



Original Article

Iron Deficiency Anemia in Patients with Chronic Renal Insufficiency at Tertiary Care Hospital in Northern Punjab

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ABSTRACT

Anemia is a frequently encountered complication of chronic kidney disease (CKD) leading to worse outcomes in terms of quality of life and premature death. However, the current prevalence of iron deficiency anemia (IDA) in CKD is understudied in Pakistan. **Objective:** To assess the frequency of IDA in patients with CKD at Bewal International Hospital, Gujjar Khan, Pakistan. **Methods:** A cross-sectional was executed at the Department of Nephrology, Bewal International Hospital, Pakistan from January 1, 2022, to June 30, 2022. The study comprised 97 patients aged >13 years of either gender having CKD (GFR <60 ml/min/1.73m²) for at least 90 days. All patients were tested for serum creatinine, ferritin, and hemoglobin levels. IDA was considered if hemoglobin was ≤12 mg/dL in women and ≤13 mg/dL in men. **Results:** Among 97 patients, there were 57(58.7%) males and 40(41.3%) females. The mean age was 51.23 ± 12.99 years while the mean disease duration was 6.01 ± 1.610 years. 57(58.7%) patients had IDA. IDA was more frequent in women with CKD (67.5%), compared to men (52.64%). However, this association was statically insignificant (p>0.05). When data was stratified, a substantial association was found between IDA and the stage of CKD (p=0.007). There was no significant association between IDA and disease duration (p>0.05). **Conclusions:** It was concluded that anemia is common in CKD patients, with a high prevalence in females. Stage 3-5 CKD is significantly associated with developing iron deficiency anemia. Early identification and timely management can avoid unfavorable outcomes in these patients.

INTRODUCTION

Chronic renal insufficiency, commonly known as chronic kidney disease, is an irreversible condition characterized by gradual deterioration in kidney function with glomerular filtration rate (GFR) < 60 ml/min/1.73m² for ≥ 3 months [1]. It is becoming a worldwide epidemic and is associated with poor outcomes. Global reports consider it as one of the major causes of mortality worldwide [1, 2]. In Pakistan, the overall prevalence of CKD was reported to be 21.2%, irrespective of the demographic factors [3, 4]. As kidneys function in regulating blood composition and volume, and removing metabolic waste products by urination [5], CKD

leads to the development of various blood irregularities including iron deficiency anemia (IDA) [6]. IDA is a commonly encountered problem in CKD. Multiple factors are responsible for anemia in CKD such as erythropoietin insufficiency from decreased renal mass, elevated pro-inflammatory mediators affecting erythropoiesis, reduced red cell survival, increased blood loss, and iron and nutritional deficits [6]. It is linked with unfavorable outcomes such as sleep disorders, cognitive impairment, serious cardiovascular and neurovascular implications, progression of CKD, increased hospitalization, and

increased mortality rates [7], causing a substantial burden on healthcare infrastructure due to amplified costs of disease management [8]. The prevalence of anemia in CKD varies across regions, ranging from 25.3% in the United States [8] to 85.33% in Ethiopia [7]. The prevalence snowballs further as the disease progresses [7]. However, little is known regarding the prevalence of IDA in patients presenting with CKD in Pakistan. Several studies reported its prevalence in dialysis patients [9] while only a few reported the prevalence of IDA in non-dialysis CKD patients, ranging between 38.83% to 77.9% [10, 11].

This study aimed to assess the more recent prevalence of IDA in CKD patients. This study will guide us to know the disease burden in the Northern Punjab region of Pakistan. The aim of this study was to assess the psychological factors affecting the patients of functional dyspepsia and their effect in a person's day to day life.

METHODS

A cross-sectional study was executed at the Department of Nephrology, Bewal International Hospital, Gujar Khan, Pakistan from January 1, 2022, to June 30, 2022. A sample size of 97 was calculated using the WHO sample size calculator with a 95% confidence level, a 5% margin of error, and a 6.8% prevalence of mild anemia among adult male patients [12]. The study was approved by the hospital Ethical committee i.e. Ref No: /1/06/2021/S1 ERB dated, June 1, 2021. Data were collected using a convenient sampling technique. Patients aged >13 years of either gender having CKD (GFR <60 ml/min/1.73m²) for at least 90 days were included in the study. Patients who underwent dialysis or renal transplant, having CKD Stage I or II, malignancy, any hematological condition, acute or chronic infection, and recent history of blood transfusion or severe bleeding episode from any orifice of the body were excluded. After obtaining informed consent from patients, a total of 97 patients meeting the inclusion criteria were taken from the Department of Nephrology, Bewal International Hospital, Gujar Khan. Socio-demographic profiles such as weight, gender, and age were noted. All patients were tested for serum creatinine, ferritin, and hemoglobin levels. Cockcroft-Gault formula was used for GFR estimation [13], and patients having GFR <60 ml/min/1.73m² for ≥90 days were considered as having CKD [14]. Staging of CKD was done and explained as Stage III with GFR 30-59 mL/min/1.73m², stage IV with GFR 15-29 mL/min/1.73m², and stage V with GFR <15 mL/min/1.73m² [7]. IDA was considered if hemoglobin was ≤12 mg/dL in women and ≤13 mg/dL in men [7]. All tests were performed at the Laboratory of Bewal International Hospital Gujar Khan. All information was collected on a pre-structured questionnaire. Data analysis was performed using SPSS Version 24.0. The quantitative data such as age, weight, and duration of disease were executed as mean and

standard deviation. The categorical data such as gender, presence of IDA, and CKD stage were shown as frequency and percentage. Stratification of data was performed to control the confounding variables such as gender, stage of CKD, and duration of disease. The chi-square test was implemented after stratification to assess the significance and a p-value ≤0.05 was regarded as significant.

RESULTS

The study included 97 patients. Demographic details are explained in table 1. The mean age was 51.23 ± 12.99 years. There were 57(58.7%) males and 40 (41.3%) females. The mean weight was 57.58 ± 15.78 kg and the mean duration of the disease was 6.01 ± 1.610 months. 7(7.22%) patients had stage 3 CKD, 23 (23.71%) had stage 4, and 67 (69.07%) had stage 5 CKD (Table 1).

Table 1: Baseline Details of Study Participants (n=97)

Characteristics		n (%)
Age* (Years)		51.23 ± 12.99
Gender	Male	57 (58.4)
	Female	40 (41.3)
Weight* (Kg)		57.58 ± 15.78
Duration of Disease* (Months)		6.01 ± 1.610
Stage Of CKD	3	7 (7.22)
	4	23 (23.71)
	5	67 (69.07)

n = number of patients; % = percentage of patients; * = mean ± standard deviation was given; CKD = chronic kidney disease; kg = kilograms.

57(58.7%) patients had iron deficiency anemia, as illustrated (Figure 1)

Iron Deficiency Anemia

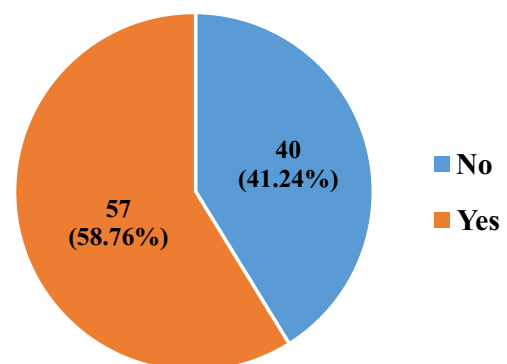


Figure 1 : Frequency of Iron Deficiency Anemia in CKD patients

When data were stratified, a significant association was found between IDA and the stage of CKD (p=0.007). IDA was more frequent in women with CKD (67.5%) compared to men (52.64%). However, this association was statistically insignificant. No significant difference was observed in IDA concerning gender and duration of disease (Table 2).

Table 2: Frequency of IDA in CKD to Gender, Stage of CKD, and Duration of Disease

Parameters	Iron Deficiency Anemia		p-value*	
	Yes	No		
Gender	Male	30 (30.93%)	27 (27.83%)	0.143
	Female	27 (27.83%)	13 (13.40%)	
Stage of CKD	3	4 (4.12%)	3 (3.09%)	0.007*
	4	19 (19.59%)	4 (4.12%)	
	5	63 (64.95%)	4 (4.12%)	
Duration of Disease (Months)	3-5	18 (18.56%)	20 (20.62%)	0.187
	6-8	35 (36.08%)	18 (18.56%)	
	9-11	4 (4.12%)	2 (2.06%)	

CKD=chronic kidney disease; IDA=iron deficiency anemia; *= Chi-square test was used and $p \leq 0.05$ was taken as significant

DISCUSSION

Anemia is a commonly encountered complication in CKD and is associated with several adverse events. Assessing the prevalence of anemia in these patients helps in identifying the burden of disease, slowing the progression of CKD, and preventing these adverse outcomes [7]. Therefore, this study assessed the more recent prevalence of IDA in CKD patients. The current study reported that a total of 57(58.7%) CKD patients had IDA. This result is comparable to the findings of the studies conducted in Ethiopia (53.5%) [15], Oman (29.3%) [16], Malaysia (47.9-76.9%)[17-19], Ecuador(80.22%)[20], Japan(0-95%)[21], and Pakistan (38.83- 80.5%) [11, 22-24]. A meta-analysis was conducted to determine the pooled prevalence of anemia and revealed that it was 59.15% in CKD patients [25]. However, an American study reported a lower prevalence of anemia (15.4%) in CKD patients [26]. Similarly, two other studies conducted in England and the United States also documented a lower prevalence of 22.2% and 23.0%, respectively [27, 28], contrary to the results of the current study. The results of the present study disclosed a significant association between the stage of CKD and the occurrence of anemia ($p = 0.007$). 94.02% of stage 5 patients had IDA, compared to 57.14% of stage 3 patients. Findings of a study conducted by Bishaw et al, in Ethiopia, [7] showed that there was a significant association between grades of anemia and grades of CKD and concluded that anemia severity differed according to the stage of chronic kidney disease (CKD), with a larger percentage of severe anemia in stage 5(11.33%) compared to stage 3, 5 (3.33%), and stage 4, 2 (1.33%). A similar conclusion was laid down in a research study conducted by Stauffer et al., where they concluded that anemia prevalence rose with CKD stages, rising from 8.4% at stage 1 to 53.4% at stage 5 [26]. Another study conducted in Peshawar by Khan et. al. came to a comparable outcome where 10.06% of stage I, 15.72% of stage II, 22.01% of stage

III, 23.27% of stage IV, and 28.93% of Stage V CKD patients had anemia [23]. Comparable results were also highlighted in another study done in Malaysia by Javed et al., who concluded that a positive relationship exists between the severity of iron deficiency anemia and stages of CKD; i.e., the higher the grade of CKD, the higher the severity of IDA [17]. The limitations of the current study need to be recognized, including the cross-sectional study design and convenience sampling technique. Another limitation is the unavailability of research related to the prevalence of CKD in local settings. The findings of the current study are of a single center of the Nephrology Outdoor Department of Bewal International Hospital. Detailed researches including a larger sample size are required to generalize the results. In summary, the prevalence of anemia seems to be increasing in the Pakistani population with CKD and the prevalence increases with the advancement of stage of CKD.

CONCLUSIONS

Anemia is common in CKD patients, with a high prevalence in females. Having stage 3-5 CKD is significantly associated with developing iron deficiency anemia. Early identification and timely management can avoid unfavorable outcomes in these patients.

Authors Contribution

Conceptualization: MS, HAK

Methodology: MS, HAK

Formal analysis: MS, HAK, MI¹, MIUH, MZ, MI²

Writing-review and editing: MS, HAK, MI, MIUH

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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