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Prevalence of Anemia in Chronic Kidney Disease: Review of Literature

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Abstract
Anemia is one of the most common and clinically significant complications of chronic kidney disease (CKD), affecting a large proportion of patients worldwide. The prevalence of anemia increases progressively with declining renal function and contributes substantially to morbidity, mortality, and reduced quality of life. Over the past decade, numerous epidemiological studies have examined the burden of anemia in CKD across different populations and healthcare settings. This review summarizes evidence published during the last ten years regarding the global prevalence of anemia in CKD and highlights major demographic and clinical risk factors associated with its development. The reviewed literature emphasizes the importance of early identification and timely management of anemia to improve outcomes in CKD patients.

Keywords: Anemia, Chronic Kidney Disease, Prevalence, Risk Factors

INTRODUCTION

Chronic kidney disease is a major global public health concern, affecting approximately 10–13% of the adult population worldwide [1]. CKD is characterized by a progressive decline in renal function and is associated with numerous systemic complications. Among these, anemia is one of the earliest and most prevalent manifestations and becomes increasingly common as kidney function deteriorates [2]. CKD-related anemia primarily results from reduced erythropoietin production by damaged kidneys, iron deficiency, chronic inflammation, and reduced red blood cell lifespan [3]. The presence of anemia in CKD patients is strongly associated with adverse clinical outcomes including cardiovascular disease, hospitalization, cognitive impairment, and increased mortality [4].

Methods of Literature Search

A comprehensive literature search was conducted to identify relevant studies published between 2014 and 2024. Peer-reviewed articles were identified from international nephrology and medical journals. Studies reporting prevalence, epidemiology, and risk factors of anemia among adult CKD patients were included. Review articles, population-based studies, hospital-based cohorts, and multicenter observational studies were analyzed. Articles not published in English and studies focusing exclusively on pediatric populations were excluded.

Global Prevalence of Anemia in Chronic Kidney Disease

Multiple large-scale studies conducted over the last decade demonstrate that anemia is highly prevalent among patients with CKD. Data from the Global Burden of Disease (GBD) Study 2021 estimated that over 63 million individuals worldwide were affected by CKD-related anemia, representing a substantial increase compared to previous decades [5]. Population-based studies from North America indicate that anemia prevalence ranges from approximately 15–20% in stage 3 CKD and increases to more than 50% in stages 4 and 5 [6]. Similar trends have been reported in European cohorts, where anemia prevalence rises sharply with declining estimated glomerular filtration rate (eGFR) [7].

In Asian populations, hospital-based and community-based studies have reported anemia prevalence ranging from 30% to 60% among non-dialysis CKD patients [8]. The KoreaN Cohort Study for Outcomes in Patients With Chronic Kidney Disease (KNOW-CKD) reported anemia in approximately 45% of participants, with higher prevalence observed in advanced CKD stages [9]. Studies from China and the Middle East have similarly demonstrated high anemia prevalence, particularly among elderly patients and those with comorbid diabetes mellitus [10].

Risk Factors Associated with Anemia in CKD

Advanced CKD stage is consistently identified as the strongest predictor of anemia [6,9]. As kidney function declines, erythropoietin production decreases, leading to impaired erythropoiesis. Female sex has been shown to be independently associated with higher anemia prevalence, possibly due to lower baseline hemoglobin levels and increased iron deficiency [11]. Older age is another important risk factor, reflecting cumulative comorbidities and nutritional deficiencies [12].

Comorbid conditions such as diabetes mellitus, hypertension, and cardiovascular disease significantly increase the risk of anemia in CKD patients [13]. Chronic inflammation, malnutrition, iron deficiency, and secondary hyperparathyroidism also contribute to anemia development [3,14]. Several studies have demonstrated that patients with poor nutritional status and elevated inflammatory markers have significantly lower hemoglobin levels [14].

Clinical Impact of Anemia in CKD

Anemia in CKD is associated with a wide range of adverse clinical outcomes. Reduced oxygen-carrying capacity leads to fatigue, reduced exercise tolerance, and impaired cognitive function [4]. Anemia also contributes to left ventricular hypertrophy and increased cardiovascular morbidity, which are major causes of mortality in CKD patients [15]. Early recognition and treatment of anemia have been shown to improve quality of life and reduce hospitalization rates.

Discussion

The reviewed literature clearly demonstrates that anemia remains a highly prevalent complication of CKD worldwide. Despite improvements in CKD management, late diagnosis and under-treatment of anemia persist, particularly in resource-limited settings. Variability in reported prevalence rates may be attributed to differences in study design, diagnostic criteria, population characteristics, and healthcare access.

Conclusion

Anemia is a common and clinically significant complication of chronic kidney disease, with prevalence

increasing markedly in advanced disease stages. Female sex, older age, comorbidities, and nutritional and inflammatory factors play important roles in anemia development. Early screening, standardized diagnostic criteria, and timely management strategies are essential to reduce the global burden of CKD-related anemia and improve patient outcomes.

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