

Frequency of Iron Deficiency Anemia in Chronic Kidney Disease Patients on Hemodialysis

Hemodialysis in
Kidney Disease
due to Iron
Deficiency
Anemia

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ABSTRACT

Objective: To determine the frequency of iron deficiency anemia among chronic kidney disease patients on hemodialysis therapy.

Study Design: Descriptive / cross sectional study

Place and Duration of Study: This study was conducted at the Nephrology Unit, Institute of Kidney Diseases Hayatabad Peshawar from November 2016 to November 2017.

Materials and Methods: The study was conducted at Nephrology Dialysis unit of institute of Kidney Diseases (IKD) Hayatabad Medical Complex Peshawar Pakistan. Hospital based descriptive cross-sectional study. The study duration was one year. Total sample size was 204 using 15.4% prevalence of IDA in CKD, 95% confidence level 5% margin of error with the help of WHO software for sample size determination.

Results: The study was conducted on 204 patients presented with CKD for dialysis. The mean age of our sample was 38.81 years with a standard deviation of 15.202. We divided the patients in 3 different age groups. Patients in age groups from 18-33 years were 42.2% of patients, in the age group 34-48 years we had 21.6% patients and in age group ≤ 60 years we had 36.3% of patients. Iron deficiency anemia was observed in 126 (61.8) patients while 78 (38.2) patients have no iron deficiency anemia.

Conclusion: Anemia is a common complication among patients with chronic kidney disease. Early detection and treatment of anemia would definitely improve quality of life and reduce the burden of care.

Key Words: Chronic Kidney Disease, Anemia, GFR

Citation of articles: Khan ZM, Khan S, Khan A, Khan MA, Khattak MB. Frequency of Iron Deficiency Anemia in Chronic Kidney Disease Patients on Hemodialysis. Med Forum 2018;29(11):15-18.

INTRODUCTION

Chronic kidney disease (CKD) is defined as a damage to the kidneys affecting its structure and function with glomerular filtration rate (GFR) of less than 60mL/min/1.73 m² for three month and or more three months, irrespective of clinical identification of the disease^{1,2}. There is certain limit to the condition when the nephrons damage exceeds that limit and the functional impairment of the kidneys reaches and overshoot that limit a status is characterized with whatever the underlying etiology, once the loss of nephrons and reduction of functional renal mass reaches a certain point, the remaining nephrons begin a

process of irreversible sclerosis that leads to a progressive decline in the GFR. CKD can have a variety of different presentations depending on the stage of the disease and its cause, as well as patient factors such as age. CKD is common condition that is more prevalent in the elderly population. One of the most common complications of the chronic kidney disease is iron deficiency anemia. Anemia is defined as a level of $< 13\text{g/dL}$ in men and $< 12\text{g/dL}$ in women respectively.³ IDA is one of the most common causes of anemia in developing countries of the world. The basic pathology and reason for causation of anemia in patients with CKD are multiple. Out of all these reasons erythropoietin deficiency is the most important one. Other causes and factors responsible are decreased red blood cell survival in CKD, nutritional deficiency, endocrine involvement and bleeding diathesis^{4,5}. The term CKD is used for group of disorders which affect structure and or function of the kidneys. There is an extensive variation in the disease and is dependent on etiology, pathology and progression of the disorder. The disorder is not only an area of interest and worry for nephrologists but also for medical specialists and general physicians after guidelines have recommended kidney disease as a life-threatening disorder affecting population and needs care by not only nephrologists but also general practitioners and internists⁵.

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Received by: May, 2018

Accepted by: July, 2018

Printed by: November 2018

According to the guidelines the disorder has become a public health problem to help people in its prevention, early detection and management. The purpose of this study was to determine the frequency of iron deficiency anemia in patient with chronic kidney disease (CKD) on hemodialysis. National Kidney foundation's kidney Dialysis out comes quality initiative (K/DOQI) guideline defines CKD as kidney damage or estimated glomerular filtration rate (eGFR) of $< 60\text{ml/min } 1.73\text{m}^2$ for ≥ 3 months. Grading of CKD is achieved by calculating either the creatinine clearance using the modified Cook-off- Gault equation or the estimated glomerular filtration rate (eGFR) by use of the Modification of Diet in the Renal Diseases (M DRD) equation. NKF-K/DOQI guidelines define CKD as follows ⁶.

Stage	Description	GFR(ml/min 1.73m^2)
1	Kidney Damage with normal or Elevate GFR	≥ 90
2	Kidney Damage with mild or Decreased GFR	60-89
3	Moderate decrease GFR	30-59
4	Severe decrease	15-29
5	Kidney failure	<15 (or dialysis)

The guidelines also classified CKD based on severity and therapeutic intervention required of each stage for slowing progression of the disease and treatment of complication, such as anemia and metabolic abnormalities. Stage 4 is severe impairment with severe decreased e GFR $15-29\text{ ml/min per } 1.73\text{m}^2$ in which the focus of care is appropriate preparation for renal replacement therapy and stage 5 defined as established renal failure with e GFR <15 which is accomplished in most cases by sign and symptoms' of uremia, such patients require renal replacement therapy (dialysis and renal transplantation) ⁶. Both incidence and prevalence in patients with CKD has increased globally in both developed and developing countries⁷.

Iron deficiency has been considered as important cause of anemia in CKD patients and these patients manifest iron deficiency as "absolute "or functional" iron deficiency. In CKD patients iron stores are low or even absent as a result of poor intake of nutrition mainly associated with poor appetite resulted by uremia and increased loss through chronic GIT bleeding due to blood vessel fragility associated with uremia, platelet dysfunctional related to uremia, chronic blood retention in the dialysis circuit⁸. Functional iron deficiency appears when the body needs bigger quantity of iron for restoration of normal hemoglobin blood level and it is not supported by its nominal release from iron store in CKD patient's macrophages and hepatocytes to transferring ⁸. In India, Talwar et al studied hematological profile in 27 chronic renal failure patients and the prevalence of anemia was 94% of

which 60% had microcytic hypochromic anemia with serum ferritin low in 62%, serum iron below in 74% of the patients and bone marrow iron study revealed 57% of cases had negative bone marrow iron store ⁹. Several conducted on Chronic Kidney Disease patients concluded iron deficiency anemia as common problem in these patients^{9,10, 11}.

MATERIALS AND METHODS

The study was conducted at Nephrology Dialysis unit of institute of Kidney Diseases (IKD) Hayatabad Medical Complex Peshawar Pakistan. Hospital based descriptive cross-sectional study. One year. Total sample size was 204 using 15.4% prevalence of IDA in CKD, 95% confidence level 5% margin of error with the help of WHO software for sample size determination. All hemodialysis dependent patients being dialyzed at IKD Hayatabad Peshawar with dialysis depending defined as being maintained on regular hemodialysis for the past 3 months and with age limit of 18-60 years was included in the study. Pregnant women patient under 18 years of age and not on hemodialysis

This study was conducted after approval from Hospital ethical and research committee. All out door patients meeting the inclusion criteria were included in the study .The purpose and benefits of study were explained to the patient and a written informed consent were obtained .All patients were subjected to detailed history and examination .They were assured of confidentiality of all data . All the information including name, age, gender and address were recorded in the study proforma strict exclusive criteria were followed to control confounders and bias in study result. 5ml of pre dialysis blood was collected in a BD disposable syringe. It was transferred to EDTA and serum vacutainer for estimation of hemoglobin level and ferritin level Hemoglobin (Hb) estimation was performed on automated hematology analyzer Model sysmex kx -21 and serum ferritin assay was done on (cobass e411 immunoassay analyzer Roch ECL technology at main Laboratory of IKD.

Data collected was entered in SPSS (Statistical Package for social sciences) version 17 Mean \pm Sd were calculated for quantitative variables like age, Hb and serum ferritin level. Frequency and percentage were calculated for categorical variables like gender and iron supplement to see effect modifiers .Results were presented as tables and graph /charts.

RESULTS

The study was conducted on 204 patients presented with CKD for dialysis at nephrology unit IKD HMC Peshawar from November 2016 to November 2017. The mean age of our sample was 38.81 years with a standard deviation of 15.202. We divided the patients in 3 different age groups.

In age groups from 18-33 years we had 42.2% of patients, in the age group 34-48 years we had 21.6% patients and in age group <=60 years we had 36.3% of patients as given table 1.

Out of 204 patients included in the study there were 119 (58.33%) male patients and 85 (41.67) female patients. The mean and standard deviation of hemoglobin was 9.01± 1.93 and number of hemodialysis was 1.92 ± 0.453 in patient having IDA in CKD. The mean number of blood transfusion was observed as 1.30 ± 1.39.

Out of 204 patients 160 (78.4%) patients had used iron supplementation while 44 (21.6%) patients have not used iron supplementation. (Table 2)

Table No. 1: Age group wise distribution of Sample (n=204)

Age Groups (years)	Frequency	Percent
18-33	86	42.2
34-48	44	21.6
<=60	74	36.3
Total	204	100.0

Table No. 2: Frequency of patients taking iron supplementation

Iron Supplementation	Frequency	Percent
Yes	160	78.4
No	44	21.6
Total	204	100.0

Table No. 3: Frequency of Iron deficiency Anemia in sample (n=204)

Iron deficiency anemia	Frequency	Percent
Yes	126	61.8
No	78	38.2
Total	204	100.0

Table No. 4: Age group wise stratification of Iron Deficiency Anemia (n=204)

Age Groups	Iron Deficiency Anemia		Total	p-value
	Yes	No		
18-33	57	29	86	0.42
	66.3%	33.7%	100.0%	
34-48	20	24	44	
	45.5%	54.5%	100.0%	
<=60	49	25	74	
	66.2%	33.8%	100.0%	
Total	126	78	204	

Out of 204 patients iron deficiency anemia was observed in 126 (61.8) patients while 78 (38.2) patients have no iron deficiency anemia (Table 3)

We stratified iron deficiency anemia with regards to different age groups and observed that the difference was statistically significant with a P value of 0.42 (Table 4) we stratified the iron deficiency with regards to gender and observed that the difference was statistically insignificant with a P value of 0.884 (Table 5) we stratified the iron deficiency with regards to iron supplement and observed that the difference was statistically insignificant with a P value of 0.323 (Table 6).

Table No. 5: Iron Deficiency Anemia stratification related to gender

Gender	Iron Deficiency Anemia		Total	p-value
	Yes	No		
Male	74	45	119	0.884
	62.2%	37.8%	100.0%	
Female	52	33	85	
	61.2%	38.8%	100.0%	
Total	126	78	204	
	61.8%	38.2%	100.0%	

Table No. 6: Cross tabulation of Iron deficiency anemia and Iron supplementation

Iron Supplementation	Iron Deficiency Anemia		Total	p-value
	Yes	No		
Yes	96	64	160	0.323
	60.0%	40.0%	100.0%	
No	30	14	44	
	68.2%	31.8%	100.0%	
Total	126	78	204	
	61.8%	38.2%	100.0%	

DISCUSSION

Anemia is a common complication among patients with CKD. Early detection and treatment of anemia would definitely improve quality of life and reduce the burden of care.

This study recruited CKD patients among patients with different kidney diseases seen at IKD HMC Peshawar The nephrology unit at IKD is the first and the only unit in a public hospital offering care and treatment for kidney diseases patients. The unit serves patients for the whole province, thus the study is a tertiary care hospital based.

The majority of study subjects were Male (58.33%) in line with several other studies emulating the fact ^{12,13} as men suffer CKD more than females due to fact that in developing countries men tend to seek medical attention more than females.

The mean age in this study was 38.81 ± 15.202 years which was similar finding and 45.0 ± 15.0 and 47.0 ± 2.0 years in the Nigerian and Indonesia study respectively.¹⁴⁻¹⁵

Thus average age in this study is on the other hand is another reminder that increasing age is a traditional risk factor for CKD as age increases eGFR decreases, therefore, CKD is common in adult as compared to young age Hypertension and diabetes mellitus were identified as main underlying diseases for CKD in this study.

In this study (61.8%) of CKD patients were iron deficient as indicated by serum ferritin <100 ng/ml and hemoglobin level was 9.01 ± 1.93 which is in agreement with another study done by HSU et al reported 62.6% of CKD patients with anemia are iron deficient as indicated by serum ferritin <100 ng/ml.

CONCLUSION

Anemia is a common complication among patients with chronic kidney disease. Early detection and treatment of anemia would definitely improve quality of life and reduce the burden of care.

Author's Contribution:

Concept & Design of Study:	Malik Zeb
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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