Original Article

EXPLORING THE PREVALENCE AND UNDERLYING CAUSES OF ANEMIA IN HEMODIALYSIS PATIENTS A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Anemia is a common complication among patients with chronic kidney disease (CKD), especially those who is on hemodialysis? It also has a marked effect on their Quality of Life and, with it, their morbidity-mobility. This research aimed to evaluate the frequency and incidence of Anemia in hemodialysis patients at IKD

Objectives: to find out the incidence and etiological factors responsible for Anemia in hemodialysis patients at IKD

Study design: A cross-sectional study

Duration and place of study. From 05- June 2023 to 05 Aug 2023, department of urology institute of kidney diseases Peshawar

Methods: Out of 200 hemodialysis patients of IKD Peshawar. Demographics, clinical parameters and laboratory values were collected. Anemia was characterized by hemoglobin <13 g/dL in men and <12 g/dL for women. Statistical Analysis: Descriptive statistics, including mean and standard deviation assisted by the p-value for determining significance.

Results: Out of 200 Patients had a mean age of 58.4 years (SD =12.6). 85% of patients had Anemia, with a mean hemoglobin 10.2 g/dL (SD 1.4) in anemic patients. The leading causes of anemia were iron deficiency (60%), inflammatory states (40%) and erythropoietin resistance(alone or in combinations) 25%, respectively. Anemia prevalence was significantly associated with all the comorbidities and increased hemodialysis duration.

Conclusion: Anemia is highly prevalent among hemodialysis patients at IKD, most often attributed to iron deficiency and inflammation. Treatments are effective as long the condition can be caught early, so regular monitoring is vital for a more favorable prognosis. Additional investigation is necessary to improve anemia care in this population.

Keywords: Anemia, Hemodialysis, Prevalence, Causes

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INTRODUCTION

Anemia is a common and serious complication in patients with chronic kidney disease (CKD), especially hemodialysis. It has a profound impact on the quality of life of patients and carries high morbidity and mortality rates as well as considerable healthcare costs. Anemia prevalence estimates among CKD patients range from 30% to 90%, depending on the stage of kidney disease and the criteria for defining anemia [1]. The potential causative factors of anemia in hemodialysis patients are multifactorial and include decreased erythropoietin, iron deficiency,-and chronic inflammation, while anticoagulation during dialysis leads to blood loss. [2]Erythropoietin is a hormone created by the kidneys that increases red blood cell formation in the bone marrow. The injured kidneys in CKD cannot produce enough erythropoietin, which reduces red blood cell production and induces anemia [3]. Furthermore, patients undergoing hemodialysis (HD) frequently suffer from iron deficiency caused by inadequate dietary intake, poor absorption and chronic blood loss during the dialectic procedure [4-5]. Anemia can also be promoted by inflammatory cytokines that are known to increase in CKD patients, which often affect erythropoiesis [6]. Chronic kidney disease (CKD)-associated anemia is associated with a variety of adverse outcomes such as increased cardiovascular morbidity and mortality, cognitive decline, and decreased physical capacity to exercise[7]. Anemia management in hemodialysis patients commonly includes erythropoiesis-stimulating agents (ESAs) and iron treatment [8]. However, the response to these therapies is variable, and many patients remain anaemic despite treatment [9]. Sources of Iron Deficiency and Prevalence among Hemodialysis Patients The commonness reasons for iron lack in hemodialysis patients have been comprehensively shown to incorporate the accompanying [10]Metropolitan Medical Center Ia tertiary care hospital IKD Peshawar that offers full Kidney disease treatment, including hemodialysis services. Thus, this study aimed to evaluate the prevalence and identify reasons for anemia in hemodialysis patients at IKD. By identifying these primary contributors to anemia in this population, we strive to optimize anemia management and increase the burden among patients[11].

METHODS:

This was a cross-sectional study conducted at IKD that included 100 hemodialysis patients. The study period was six months. Inclusion criteria included patients 18 years old or above who had been receiving hemodialysis treatment for at least three months. Exclusion criteria included acute kidney injury or other illnesses affecting hemoglobin levels.

ETHICAL APPROVAL STATEMENT

Principal Author Liaqat ali obtained Ethics Review Board approval-**No-IKD-ERB-1166/02/2022** for this study at the Department of Urology Institute of Kidney Diseases Peshawar Ethics board approval served as the prerequisite for beginning the study while upholding all institutional requirements for human ethics research.

COLLECTED DATA

Collected data was comprised of demographics, clinical parameters, and laboratory values. Anemia was defined as hemoglobin levels of less than 13 in males and 12 in females. The serum ferritin levels, transferrin saturation, erythropoietin dosage, and inflammatory markers were also recorded.

STATISTICAL ANALYSIS

Statistical analysis was conducted using SPSS.24.0 software and data were summarized using Descriptive statistics. The Student's t-test was used to study the difference between groups regarding continuous variables. In contrast, the chi-square test was used for categorical variables, and the considered significance value p was less than 0.05.

RESULTS:

The mean age of the study population was 58.4 years SD 12.6, and 60% were male, while 40% were female, as presented in Table 1. The duration of exposure to hemodialysis was 4.3 years (2.7), and 85% of patients had Anemia, while the average hemoglobin levels were 10.2g/dL 13.5 g/dL 1.4 in anemic patients compared to non-anemic patients. The leading cause of Anemia includes iron deficiency at 60%, Inflammatory state at 40%, and poetic resistance at 25%. Patients who have been on hemodialysis for more than five years had a higher prevalence of

Anemia at 90% as opposed to patients on hemodialysis for a period of fewer than five years at a level of 75% and p=0.026, while those with diabetes had a prevalence of 88% as opposed those without it at an 80% with a non-significance level of p=0.09.

Table 1: Demographic Characteristics of Study Population

Characteristic	Total (n=200)
Age(years), mean (SD)	58.4 (12.6)
Gender, n (%)	
Male	120 (60%)
Female	80 (40%)
Duration of Hemodialysis (years), mean (SD)	4.3 (2.7)

Table 2: Prevalence of Anemia

Anemia Status	Total (n=200)
Anemic, n (%)	85 (85%)
Non-Anemic, n (%)	15 (15%)
Hemoglobin (g/dL), mean (SD)	
Anemic	10.2 (1.4)
Non-Anemic	13.5 (1.2)
p-value	<0.001

Table 3: Causes of Anemia

Cause of Anemia	Total (n=170)
Iron Deficiency, n (%)	120 (60%)
Inflammatory States, n (%)	64 (40%)
Erythropoietin Resistance, n (%)	16 (25%)

Table 4: Association with Clinical Parameters

Parameter	Anemic (n=170)	Non-Anemic (n=30)	p-value
Duration of Hemodialysis > 5 years, n (%)	76 (90%)	4 (75%)	0.02
Duration of Hemodialysis < 5 years, n (%)	9 (10%)	11 (25%)	
Presence of Diabetes, n (%)	75 (88%)	12 (80%)	0.09
No Diabetes, n (%)	10 (12%)	3 (20%)	

DISCUSSION

the percentage of Anemia among all hemodialysis patients who are receiving care at IKD is equal to 85%(n-70)for scale(parameters=metric)parameters =biologic_pt). This is broadly consistent with previous studies showing a 70- 90% prevalence of anemia in hemodialysis populations, underlining the substantial burden that this condition poses for CKD patients. Mean hemoglobin levels in anemic patients were significantly lower than in non-anemic patients (10.2 g/dL vs 13.5 g/d), which reflects the severity of anemia in this cohort. Iron deficiency explained more than half of Anemia among all patients(variable 1) both in the unit and back home(Tabklet2), by similar findings showing iron as a main problem for hemodialysis, secondary causes may be inadequate dietary intake. Impaired absorption or frequent blood loss during sessions(hemodiafiltration). [15]. This study further underlines the importance of frequent iron status monitoring and adequate supplementation with iron in this patient group. About 40% of patients with anemia had inflammation as the second most common cause. Pro-inflammatory cytokines, such as interleukin-6 (IL-6) and tumor necrosis factor- alpha (TNF-α), which are stimulated during inflammatory states in patients with CKD, can blunt erythropoiesis [16]. These cytokines cause the Production of hepcidin, a hormone that inhibits iron absorption and releases from stores, with consequent anemia. This effect was not unexpected as inflammation in Anemia of CKD has been well described [17] and fits our results. Twenty-five per cent of anemic patients were erythropoietin- resistant. When Anemia does not respond to treatment with erythropoiesis- stimulating agents (ESAs), the condition is referred to as functional or absolute iron deficiency, accounting for many ESA-resistant cases. It may be related to half of these patients' resistance to inflammation and other comorbidities such as diabetes mellitus and/or cardiovascular disease [18]. Consistent with prior studies demonstrating that patients on long- term dialysis and those with diabetes are at increased risk for resistance to erythropoietin [19], our study identified the independent significance of longer duration of hemodialysis or the presence of diabetes as predictive determinants associated with anemia. Anemia is driven more by iron deficiency than erythropoietin hypo responsiveness among lower.

CONCLUSION:

This study reveals the complex pathophysiology of anemia in patients on maintenance hemodialysis: iron deficiency, inflammation with immune response, increased hepcidin levels, and resistance to metabolically active EPO. Monitoring and managing these factors aggressively is vital to optimizing anemia outcomes in this population. More prospective studies are needed to investigate new therapeutic strategies and interventions to treat anemia in these patients under hemodialysis. Dialysis dose chronic kidney disease patients on extended hemodialysis Hematopoiesis in Longer Dialysis Patients - Am J Physiol Renal the American Society of Nephrology Already has an account withNSI.org? This long-term study finding highlights the need for regular anemia screening and appropriate therapeutic intervention in patients undergoing extended hemodialysis sessions. Similar trends have been noted in previous studies, suggesting that the cumulative effects of factors such as blood loss and inflammation lead to anemia progressing over time due to iron deficiency [20]. Notably, though Anemia was more prevalent in people with diabetes (88%), this association did not reach statistical significance; p=0.09. This might not be very easy - perhaps due to the small sample size or other confounders. However, we found a positive association between diabetes and anemia in CKD, and it is well-known that diabetes predisposes the development of anemia largely through autonomic neuropathy, affecting erythropoietin production [21].

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