Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2024i1.1068
*Biol. Clin. Sci. Res. J., Volume, **2024**: 1068*
Original research article

ANEMIA PATTERN IN PATIENTS WITH CHRONIC KIDNEY DISEASES PRESENTED AT TERTIARY CARE HOSPITAL

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(Received, 7th August 2024, Revised 2nd September 2024, Published 2nd September 2024)

Abstract: *Anemia is a common complication in patients with chronic kidney disease (CKD) and contributes significantly to morbidity. Understanding the patterns and severity of anemia within this population can guide more effective management strategies.* ***Objective:*** *To assess the pattern and severity of anemia in patients with chronic kidney disease.* ***Methods:*** *This cross-sectional study was conducted from January 2024 to July 2024, involving 250 anemic CKD patients aged 18 years and above. The study was carried out at a nephrology care facility, with participants selected based on predefined inclusion and exclusion criteria. Data on demographic information, laboratory profiles, and anemia patterns were collected. Anemia was classified into mild, moderate, and severe categories. Statistical analysis was performed using SPSS version 24 to establish associations between the severity of CKD and the type of anemia.* ***Results:*** *Among the patients, 59.2% had normochromic anemia, 18.8% had hypochromic anemia, and 14% had macrocytic anemia. Moderate anemia was the most prevalent severity, observed in 51.2% of cases, followed by mild anemia in 41.6% and severe anemia in 7.2%. A significant association was noted between the severity of CKD and the type of anemia, particularly with normochromic anemia being more prevalent in patients with moderate CKD.* ***Conclusion:*** *The study concludes that normochromic anemia is the most predominant pattern of anemia in CKD patients, followed by hypochromic and macrocytic anemia. These findings underscore the importance of regular monitoring and tailored anemia management in CKD patients to improve overall patient outcomes.*

Keywords: Chronic Kidney Disease, Anemia, Normochromic Anemia, Hypochromic Anemia, Macrocytic Anemia, eGFR, Hemoglobin.

Introduction

Patients with chronic kidney disease (CKD) require specific restrictions and limitations. The kidneys play a crucial role in regulating blood pressure, maintaining electrolyte balance, synthesizing the active type of vitamin D, and producing erythropoietin. This hormone stimulates the creation of red blood cells (1, 2). CKD has detrimental effects on nearly all physiological systems in the body. In CKD, the kidneys experience reduced functionality, and symptoms only become apparent in advanced stages (3). These advanced stages are associated with a high risk of complications such as cardiac issues, vascular problems, anemia, pulmonary complications, sleep disturbances, fatigue, depression, bleeding, viral hepatitis B & C infection, and uremic pruritus (4-6).

Anemia is a common and controllable risk factor for CKD that is closely linked to the course of CKD and the development of adverse effects. Anemia of chronic kidney disease predominantly occurs due to decreased erythropoietin release from the renal peritubular interstitium, along with many other pathophysiologic causes (7). Anemia correction improves the symptoms of the condition, such as cognitive and cardiac function, and reduces the rates of heart enlargement and left ventricular hypertrophy. This leads to shorter hospital stays and a lower risk of death. Several variables contribute to the development of anemia in CKD, including gender disparities, infections, and the utilization of renin-angiotensin aldosterone channel inhibitors. Additional factors contributing to the high occurrence of anemia in CKD include inflammation (8).

Infections also play a role, as they can lead to increased destruction of red blood cells, worsening proteinuria, and sudden deterioration of kidney function. Inadequate blood pressure management leads to persistent pressure inside the glomerular and peritubular capillaries, potentially affecting the flow of blood in the kidneys (9, 10). According to reports, the pace at which hemoglobin decreases in CKD is more rapid during the initial phases of the illness (11, 12).

Given the negative impact of anemia on the quality of life and mortality in patients with CKD, it is crucial to gain a deeper understanding, particularly in low-income nations, to enable nephrologists to provide more effective management of anemia in the early stages of CKD. This study aims to determine the anemia pattern in patients with chronic kidney diseases.

Methodology

This study employed a cross-sectional design conducted in the Department of Nephrology of Rehman Medical Institute, Peshawar, from January 2024 to July 2024 after

obtaining ethical approval from the hospital. This study included patients with chronic kidney disease and anemia. Patients aged 18 years and above of either gender diagnosed with chronic kidney disease (CKD) with an estimated glomerular filtration rate (eGFR) < 60 ml/min and hemoglobin < 12 g/dl for female patients while for males < 13.5 g/dl were included. Patients having acute kidney injury or with known hematological disorders unrelated to CKD were excluded. The severity of anemia was categorized as mild, moderate, and severe. Blood samples were collected from all the patients and sent to the hospital's laboratory for peripheral blood film assessment to determine the pattern of anemia.

All the data, including demographics, laboratory profiles, and patterns of anemia, were recorded in an Excel sheet and later converted to SPSS 24 for analysis. The Chi-square test is used for the association, keeping the P value notable at < 0.05.

Results

The study on the pattern of anemia in chronic liver disease patients analyzed data from 250 individuals with a mean age of 52.04±13.7 years. The mean hemoglobin level was recorded at 10.13±1.26 g/dL, indicating a prevalent trend of anemia among the participants. The mean eGFR was 46.14±10.08 ml/min. Most of the patients were male, 167 (66.8%), with females constituting 83 (33.2%). Anemia severity was categorized as mild in (104) 41.6% of the cases, moderate in 128 (51.2%), and severe in 18 (7.2%). Chronic kidney disease (CKD) severity, a critical comorbidity, was observed as moderate in 91.2% and severe in 8.8% of the cohort. Regarding the anemia patterns, normochromic anemia was the most common, affecting 148 (59.2%) of patients, followed by hypochromic anemia 47 (18.8%), macrocytic anemia 35 (14%), and hemolytic anemia 20 (8%). The distribution of anemia patterns regarding CKD severity was further analyzed. Normochromic anemia was prevalent across both moderate and severe CKD cases, with a significantly higher occurrence in moderate CKD (95.3%) compared to severe CKD (4.7%), showing a statistically significant association (P = 0.01). Similarly, hypochromic anemia was more common in moderate CKD (85.1%) than in severe CKD (14.9%). In contrast, macrocytic and hemolytic anemias were less frequent but still notably present, with hemolytic anemia showing a higher relative occurrence in severe CKD (30%).

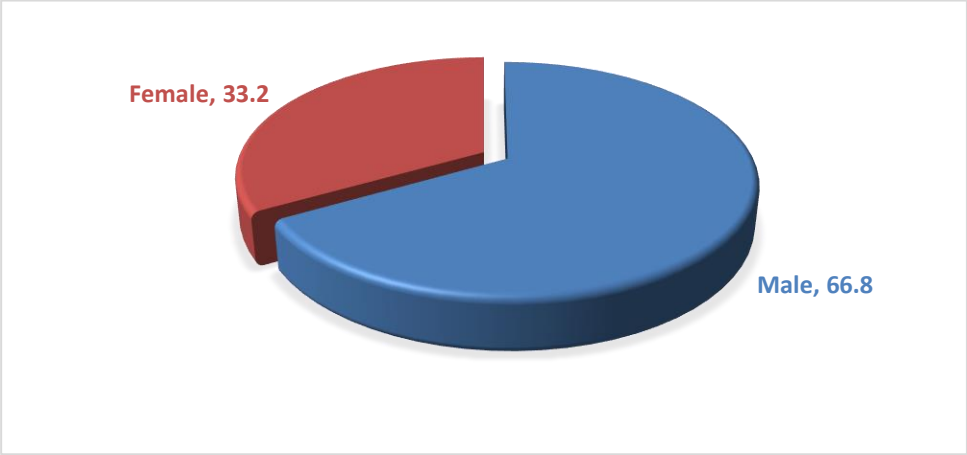

Figure 1 Gender distribution

Table 1 Severity of anemia

Severity of anemia	Frequency	Percent
Mild	104	41.6
Moderate	128	51.2
Severe	18	7.2
Total	250	100.0

Table 2 Severity of chronic kidney disease (CKD)

Severity of CKD	Frequency	Percent
Moderate CKD	228	91.2
Severe CKD	22	8.8
Total	250	100.0

Table 3 Pattern of anemia

Pattern of anemia	Frequency	Percent

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Normochromic anemia	148	59.2
Hypochromic anemia	47	18.8
Macrocytic anemia	35	14.0
Hemolytic anemia	20	8.0
Total	250	100.0

Table 4 Association of pattern of anemia with severity of CKD

		Severity of CKD		Total	P value
		Moderate CKD	Severe CKD		
Pattern of anemia	Normochromic anemia	141	7	148	0.01
		95.3%	4.7%	100.0%	
	Hypochromic anemia	40	7	47	
		85.1%	14.9%	100.0%	
	Macrocytic anemia	33	2	35	
		94.3%	5.7%	100.0%	
	Hemolytic anemia	14	6	20	
		70.0%	30.0%	100.0%	
Total		228	22	250	
		91.2%	8.8%	100.0%	

Discussion

The pattern of anemia in chronic kidney disease (CKD) patients is a critical factor influencing patient outcomes, particularly concerning the management of CKD and its associated complications.

In our study, the mean hemoglobin level was 10.13±1.26 g/dL, and anemia severity was categorized as mild in 41.6%, moderate in 51.2%, and severe in 7.2% of cases. This finding aligns with the study conducted in Nepal, where a similarly high prevalence of anemia was noted among CKD patients, with 96.8% of the patients affected (13). However, the Nepal study reported a slightly lower mean hemoglobin level of 9.45±1.60 g/dL and a higher percentage of patients with severe anemia (58.9%). The contrast in the severity of anemia between the two studies might be due to differences in the population's underlying health conditions or the criteria used to define anemia severity.

In comparison, the study from Pakistan reported a lower prevalence of anemia (48.62%), with moderate and severe CKD stages having higher associations with anemia (14). The differences in the reported prevalence could be due to variations in study design, diagnostic criteria, or patient demographics.

We found that anemia severity was higher in increasing stages of CKD, which is also reported by the study above from Pakistan; they reported that the severity of anemia was linked with the increasing stages of CKD.(14)

Our study found normochromic anemia to be the most common pattern, affecting 59.2% of patients, followed by hypochromic (18.8%), macrocytic (14%), and hemolytic anemia (8%). This contrasts with the findings from the study in Nepal, where microcytic hypochromic anemia was the most prevalent (44.7%), followed by normocytic normochromic anemia (43.7%). (13) The higher occurrence of microcytic hypochromic anemia in the Nepal study could reflect differences in the population's nutritional status, particularly iron deficiency, which is more prevalent in certain regions.

In Iraq, the pattern of anemia was also similar to our study, with a significant prevalence of microcytic hypochromic anemia, which may be linked to chronic blood loss or nutritional deficiencies common in the region. They reported that hypochromic c anemia was present in 8 (20%) patients, macrocytic anemia in 5 (12.5%) patients, and hemolytic anemia in 2 (5%) patients. (15)

The variations in anemia patterns and severities across these studies underscore the need for tailored approaches to anemia management in CKD patients. In regions where normochromic anemia is more common, as seen in our research, treatment strategies might focus more on addressing erythropoietin deficiency and managing inflammation.

Conclusion

We conclude that normochromic anemia was the most prevalent pattern of anemia in chronic kidney disease patients, followed by hypochromic anemia, macrocytic anemia, and hemolytic anemia, respectively. We advise the critical need for early detection and targeted management of anemia in CKD patients to prevent further complications.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate.

It is approved by the department concerned. (IRBEC/RMCH-024/23)

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

Authors Contribution

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Concept & Design of Study

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