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A Pilot Study Based on Proportion of Anemia in Chronic Kidney Disease Patients in a Tertiary Care Centre

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ABSTRACT

Anemia is a complication of chronic kidney disease and may contribute to adverse clinical outcomes. Early identification and treatment of anemia may improve cardiovascular morbidity and mortality. No large-scale population data are available specifically for patients with chronic kidney disease regarding prevalence of anemia, subpopulations at risk, and relationships between anemia and kidney function[1]. Here we examined the proportion of anemia, its association with clinical and laboratory values using the baseline data from the medical records of the patients. We defined anemia when haemoglobin level was lower than 11.5g/dl. This study was undertaken to address these questions in patients with chronic kidney disease, and investigate the relationship between anemia and kidney function.

INTRODUCTION

Kidney disease is a common and progressive illness that is becoming a global public health problem. The inability of the kidney to perform these functions adequately is termed as renal failure. Dysregulation of kidney function is classified as Acute Kidney Disease (AKD) and Chronic Kidney Disease (CKD). The type of renal failure is determined by the trend in the variation of serum creatinine values. ARF recently known as Acute Kidney Injury is the sudden reversible interruption of the kidney function characterized by oliguria (decreased urine production, quantified as less than 400 ml per day in adults), body water and body fluids disturbances and electrolyte management[2].

CKD or Chronic Kidney Injury is a progressive irreversible deterioration of renal function that may occur even when the primary insult has been corrected or treated or become inactive. Chronic kidney disease is defined as the kidney damage or glomerular filtration rate (GFR) 60 ml/min/1.73 m^2 for three months or more, irrespective of the cause. The lack of community based screening programs has led to patients being detected with CKD at an advanced stage. The prevalence of CKD is estimated at nearly 25 million people.[3] Long term follow up studies indicate that patients continue to recover renal function up to six months after hospital discharge, had a chance of development of some degree of CKD and need for renal replacement therapy(RRT). Even though the majority of patients will recover normal kidney function, approximately 25% will have CKD, and 12.5% will remain dialysis dependent. Chronic renal failure often progresses through four stages. Reduced renal reserve shows a glomerular filtration rate (GFR) of 35% to 50% of normal; renal insufficiency has a GFR of 20% to 35% of normal; renal failure has a GFR of 20% to 25% of normal; and end-stage renal disease has a GFR less than 20% of normal. Anemia, which affects most patients with CKD, is caused by damage of peritubular cells resulting in a decreased production of erythropoietin (EPO) resulting, a glycoprotein that stimulates red blood cell production in the bone marrow and is released in response to hypoxia. EPO concentrations in patients with kidney failure are lower than in individuals with normal kidney function. Several other factors contribute to the pathogenesis of anemia in CKD, including shortened red cell survival, marrow suppression by uremic toxins and iron or folate deficiency associated with poor dietary intake or increased loss. Pallor and fatigue are the earliest clinical signs, with other manifestations like decreased energy level, and shortness of breath, headaches,

problems with concentration, dizziness and chest pain; developing as anemia progresses with declining kidney function.

Anemia appears as early as stage 3 CKD and is characterized by normochromic (normal colour) and normocytic (normal size) red blood cells unless a concomitant iron, folate, or vitamin B12 deficiency exists. Anemia is a common consequence of CKD and affects most people with CKD stages 4 and 5. Early identification of anemia, particularly in high-risk populations, could lead to effective preventive and therapeutic strategies to improve outcomes. Anemia in CKD is associated with cognitive impairment, sleep disturbances, CKD progression, cardiovascular comorbidities, and higher mortality. A higher prevalence of anemia occurs in the population with an eGFR less than 60 mL/minute/1.73 m^2. Anemia, when defined by a haemoglobin of <13 g/dL, was found to increase in prevalence at Stage 3 CKD and become even more prevalent into Stages 4 and 5. The treatment of anemia can improve or resolve symptoms and may help to stabilize kidney function. Management of anemia includes administration of erythropoietin agents (epoetin alfa and darbepoetin alfa) and regular iron supplementation (oral and/or intravenous administration) to achieve a target haemoglobin of 11 to 12 g/dL.

MATERIALS AND METHODS

The present study was conducted after the clearance from the institutional Human Ethical committee.

It was carried out in the Nephrology Department of a tertiary care centre.

Inclusion criteria:

- Patient of both sexes in the age group of ≥ 18 years with CKD.
- Dialysis patients are included in this study.

Exclusion criteria

- Patients who are not willing to participate in the study.
- Patients with associated haematological disorder.
- Pregnant women.

PROCEDURE

Only 40 patients diagnosed with CKD were enrolled for the study. A written informed consent was taken from the patients as per by ICMR biomedical research guideline format. A written informed consent will be taken from the patients with CKD satisfying the inclusion and exclusion criteria. The relevant data will be collected from patients' medical records and direct interview with patients with the help of physicians. The collected data will be entered in pre framed proforma based on valid suggestions from experts of medical and pharmacy fields. For this study patients, haemoglobin level and proportion of anemia were assessed from the study population based on the collected data. At the end of the study, all the collected parameters and scores were compared from the baseline to the end of the study.

RESULTS AND DISCUSSION

Fourty patients having CKD diagnosed by physician were enrolled in the study. The study was done in the Nephrology Department of the tertiary care hospital in South Kerala. Patients between the age ≥ 18 years were enrolled in the study. Out of 40 patients, 29 patients were found to be anemic and 11 patients were having normal haemoglobin level.

The effectiveness of the treatment was statistically assessed using Chi-square test. A calculated p-value less than 0.05 is considered to be statistically significant.

The details given as follows:

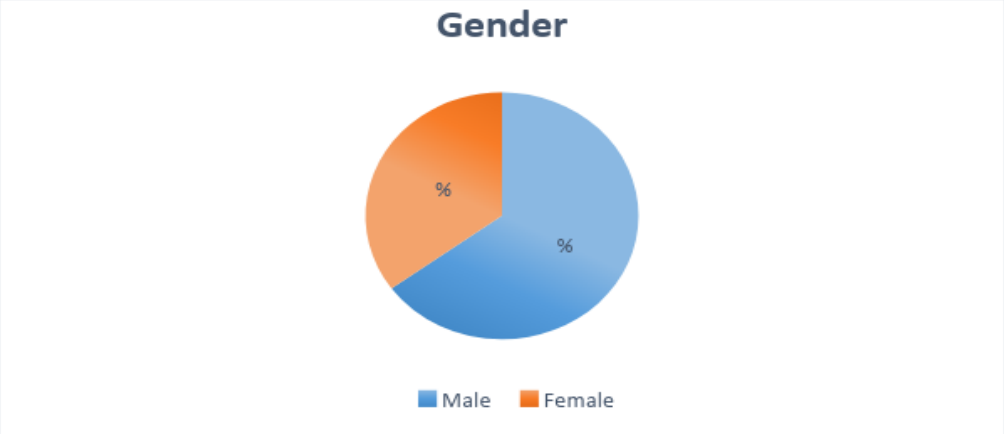
- **Distribution of patients based on gender is shown in table 1**

Table 1 Distribution of patients based on gender

Gender	Frequency	Percentage
Male	26	65
Female	14	35

From table 1 it is seen that 65% patients were male and 35% patients were female. Therefore majority of the patients enrolled in the study were males.

- **Diagrammatic representation of patients based on gender are shown in fig 1**



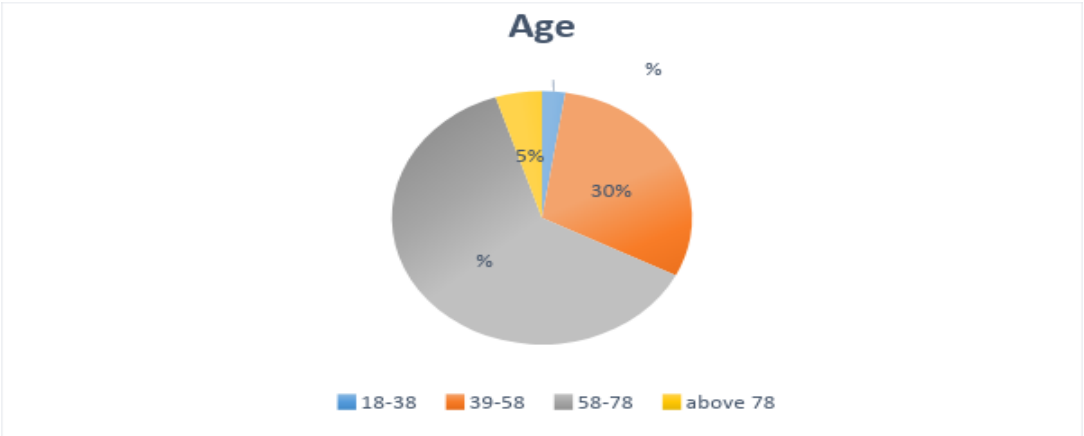
- **Distribution of patients based on age is shown in table 2**

Table 2 Distribution of patients based on age

Age	Frequency	Percentage
18-38	1	2.5
39-58	12	30.0
58-78	25	62.5
Above 78	2	5.0

From table 2 it is seen that 62.5% patients were in age group between 58 - 78 years, 30% patients were in age group between 39-58 years, 5% were between above 78 years and 2.5% were between 18 - 38 years. Therefore majority of the patients were in age group between 58-78 years.

- **Diagrammatic representation of patients based on age are shown in fig 2**



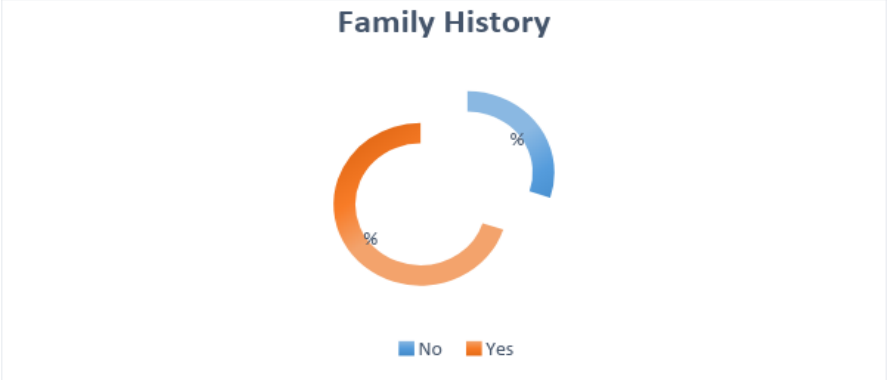
- **Distribution of patients based on family history is shown in table 3**

Table 3 Distribution of patients based on family history

Family History	Frequency	Percentage
Yes	28	70%
No	12	30%

From table 3 it is seen that 70% patients have a family history of CKD and 30% patients do not have family history of CKD. Therefore majority of the patients enrolled in the study have a family history of CKD.

- **Diagrammatic representation of patients based on family history are shown in fig 3**



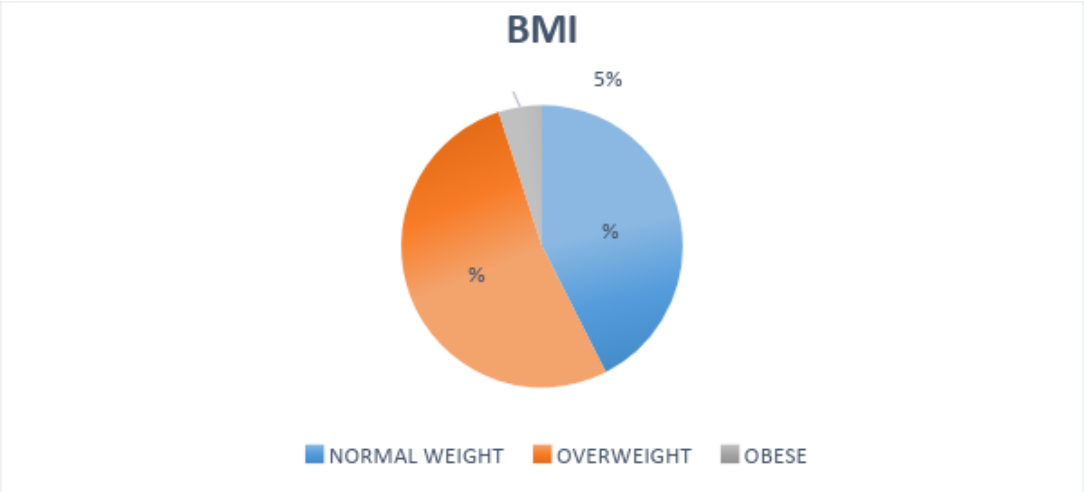
- **Distribution of patients based on Body mass index (BMI) is shown in table 4**

Table 4 Distribution of patients based on BMI

BMI	Frequency	Percentage
Normal weight	17	42.5
Overweight	21	52.5
Obese	2	5

From table 4 it is seen that 52.5% patients were found to be overweight, 42.5% patients were having normal weight and 5% were obese. Therefore majority of the patients selected in the study were overweight.

- **Diagrammatic representation of patients based on BMI are shown in fig 4**



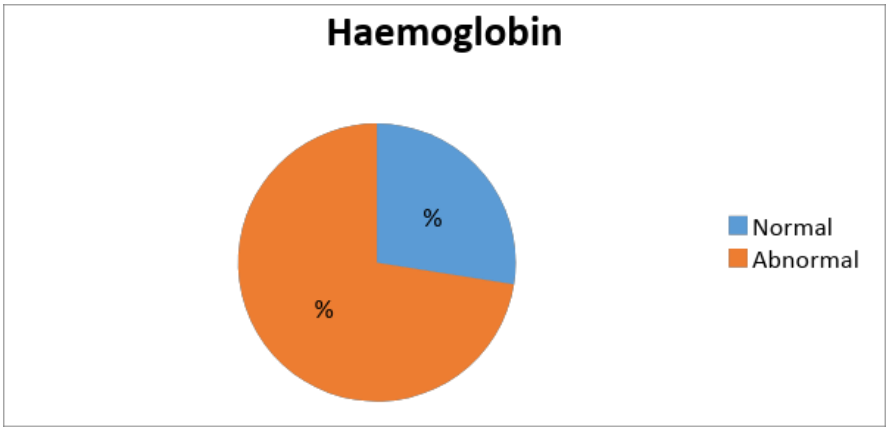
- **Distribution of patients based on haemoglobin is shown in table 5:**

Table 5 Distribution of patients based on haemoglobin

Haemoglobin	Frequency	Percentage
Abnormal	29	72.5
Normal	11	27.5

From table 5 it is seen that 72.5% patients were found to be anemic and 27.5% patients are normal. Therefore majority of the patients selected in the study were anemic.

- **Diagrammatic representation of patients based on haemoglobin are shown in fig 5**



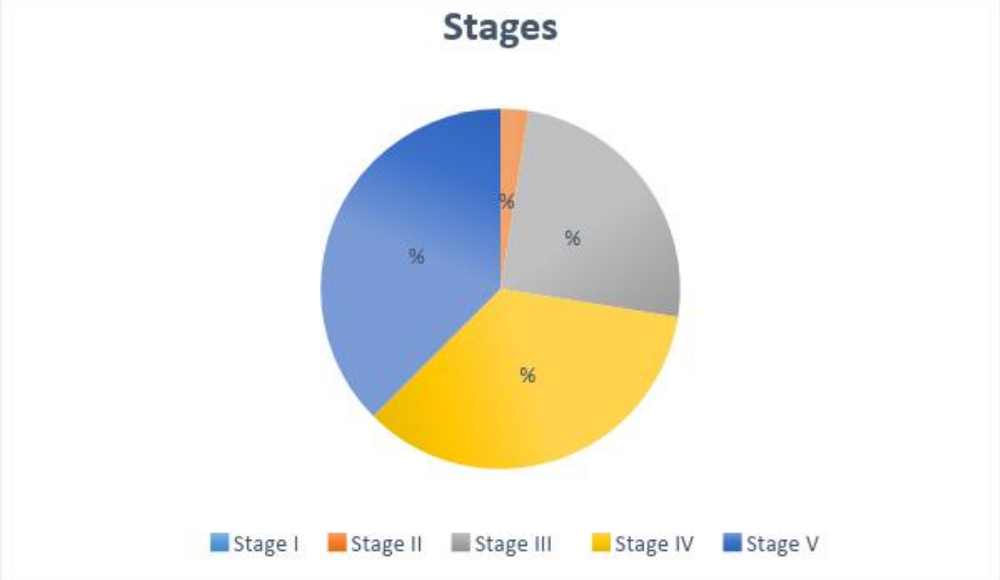
- **Distribution of patients based on Stages of CKD is shown in table 6:**

Table 6 distribution of patients based on Stages of CKD

Stages of CKD	Frequency	Percentage
Stages I	0	0
Stages II	1	2.5
Stages III	10	25
Stages IV	14	35
Stages V	15	37.5

From table 6 it is found that 37.5% patients were of Stage V, 35% patients were of Stage IV, 25% patients were of Stage III and 2.5% patients were of Stage I. Therefore majority of the patients enrolled in the study were of Stage V.

- **Diagrammatic representation of patients based on Stages of CKD are shown in fig 6**



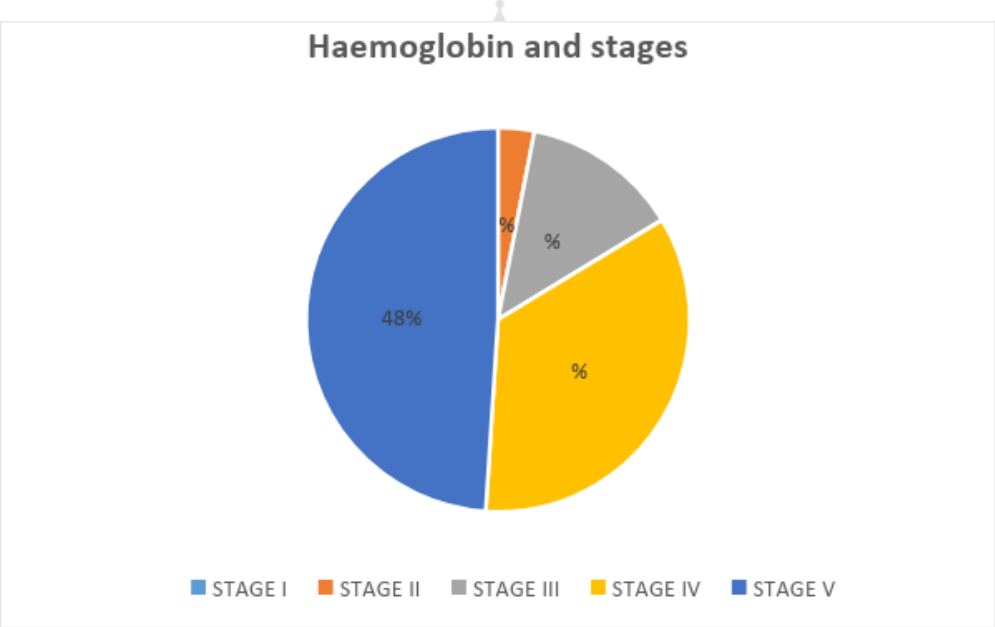
- **Distribution of patients based on haemoglobin and stages of CKD is shown in table 7:**

Table 7. Distribution of patients based on haemoglobin and stages of CKD

Haemoglobin abnormal	Frequency	Percentage
STAGE I	0	0
STAGE II	1	3
STAGE III	4	13
STAGE IV	10	34
STAGE V	14	48

From table 7 it is found that 48% of patients have anemia in Stage V, 34% of patients have anemia in Stage IV, 13% of patients have anemia in Stage III and 3% of patients have anemia in Stage I. Therefore majority of the patients enrolled in the study having anemia were in Stage V.

- **Diagrammatic representation of patients based on haemoglobin and stages of CKD are shown in fig 7**



The data on personal details and laboratory values were collected from 40 CKD patients, analysed using appropriate statistical methods. Frequency and percentage were calculated as summary measures for categorical study variables. Chi-square test was employed for finding out the proportion of anemia in CKD patients. All the analysis were carried out with the help of software SPSS v.21 for windows. William et al. revealed that majority of the patients were anemic in his study and concluded that prevalence of anemia increased as kidney function

decreases[1]. Sang-Ryol Ryu et al. postulated that anemia is a well-known complication in chronic kidney disease (CKD) and associated with progression of CKD and the proportion of having anemia started to increase exponentially from stage II[4]. Thomas C. Dowling revealed that treatment of anemia in predialysis patients with stage II– IV CKD may slow renal disease progression and improve energy, work capacity, health-related quality of life, and cardiac function. Optimizing the haemoglobin or haematocrit value before initiating dialysis may reduce mortality[5].

CONCLUSION

This study depicts the proportion of anemia in CKD patients. Here it is observed that the proportion of anemia was found to be 75.2% which conclude that majority of CKD patients are anemic. In our study, majority of patients were belonging to stage V and the proportion of anemia was also found to be more in stage V. Anemia is a well-known complication in chronic kidney disease (CKD) and associated with progression of CKD, poor quality of life, and increase in morbidity and mortality. Anemia in CKD is due to erythropoietin deficiency from reduced renal mass, iron and nutritional deficiencies, elevation of pro inflammatory mediators in CKD may affect the erythropoiesis in CKD. From this study, it is concluded that treating anemia has the potential to improve clinical and economic outcomes in patients with CKD.

ACKNOWLEDGMENT

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