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Prevalence and Management of Anaemia in Chronic Kidney Disease Patients in Tertiary Care Hospitals: An Observational Prospective Study

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ABSTRACT

Anaemia is a frequent consequence of chronic kidney disease (CKD) that is linked to a worse quality of life as well as an increased risk of morbidity and death. The processes behind anaemia linked with CKD are many and intricate. Reduced endogenous erythropoietin (EPO) production, absolute and/or functional iron deficiency, and inflammation with elevated hepcidin levels are only a few of them. Oral or intravenous iron supplements, as well as erythropoietin stimulating medications, are widely used to treat patients (ESA). These therapies, on the other hand, come with hazards and are occasionally ineffective. Nonetheless, there has been some significant advancement in the treatment of CKD-related anaemia in recent years, raising high hopes. On the one hand, a novel class of medicines known as hypoxia-inducible factor prolyl hydroxylase inhibitors has been created (HIF-PHIs). These compounds stimulate endogenous EPO synthesis; improve iron availability, and lower hepcidin levels, among other things. Some of these have already been approved for commercialization. Recent clinical trials, on the other hand, have highlighted crucial elements of iron supplementation, which may influence therapy goals in the future. The present state of knowledge on the pathophysiology of CKD-related anaemia, existing therapeutics, patient care trends, and unfulfilled objectives are discussed in this article.

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INTRODUCTION

Anemia is a common consequence of chronic kidney disease (CKD), and it's linked to a lower quality of life [1, 2], a lower renal survival rate [3, 4], increased morbidity and death rates [5, 6], and higher expenditures. Several studies on the prevalence of anaemia in non-dialysis dependent (NDD) CKD patients suggest anaemia rates as high as 60%. Anemia in CKD is caused by a variety of factors. The steady decline of endogenous erythropoietin (EPO) levels has traditionally been thought to be the most important factor. An absolute iron deficiency due to blood losses or impaired iron absorption, ineffective use of iron stores due to increased hepcidin levels, systemic inflammation due to CKD and associated co-morbidities, a reduced bone marrow response to EPO due to uremic toxins, a reduced red cell life span, or vitamin B12 or folic acid deficiencies have all been described as contributing to anaemia in CKD patients [7].

As the estimated glomerular filtration rate (e GFR) decreases, anaemia becomes more common and severe. Anemia was twice as common in patients with CKD as it was in the general population, according to cross-sectional data from the National Health and Nutrition Examination Survey (NHANES) in 2007–2008 and 2009–2010 [8]. (15.4 percent vs. 7.6). Anemia became more common as CKD pro-

gressed, rising from 8.4% at stage 1 to 53.4 percent at stage 5. A more recent publication by the CKD Prognosis Consortium [9] found similar results. They also discovered a higher frequency of anemia in diabetic individuals, regardless of e GFR or albuminuria. As the estimated glomerular filtration rate (e GFR) decreases, anemia becomes more common and severe. Anemia was twice as common in patients with CKD as it was in the general population, according to cross-sectional data from the National Health and Nutrition Examination Survey (NHANES) in 2007–2008 and 2009–2010 [8] (15.4 percent vs. 7.6). Anemia became more common as CKD progressed, rising from 8.4% at stage 1 to 53.4 percent at stage 5. A more recent publication by the CKD Prognosis Consortium [9] found similar results. They also discovered a higher frequency of anemia in diabetic individuals, regardless of e GFR or albuminuria.

In the framework of guideline guidelines, there are significant disputes and variations in the "real-world" therapy of anaemia in CKD. However, just a few research have looked into this. Anemia therapy in 755 prevalent NDD-CKD patients was studied in two visits in an Italian observational research. The average eGFR was 27.5 mL/min/1.73 m2. At month 6, the prevalence of severe and moderate anaemia was 18 and 44 percent, respectively (19.3 and 43.2 percent). Clinical inertia to ESA was comparable at baseline and month 6 (39.6 and 34.2 percent, respectively, P = 0.487), and it was less common than clinical inertia to iron treatment (75.7 and 72.0 percent, respectively) [10]. A new observational study from the Swedish Renal Registry looked at the epidemiology and treatment trends of all adult CKD patients referred to nephrology in 2015. Anemia was found in 60 percent of NDD patients and 93 percent of DD patients among 14 415 individuals [Non-Dialysis Dependent (NDD), 11,370; Dialysis-Dependent (DD), 3,045].

In comparison to NDD patients, DD patients took more erythropoiesis-stimulating agents (ESAs; 82 vs. 24%) and iron (62 vs. 21%). Low to moderate ESA dosages were provided [median 48.2 IU/kg/week (NDD), 78.6 IU/kg/week (DD)]. Hemoglobin (Hb) >13 g/dL was found in 6–21% of ESA-treated patients, whereas Hb 9 mg/L was found in 2–6%. Inflammation (C-reactive protein >5 mg/L) was common and linked to ESA resistance and higher ESA dosages, but not to iron consumption. Furthermore, greater ESA dosages (>88 IU/kg/week) were linked to a higher risk of serious cardiovascular events. Despite guidelines' recommendations, iron utilisation was shockingly low, particularly in ESA-treated NDD patients, and a fifth of ESA-treated dialysis patients had haemoglobin levels above the suggested thresholds [11]. A multicenter cross-sectional study conducted at specialist nephrology clinics in Ireland also revealed significant variation in the implementation of different guidelines, as well as high rates of anaemia (ranging from 21 to 63 percent; p 0.001, depending on the CKD Stage), low iron deficiency testing rates (only 45 percent of anaemic patients), and low treatment use (86 percent of patients with confirmed iron deficiency were not on treatment) [12].

Aims and Objectives

Aim

The aim of this study is to determine the prevalence and management of anaemia in CKD patients.

Objectives

1. Describe the risk factors for developing chronic kidney disease.
2. Review the path-physiology of chronic kidney disease.
3. Outline the treatment and management options available for chronic kidney disease.
4. Explain the path-physiology of anaemia and chronic renal disease.
5. Explain how to diagnose and monitor anaemia and chronic kidney disease.
6. Explain the management and severity of anaemia in chronic kidney disease.
7. Explain the inter-professional team strategies for improving co-ordination and communication to enhance the management of renal anaemia with CKD Patients.
8. Evaluate occurrence of anaemia in CKD.
9. To know the predictable consequences of other co-morbidities in CKD

Need of the Study

1. Oral anti-emetics are the primary guideline recommended treatment strategy for patients presenting with decreased haemoglobin and RBC count.
2. Erythropoietin stimulating agents are prescribed for the severe renal anaemia patients.
3. Following with anti-emetics and ESA'S treatment folic acid supplements are recommended as secondary guidelines for patients of anaemia with chronic kidney disease.

4. Based on the GFR levels the patients are divided into different stages for further management process.
5. End stage renal disease patients underwent dialysis irrespective of age, gender due to severe kidney damage – haemodialysis, peritoneal dialysis for twice or thrice weekly.
6. The prevalence of anaemia in CKD patients were found by point prevalence method.
7. Thus, the overall prevalence rate for anaemia was found in CKD patients from stage 1 to 5.

METHODOLOGY

Study Site

A Tertiary Care hospital in Bangalore.

Study Period

6 months.

Study Design

An Observational Prospective Study.

Study Population

Patients having chronic kidney disease with Anaemia were included in the study.

Sample Size

The total numbers of patients included in this study are 253.

Study Criteria

Inclusion Criteria

1. Patient of age > 18years.
2. Patients with history of HTN, DM, Blood disorders and Dialysis.
3. Patients having previous history of CKD from with stage 1-5.
4. Patients with history of Auto immune disorders.
5. Includes patients of both the gender.
6. Patients who are willing to give the information.

Exclusion Criteria

1. Patient of age <18years.
2. Pregnant and lactating women.
3. Patients involved in clinical trials.
4. Patient's undergone renal transplantation.

Sources of Data Collection

The relevant and necessary information was collected from.

1. Case notes.
2. Laboratory reports.
3. Patient Interview.
4. Interviewing the clinician about the patient.

All the data was documented in Data Collection Form.

Designing the Data Collection Form

A suitable data collection form was designed to collect, document and analyse the data. Data collection form includes the provision for collection of information related to.

1. Patient Demographic Profile.
2. Chief complaints.
3. Past medical history.
4. Present medication history.
5. Family history.
6. Physical examination.
7. Auto immune disorders.
8. Social Habits.
9. Blood transfusions.
10. Laboratory investigations.
11. Contact details and other relevant information.

Plan of Work

1. To review the literature.
2. Designing the Data collection Form.
3. Assessing the risk factors that may contribute to CKD.
4. Monitoring complete blood count for evaluating haemoglobin, RBC count packed cell volume.
5. Measuring serum ferritin levels is the most accurate test to diagnose iron deficiency anaemia.
6. Monitoring RFT parameters including glomerular filtration rate levels and serum creatinine levels to determine the stages of CKD.

7. Evaluating Hypertension, diabetes mellitus.
8. Evaluating the symptoms of CKD and Anaemia.
9. Management of anaemia with antiemetics which includes oral and parenteral iron supplements, folic acid supplements, Erythropoietin stimulating agents.
10. Determining the prevalence rate of anaemia in CKD patients.
11. To explain the patient in detail about disease condition and provide counselling regarding treatment strategies.
12. The relevant and required data collection is done from the patient and patient records during the hospital visits.
13. Reporting the collected data.

Statistical Analysis

Methods for calculating the prevalence rate:

The prevalence of anaemia in patients with CKD was determined by using the point prevalence method.

Point prevalence refers to the prevalence measured at a particular point in time it is the proportion of persons with a particular disease or attribute on a particular date.

$$Point\ Prevalence = (Number\ of\ current\ cases\ (new\ and\ pre-existing)\ at\ a\ specified\ point\ in\ time/\ population\ at\ the\ same\ specified\ point\ in\ time) * 100$$

The RFT parameter GFR was determined by using Cockcroft –Gault formula,

$$Creatinine\ clearance = (140 - age) \times weight\ in\ kg\ /\ (serum\ creatinine) \times 72 - [male]$$

$$Creatinine\ clearance = Crcl\ (male) \times 0.85 - [\ female]$$

The patients are categorized into stages according to their creatinine clearance levels and gfr levels.

RESULTS & DISCUSSION

In our study, a total of 253 patients were assessed for a period of six month. We included the patients of age more than 18, patients with history of HTN, DM, and Dialysis of both genders.

Method for calculating prevalence of CKD:

$$\frac{All\ new\ and\ pre\ existing\ cases\ during\ a\ given\ time\ period}{Population\ during\ the\ same\ time\ period} * 10^n$$

Patients with CKD and Anemia = 76.

Total Population = 253.

$\frac{76}{253} * 100 = 30\%$

Descriptive Analysis: No. of patients included in the study based on gender given in Figure 1.

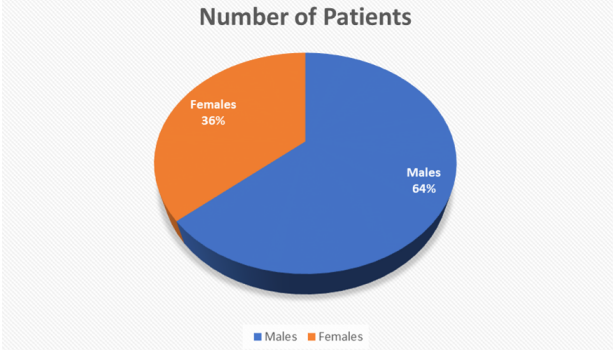

Figure 1: Based on Gender

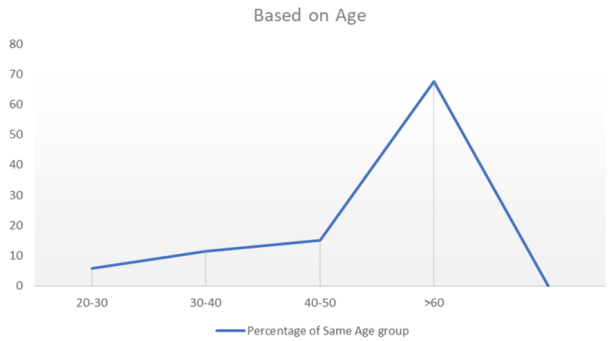

Figure 2: Based on Age

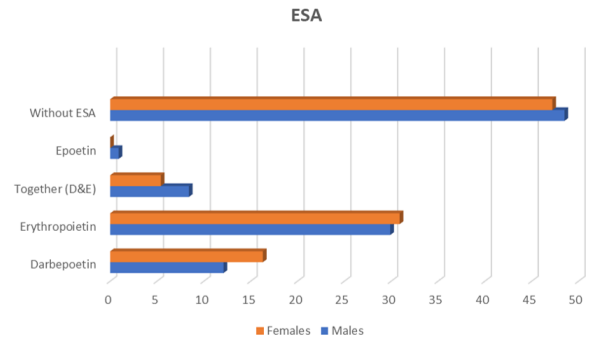

Figure 3: Based on ESA Treatment

All the data discussed below are from patient profile form taken from our Hospital, the data include both men (64%) and women (36%) information. The above pie chart shows the distribution of men and women in the study.

Patients based on age groups were distributed in Figure 2. The data is distributed into different age groups, mainly 4 age categories are taken into consideration as shown in the above line chart, we see from the above line chart that there are 5.9%

Table 1: Based on Diagnosis of Chronic Kidney Disease

	Males	Males Percentage	Females	Females Percentage	Total CKD Patients Percentage
CKD	113	44.6%	54	21.3%	66%

Table 2: Based on Diagnosis of Chronic Kidney Disease with Anemia

	Males	Males Percentage	Females	Females Percentage	Total CKD with Anemia Patients Percentage
CKD with Anemia	41	16.2%	35	13.8%	30%

Table 3: Iron Treatment

Males	Oral	Parental	Other Treatments
Iron Treatment (113)	31 (27.4%)	22 (19.4%)	60 (53.1%)
Females	**Oral**	**Parental**	**Other Treatments**
Iron Treatment (66)	15 (22.7%)	22 (33.3%)	29 (43.9%)

patients from 20 to 30 age group, 11.4% from 30 to 40 age group, 15% from 40 to 50 age groups and the patients with age more than 60 years are 67.7%. The spike in the line chart clearly indicates that more patients are from elderly group.

The patient data has been categorized into two types using eGFR, Hemoglobin estimates, the estimates gave us the CKD and CKD with Anemia patients list, the CKD list has 44.6% males and 21.3% females, similarly the CKD with Anemia list has 16.2% males and 13.8% females. The above bar charts show the distribution of males and females in both CKD and CKD with Anemia categories. From both the charts we can see that the percentage of male patients are higher when compared to females. This data tabulated in Table 1 & Table 2 respectively.

According to the CKD stages and their severity, patients were treated with ESA and Iron, the patient according to percentages were recorded in the tables, separate tables for men and women has been made for clear understanding. The table data includes the drugs that were prescribed to the patients during treatment. The mostly used drugs (Darbepoetin, Erythropoietin) are stored in the tabular form, the drug data is stored in the percentages form for better calculation and understanding. Most of the males and females are treated using Erythropoietin. In the treatment of CKD, 30% of both men and women were prescribed Erythropoietin, and around 15% were prescribed Darbepoetin. This data is picturized in Figure 3.

Similar tables were made for Iron Treatment, the table data was categorized according to their administration represented in Table 3. Oral and Parental were the route of administration. The parental administration includes IV, IM, SC and PO. Iron treatment using both the routes of administrations for both males and females has been recorded in percentages.

The transfusion is done when the amount of hemoglobin in the body reaches a threshold limit of 6gms/dL. There are a total of 38 patients who went through transfusion process and their data was represented in Figure 4.

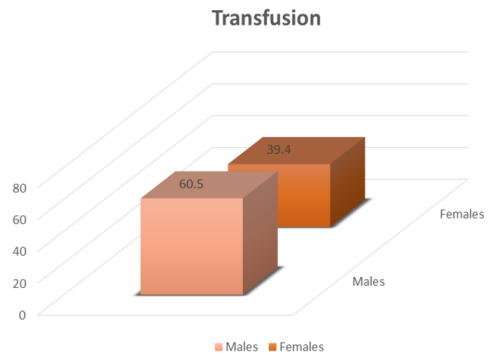

Figure 4: Based on Transfusion

There are 5 stages by which the prevalence of anaemia can be estimated. From the data that we have gathered and analyzed above; we further categorized the patients according to their severity in CKD. Stages are numbered according to their GFR levels; the lowest number states the low severity while the highest states highest severity. Figure 5 shows the distribution of patients according to their GFR and severity levels.

The prevalence of Anaemia at Stage 1 & 2 is 32.8%, this is the combined result of stage 1 and stage 2. Stage 3 has 11.8% prevalence rate; Stage 4 has 5.2% and the Stage 5 has 50% prevalence of Anaemia represented in Figure 6.

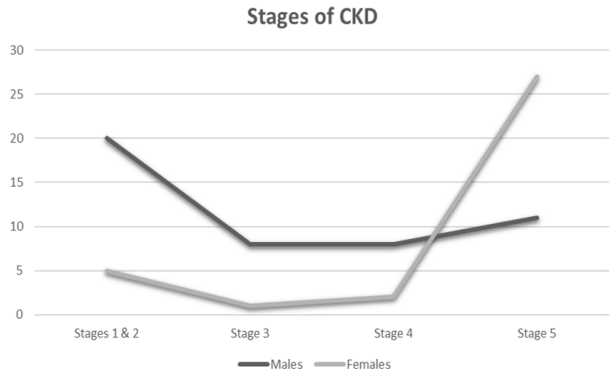

Figure 5: Based on Stages of CKD

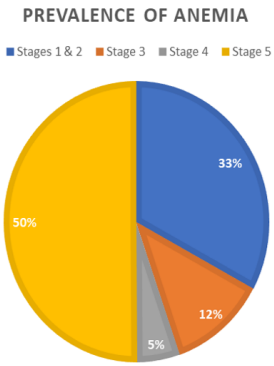

Figure 6: Prevalence of Anemia

CONCLUSION

Mean haemoglobin levels showed an increase in patients with epoetin therapy. Continuous monitoring of hb and iron status ensured desired outcomes and made easy for necessary dose adjustments in ESA and iron therapy. Managing anaemia in non-dialysis patients with stage 2-4 CKD lowered renal disease progression and managing dialysis with epoetin alpha had the potential to improve clinical and economic outcomes in patients with CKD. The prevalence is increased with advancing CKD stages and shown more prevalent in patients with diabetic nephropathy. The overall prevalence rate for anaemia was found 30 percent in total 253 populations with CKD, from stage1- 4.3% to 50% at stage 5. Therefore, early detection and managing with ESA-EPO treatment in CKD patients improved symptoms of anaemia, reduced the risk of blood transfusions, and improved the quality of life. HTN, DM, presence of proteinuria, CKD severity and patient haemodialysis was independently associated with anaemia in CKD patients. There is a need to improve multiple aspects of CKD management, including early diagnosis and treatment of anaemia. Periodic screening and intervention for anaemia in CKD patients should be practiced preventing its complications.

Ethical Considerations

We obtained the consent form from every patient enrolled in the study.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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