

Prevalence of Anemia in Chronic Kidney Disease

Kazi Mazharul Islam^{*1}, Suny Ajmery², Mahumudul Huda³,
Suporna Saleh⁴, Bhagyoshree Karmokar Jyoti⁵, Tumpa Saha⁶

Abstract

Introduction: Anemia in CKD is associated with cognitive impairment, sleep disturbances, CKD progression, cardiovascular co morbidities, and higher mortality. Direct healthcare costs are higher in CKD patients with anemia. The aim of the present study was to evaluate the prevalence of anemia in chronic kidney disease patients at a tertiary level teaching hospital in Dhaka. **Materials and Methods:** It was an observational type of descriptive study, conducted in the Dhaka National Medical College, Dhaka, during the study period of January 2019 to April 2019. The study was approved by the institutional ethical committee. **Results:** Most of the patients (44.56%) belonged to the middle age group 40 - 60 years. Male patients (64.40%) are suffering from more CKD than the female patients (35.50%). Most of the patients (58.41%) are anemic. 45% CKD patients also suffering from diabetes mellitus. Most of the patients (51.48%) treated with oral iron agents for anemia in CKD patients. **Conclusion:** In this study most of the chronic kidney disease patients are anemic. Improving our understanding of the molecular mechanisms underlying anemia of CKD holds promise for developing pharmacological agents that more closely target the underlying pathogenic mechanisms of this disease for improved efficacy and reduced treatment related adverse outcomes.

Keywords: Anemia, CKD.

Number of Tables: 03; **Number of Figures:** 02; **Number of References:** 20; **Number of Correspondence:** 05.

*1. Corresponding Author:

Dr. Kazi Mazharul Islam

Senior lecturer
Department of Pathology
Dhaka National Medical College.
Email: drmilon2004@yahoo.com
Mobile: 01779410111

2. Dr. Suny Ajmery

Assistant Professor
Department of Pharmacology
Jahurul Islam Medical College, Dhaka.

3. Dr. Mahumudul Huda

Associate Professor
Department of Pathology
Dhaka National Medical College, Dhaka.

4. Dr. Suporna Saleh

Assistant Professor
Department of Pathology
Dhaka National Medical College, Dhaka.

5. Dr. Bhagyoshree Karmokar Jyoti

Medical Officer
Department of Surgery
Dhaka Medical College, Dhaka.

6. Dr. Tumpa Saha

Medical Office
Department of Oncology
Anower Khan Modern Medical College, Dhaka.

Introduction:

Chronic kidney disease (CKD) is a prevalent, worldwide condition, and the number of patients affected continues to increase. In the United States, it is estimated that, by 2010, > 2 million people will be afflicted with CKD. Although the most severe form of CKD is kidney failure and the need for renal replacement therapy (hemodialysis, peritoneal dialysis, or renal transplantation), many more patients are affected by less severe forms of CKD. The National Kidney Foundation (NKF) Kidney Disease Outcomes Quality Initiative (KDOQI) defines CKD based on glomerular filtration rate (GFR) and divides the disease into five distinct stages. In Stage 1 CKD, the GFR is ≥ 90 ml/min/1.73 m². Stages 2, 3, and 4 CKD are defined by a GFR of 60–89 ml/min/1.73 m², 30–59 ml/min/1.73 m², and 15–29 ml/min/1.73 m², respectively. The final stage, Stage 5, occurs when the GFR is < 15 ml/min/1.73 m² or when patients require dialysis¹. Anemia is a common feature of CKD associated with poor outcomes. Anemia was first linked to CKD over 170 years ago by Richard Bright. As kidney disease progresses, anemia increases in prevalence, affecting nearly all patients with stage 5 CKD. Anemia in CKD is associated with reduced quality of life and increased cardiovascular disease, hospitalizations, cognitive impairment, and mortality. Anemia in CKD is typically normocytic, normochromic, and hypoproliferative². Anemia occurs due to the reduction of function of kidney. One of the lesser known functions of the kidneys is the production of erythropoietin, a signaling molecule that stimulates red blood cell production, in response to decreased oxygen levels in the blood. Any disruption of this process, e.g., secondary to a functional abnormality due to CKD, has the potential to produce anemia, a condition in which the number of circulating red blood cells, and therefore the level of hemoglobin, is lower than normal. Other possible causes of anemia in CKD patients include

iron deficiency, inflammation, and the accumulation of uremic toxins³. The correction of anemia has been shown to improve cardiac and cognitive functions, quality of life, physical activity, shorten the hospitalization period and decrease mortality⁴. Since the introduction of recombinant human erythropoietin, erythropoiesis-stimulating agents (ESA) have become the cornerstone of CKD anaemia treatment and have reduced requirements for transfusion, improved the quality of life and reduced left ventricular hypertrophy and morbidity and mortality in these patients⁵. The target Hb of >13 g/dl might lead to increase in the risk of CVD although maintaining a high Hb of >12 g/dl without Erythropoietic stimulating agent is not harmful for CKD patients. It is desirable to determine the target Hb in dialysis patients depending on their ages. Taken all the international guidelines we should consider administration of ESA when the Hb level becomes <11 g/dl in pre-dialysis patients and <10 g/dl in dialysis patients⁶. The aim of the present study was to evaluate the hemoglobin level in chronic kidney disease patients at a tertiary level teaching hospital in Dhaka.

Materials and Methods:

An observational, cross sectional study was conducted from January 2019 to April 2019 among patients attending at nephrology outpatient department of the Dhaka National Medical College after obtaining requisite consent from the patients. Only known case of chronic kidney patients were included in this study. Once the consultation by the physician was over the patients were interviewed. The interviews were held in the corridor just outside the medical outpatient department. After taking informed consent and informing details about the procedure, blood sample was taken for measuring hemoglobin. If the patient hemoglobin level <13 g/dl (male) or <12g/dl (female) then he or she considered as an anemic. All filled questionnaires were entered into the computer for subsequent analysis using SPSS method version 20.1. The study was approved by the institutional ethical committee.

Results:

According to table I: the age structures of the patients have been categorized in years into three groups. Overall 23 (22.78%) patients were in < 40 years old while 45 (44.56%) patients were 40-60 years old, 32 (31.69%) patients belong to > 60 years age group. Most patients belonged to the middle age group 40 - 60 years. According to figure 1: Total numbers of patients both male and female were 101. It comprised of 65 (64.40%) male and 36 (35.50%) female. Male patients are suffering from more CKD than the female patients. According to table 2: 59 (58.41%) CKD patients suffering from baseline anemia. 42 (41.58%) CKD patients' hemoglobin levels are normal. According to figure 2, 45% CKD patients suffering from diabetes mellitus. According to table 3: Most of the patients (51.48%) treated with oral iron agents for anemia in CKD patients. 21.78% patients treated with erythropoietin agent and 26.73% patients treated with both oral iron and erythropoietin agent.

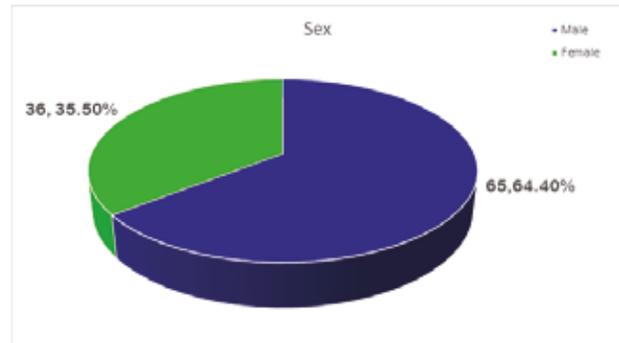


Figure 1: Pie chart showing percentage of sex distribution of patient.

Table-I: Age distribution of the study population (n=101).

Age in years (Range 08-98 years)	Frequency	Percentage (%)
<40	23	22.78
40-60	45	44.56
>60	32	31.69
Total	101	100

Table-II: Hemoglobin status of the CKD patients (n=101).

Anemic status	Frequency	Percentage (%)
Baseline Anemia	59	58.41%
No baseline anemia	42	41.58%

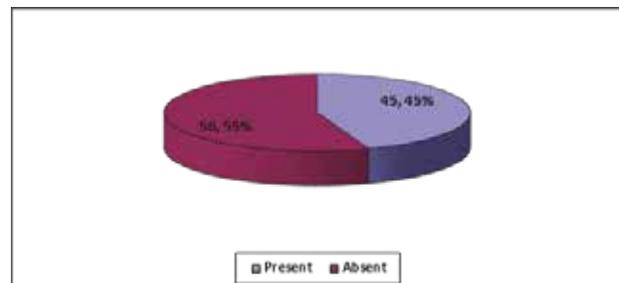


Figure 2: Pie chart showing presence of DM in the CKD patients (n=101).

Table-III: Management of anemia of the CKD patients (n=101).

Treatment	Frequency	Percentage (%)
Oral iron	52	51.48%
Erythropoietin agent	22	21.78%
Oral iron+	27	26.73%
Erythropoietin agent		

Discussion:

Chronic kidney disease (CKD) is one of the most widespread diseases and it is deemed to be a real public health problem worldwide⁷. This study showed that male patients (64.40%) were suffering from chronic kidney disease than the female patients (35.50%). In the Bangladesh scenario it is noticed that female populations are reluctant to utilize health care facilities even if they are critically ill and especially by the lower socio-economic strata. Similar results were obtained in the study conducted

by Amoako et al. (2014)⁸. Dissimilar results were obtained in the study conducted by Anupama and Uma (2014)⁹. Their study revealed that female patients (54.43%) suffering from more chronic kidney disease than male patients. In our study, the most (44.56%) common age groups were 40-60 years. Similar results were obtained in the study conducted by Bapat et al. (2008) study. Their study showed that 41-60 years patients (42.6%) suffering from more chronic kidney disease than other aged patients¹⁰. Anemia is common in patients with chronic kidney disease increasing the risk of cognitive impairment, sleep disturbances, cardiovascular comorbidities, need for dialysis, and all-cause mortality¹¹. In our study 58.41% CKD patients suffering from anemia which is higher than the number reported by Alan S. GO. et al. (2006) study. In their study they reported that 42.58% patients suffering from baseline anemia¹². Multi-morbidity, defined as the presence of two or more chronic health conditions in an individual, is a growing concern whilst caring for CKD patients. Some individual co-morbidity are known risk factors for CKD progression. In addition, multi-morbidity may increase the treatment burden on patients, lead to poly-pharmacy, and have negative impacts on patient quality of life¹³. In our study 45% CKD patients also suffering from DM. Similar results were obtained in the study conducted by Finkelstein, FO et al. study (2009). Their study stated that 45.7% CKD patients suffering from DM¹⁴. Many patients with advanced chronic kidney disease (CKD) are in negative iron balance as a result of reduced dietary intake, impaired absorption from the gut, and increased iron losses. This is particularly true in hemodialysis (HD) patients, for whom supplemental iron is often essential to keep pace with blood loss and the requirements for erythropoiesis¹⁵. In our study 51.48% patients treated with oral iron agent for anemia in CKD patients. Dissimilar results were obtained in the study conducted by Sang Royle Ryu et al. (2016) study¹⁶. In their study they stated that 27.7% patients treated with oral iron agent. Erythropoiesis-stimulating agents (ESAs) have been used to manage anemia in chronic kidney disease (CKD) to reduce transfusion requirements and anemia symptoms¹⁷. The introduction of erythropoietin (Epo) in clinical practice, more than two decades ago, altered completely the management of patients with chronic kidney disease (CKD)¹⁸. In our study 22% patients treated with Erythropoietin agent for anemia in CKD patients. N Dimkovic stated that early administration of erythropoietin is recommended especially in high-risk patients: the elderly, diabetics and those with coronary artery and peripheral artery diseases¹⁹. Administration of Erythropoietin may be associated with exacerbation of hypertension in about 5% of patients that will require dose adjustment or switching to a different ESA²⁰.

Conclusion:

In our study, most of the patients are anemic. In most of the patients the severity of anemia can be easily reduced by the use of erythropoietin agents and intravenous iron as

necessary in the primary care setting. Monthly follow-up is required to evaluate general cardio renal health and to ensure that HB levels do not overshoot the optimal range of 11-12 g/dl.

Conflict of Interest: None.

Acknowledgement:

The authors are grateful to the entire staff of the nephrology department of Dhaka National Medical College Hospital, Dhaka for their cooperation and support during the study period.

References:

1. Neeta Bahal, O Mana. "Anemia in patients with chronic kidney Disease". American Diabetes association, Diabetes spectrum. 2008; 21(1): 12-19.
<https://doi.org/10.2337/diaspect.21.1.12>
2. Jodie L. Babitt and Herbert Y. Lin. "Mechanisms of anemia in CKD". Journal of the American Society of Nephrology. 2012; 23 (10):1631-1634.
<https://doi.org/10.1681/ASN.2011111078>
PMid:22935483 PMCID:PMC3458456
3. Melissa E. Stauffer and Tao fan. "Prevalence of anemia in chronic kidney disease in the united states". US national library of Medicine. 2014; 9 (1).
<https://doi.org/10.1371/journal.pone.0084943>
PMid:24392162 PMCID:PMC3879360
4. Alagoz S, Dincer MT, Eren N, Bakir A, Pekpak M, Trabulus S, et al. "Prevalence of anemia in predialysis chronic kidney disease: Is the study center a significant factor?". Plos one. 2020; 15(4).
<https://doi.org/10.1371/journal.pone.0230980>
PMid:32240223 PMCID:PMC7117725
5. Amenós AC, Castela AM., Ros JF. "Prevalence of anemia and its clinical management in stage 3-5 chronic kidney disease not on dialysis in Catalonia: the MICENAS I study". Nefrologia.2014; 34(2).
6. Mimura I, Tanaka T., Nangaku M. "How the Target Hemoglobin of renal anemia should be?" Nephron. 2015; 131(3).
<https://doi.org/10.1159/000440849>
PMid:26381503
7. Barbieri, M. A., Rottura, M., Cicala, G. "Chronic Kidney Disease Management in General Practice: A Focus on Inappropriate Drugs Prescriptions", Journal of clinical medicine. 2020; 9(5):1346.
<https://doi.org/10.3390/jcm9051346>
PMid:32375415 PMCID:PMC7290782
8. Amoako, Y A., Laryea, D.O., Addo, G.B. "Clinical and demographic characteristics of chronic kidney disease patients in a tertiary facility in Ghana". Pan Afr Med J. 2014; 18.
<https://doi.org/10.11604/pamj.2014.18.274.4192>
PMid:25489368 PMCID:PMC4258203

9. Anupama, Y. J. and Uma, G. "Prevalence of chronic kidney disease among adults in a rural community in south india : result from the kidney disease screening project (KIDS) project". *Indian J Nephrol.* 2014; 24 (4): 214-221.

<https://doi.org/10.4103/0971-4065.132990>

PMid:25097333 PMCID:PMC4119333

10. Bapat, U., Nayak, G.S., Kedleya, P.G. "Demographics and social factors associated with acceptance of treatment in patients with chronic kidney disease". *Saudi J Kidney Dis Transpl.* 2008;19:132-136.

11. Vestergaard, S. V., Heide-Jorgensen, U. (2020) "Risk of Anemia in Patients with Newly Identified Chronic Kidney Disease - A Population-Based Cohort Study". *Clinical epidemiology.* 2020; 12:953-962.

<https://doi.org/10.2147/CLEP.S259648>

PMid:32982460 PMCID:PMC7494011

12. GO, A.S., Yang, J and Ackerson, LM. "Hemoglobin level, chronic kidney disease and the risks of death and hospitalization in adults with chronic heart failure". *AHA Journals.* 2006; 113(23): 2713-2723.

<https://doi.org/10.1161/CIRCULATIONAHA.105.577577>

PMid:16754803

13. Lee, W. C., Lee, Y. T., Li, L. C., N, et al. "The Number of Co-morbidities Predicts Renal Outcomes in Patients with Stage 3-5 Chronic Kidney Disease". *Journal of clinical medicine.* 2008; 7(12):493.

<https://doi.org/10.3390/jcm7120493>

PMid:30486496 PMCID:PMC6306906

14. Finkelstein, FO. Story, K., and Firanek, C. "Health related quality of life and hemoglobin levels in chronic kidney disease patients". *Clin J AM Soc Nephrol.* 2009: 33-38.

<https://doi.org/10.2215/CJN.00630208>

PMid:18987300 PMCID:PMC2615698

15. Macdougall I.C., Bircher A.J. "Iron management in chronic kidney disease: conclusions from a "Kidney Disease: Improving Global Outcomes" (KDIGO) Controversies Conference". *Kidney international journal.* 2015: 28-39.

16. Ryu, SR., Park, SK. And Jung, JY., et al. "The prevalence and management of anemia in chronic kidney disease patients: result from the Korean cohort study for outcome in patients with CKD". *J Korean Med Sci.* 2016; 32(2):249-256.

<https://doi.org/10.3346/jkms.2017.32.2.249>

PMid:28049235 PMCID:PMC5219990

17. Sumeska Thavarajah and Michael J. Choi. "The use of erythropoiesis-stimulating agents in patients with CKD and cancer: A clinical approach". *American journal of kidney diseases.* 2019; 74(5):667-674.

<https://doi.org/10.1053/j.ajkd.2019.04.022>

PMid:31395400

18. Provatopoulou, S. T., Ziroyiannis, P. N. "Clinical use of erythropoietin in chronic kidney disease: outcomes and future prospects". *Hippokratia.* 2011;15(2): 109-115.

19. N Dimkovic. "Erythropoietin-beta in the treatment of anemia in patients with chronic renal insufficiency". *Med pregl.* 2001; 54(5-60):235-240.

20. Hayat A., Haria D., Salifu MO. "Erythropoietin stimulating agents in the management of anemia of chronic kidney disease". *Patient Prefer Adherence.* 2008:295-200.