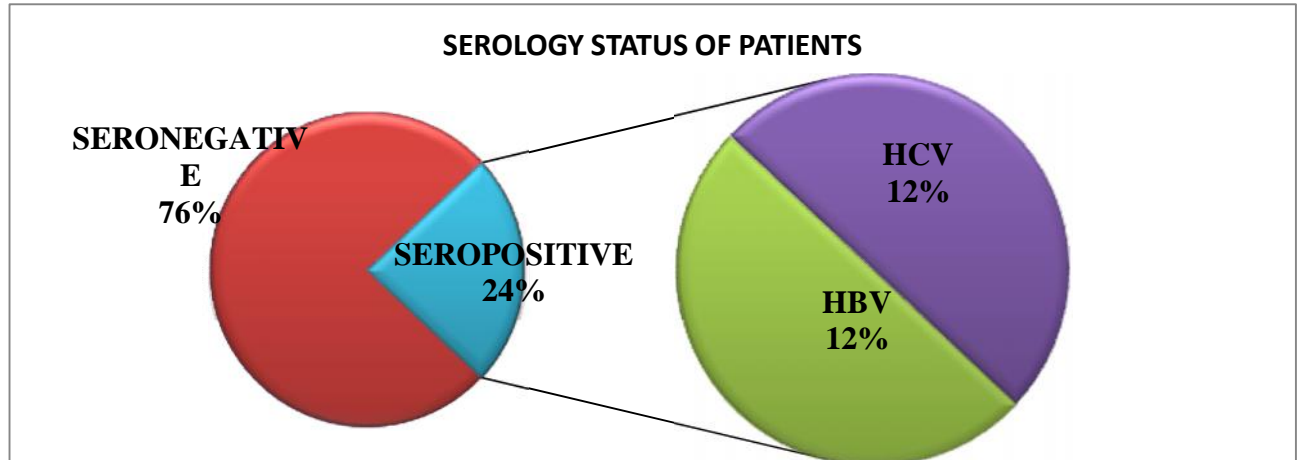


Figure 7. Serology status of the patients with respect to blood transfusion

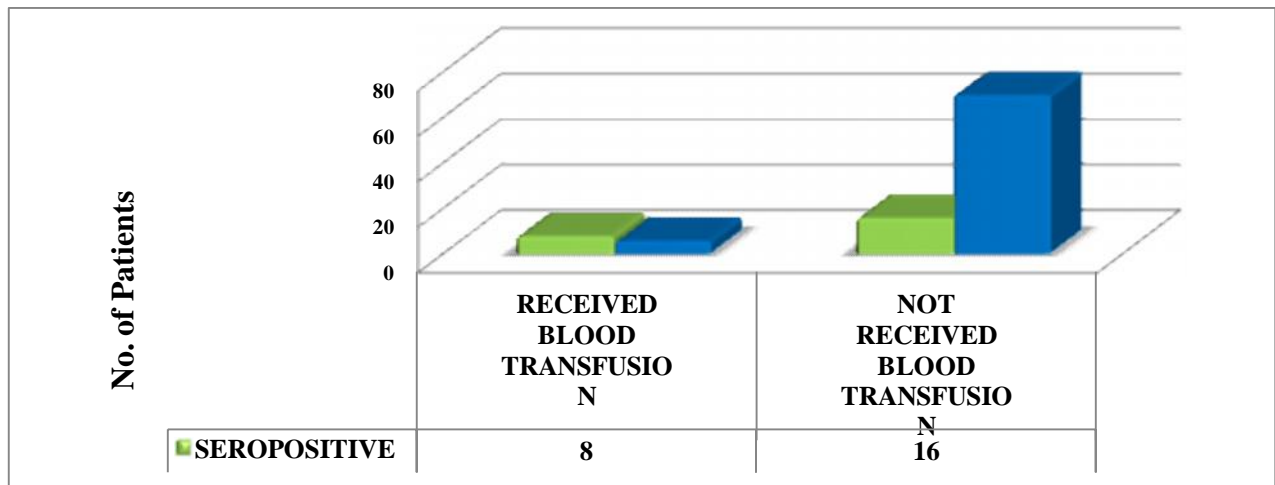
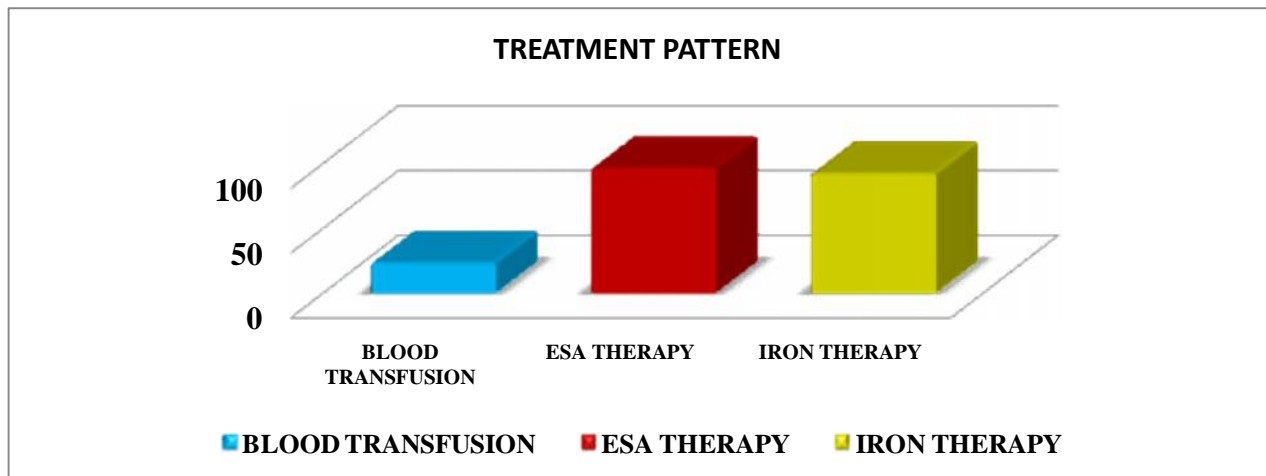


Figure 8. Treatment pattern of Anemia



Anemia occurs early in the development of kidney disease and worsens with declining kidney function.

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. 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).

Maximum number of patients on hemodialysis was in the age ranges from 61 to 75 and minimum in the age range greater than 75. 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. Gender had a significant impact on Hb. 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.

Diabetes is becoming more prevalent in Asians. India comes second only to China. Therefore diabetes is emerging as a predominant cause of CKD in India. 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).

In 1997, the National Kidney Foundation's Dialysis Outcomes Quality Initiative (DOQI) guidelines recommended as ideal hemoglobin, a goal of 11–12 g/dl (Yvette and Berns, 2012). Only 10% of patients in our population could meet the DOQI guidelines and about 80% have value between 6 to 11 g/dl. 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. 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 et al., (2002) 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 (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

Among all patients 76 patients are seronegative, 24 were found to be serologically positive. Out of the seropositive patients, 12 were found to be infected by Hepatitis-B Virus (HBV) and the rest 12 were found to be infected by Hepatitis-C Virus (HCV).

Another way of treating is Iron Therapy (Gotloib et al., 2006) in which the patients are administered iron supplements to balance their iron deficiency. Few other techniques are also applied for anemia treatment, which includes the administration of Folic Acid and Vitamin B12 to reduce their vitamin deficiency.

Conclusion

This study shows that anemia is prevalent among CKD patients by 92% where the degree of anemia was severe in female as compared to male. Across CKD stages, the proportion of patients with anemia was varying among diabetic patients, about 74%, in which, male diabetic patients had more prevalence of anemia. In the vast majority of patients, this study showed evidence of increase in the prevalence of anemia with age. 24% patients were found to be seropositive with HBV & HCV infections.

These observations may have clinical implication as in most instances intravenous iron, combined in

selected cases with subcutaneous recombinant human ESAs would represent a rational therapeutic approach to these anemic CKD patients, over traditional Blood Transfusion.

In the light of this study, there is a need for clinicians to refer CKD patients as soon as diagnosis is made or suspected to nephrologists for early evaluation and treatment of anemia and prevention of CKD progression, therefore decreasing the burden of dialysis and transplantation.

There is a need for early diagnosis and treatment of anemia in CKD patients as anemia leads to CKD progression and cardiovascular disease in these patients. As mainstay treatment of anemia in CKD is ESAs and adequate iron store are necessary to permit an optimal response, therefore it is highly recommended to do iron studies to establish types of iron deficiency as functional iron deficiency will need intravenous iron supplement compared to absolute iron deficiency which needs oral iron.

This was a hospital based study, therefore the results doesn't reflect true community picture, it is therefore recommended to do similar study using large CKD sample size at the community level which would ascertain all stages of CKD and more factors related to anemia as in this present study with high prevalence of anemia, only few factors were studied.

Summary

Anemia is pervasive in the diabetic patient with CKD.

Anemia occurs earlier, and is more severe in chronic kidney disease related to diabetes than in non-diabetic kidney disease.

Reasons for anemia in CKD include EPO deficiency, iron deficiency, decreased lifespan of red blood cells, chronic blood loss, secondary hyperparathyroidism, chronic inflammation, oxidative stress, nutritional folate deficiency, uremia and chronic suppression of erythropoiesis.

Anemia is a risk factor for cardiovascular morbidity and mortality, and is evolving as an attractive target and potentially correctable risk factor.

All patients with CKD should be screened at least annually for anemia, regardless of stage.

ESAs are the mainstay of therapy for anemia of chronic kidney disease.

Maintaining hemoglobin of 11-12g/dl is currently recommended.

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