ORIGINAL RESEARCH PAPER

General Medicine

PREVALENCE AND CLASSIFICATION OF ANAEMIA IN CHRONIC KIDNEY DISEASE PATIENTS UNDERGOING HEMODIALYSIS

KEY WORDS: Anaemia, CKD, haemodialysis, erythropoietin, iron deficiency, ESA.

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ABSTRACT

Anaemia is a common and serious complication of chronic kidney disease (CKD), primarily caused by reduced erythropoietin production, iron deficiency, and chronic inflammation. In CKD patients, anaemia exacerbates cardiovascular risks, increases fatigue, and significantly reduces quality of life. Haemodialysis plays a crucial role in managing CKD-related anaemia by removing uremic toxins that impair erythropoiesis and iron metabolism. However, despite regular dialysis, many patients remain anaemic due to factors like blood loss during dialysis, inadequate iron supplementation, and hepcidin-mediated iron sequestration. Effective management requires a multidisciplinary approach, including optimized haemodialysis, erythropoiesis-stimulating agents (ESAs), and iron therapy. Monitoring haemoglobin, ferritin, and other haematological indices is essential to tailor treatment and improve outcomes. Addressing anaemia in CKD patients not only enhances survival rates but also improves physical functioning and overall well-being. Thus, integrating anaemia management with haemodialysis protocols is vital for comprehensive CKD care.

INTRODUCTION

Chronic Kidney Disease (CKD) affects 8–16% of the global population and is frequently complicated by anaemia. According to WHO criteria, anaemia is diagnosed when hemoglobin levels fall below 12 g/dL in women and 13 g/dL in men. This research examines the frequency and morphological types of anaemia in CKD patients receiving maintenance hemodialysis (MHD), with a focus on demographic patterns and laboratory findings.

Background And Significance

Anaemia in CKD patients develops due to several interconnected mechanisms:

- *Diminished erythropoietin synthesis* caused by kidney dysfunction.
- *Excess hepcidin*, which disrupts iron metabolism.
- *Nutritional deficiencies and blood loss* associated with dialysis.

These factors contribute to worsened clinical outcomes, making anaemia a critical target for intervention in CKD management.

Study Objectives

This investigation sought to:

1. Determine how commonly anaemia occurs in MHD patients.
2. Categorize anaemia subtypes using red blood cell indices like MCV and MCH.

Image of dialysis and nephrology unit of Medicine Department, RDGMC

Image Courtesy: Dept. of medicine, RDGMC

Methodology

- ***Study Design*:** A hospital-based observational study conducted prospectively.
- ***Setting*:** Nephrology dialysis unit at RDGMC, Ujjain.
- ***Timeline*:** Data collected from August 2021 to July 2023.
- ***Participants*:** 100 adults with CKD on regular hemodialysis (excluding AKI patients and those with inconsistent follow-ups).
- ***Diagnosis*:** Anaemia was identified using gender-specific Hb thresholds.
- ***Laboratory Analysis*:** Blood tests included hemoglobin levels, MCV, MCH, and MCHC measurements.

Key Findings

1. Patient Demographics

- ***Age Distribution*:** The 31–40 age group had the highest anaemia rate (23%), followed by 41–50 (21%) and 51–60 (18%).
- ***Sex Differences*:** Males accounted for 57% of cases, females 43%.

2. Anaemia Subtypes

- *Microcytic hypochromic anaemia*: Most prevalent (33%).
- *Dimorphic anaemia (normocytic normochromic dominant)*: 31%.
- *Normocytic normochromic anaemia*: 29%.

3. Laboratory Correlations

- *MCV: 84% of microcytic cases exhibited low MCV (*$p < 0.001$).
- *MCH: Reduced MCH levels appeared in 60% of microcytic patients (*$p < 0.001$).
- *MCHC: No significant variation across anaemia types (*$p = 0.221$).
- *Hemoglobin: Anaemia classification showed no link to Hb levels (*$p = 0.765$).

Interpretation And Implications

The predominance of *microcytic hypochromic anaemia* (33%) challenges the conventional expectation of normocytic anaemia in CKD. Potential explanations include:

- *Iron deficiency* from dietary insufficiencies or gastrointestinal bleeding.
- *Inadequate dialysis frequency*, worsening iron depletion.

The substantial proportion of *dimorphic anaemia* (31%) indicates overlapping pathologies, such as combined iron deficiency and chronic inflammation.

Recommendations

1. *Routine iron monitoring* should accompany dialysis to address deficiencies promptly.
2. *Patient education programs* can improve adherence to treatment schedules.
3. *Tailored interventions* based on red cell indices (e.g., iron therapy for microcytic cases) may enhance outcomes.

CONCLUSION

This study highlights microcytic hypochromic anaemia as the leading subtype among CKD patients on MHD, underscoring the need for individualized management strategies. Improving dialysis regularity and public awareness could mitigate anaemia-related complications, especially in resource-limited settings like India.

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