Advances in Bioresearch
Adv. Biores., Special Issue (3) 2025: 164-176

Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
DOI: 10.15515/abr.0976-4585. SPL3.25.164176

Advances in Bioresearch

Prevalence of Anaemia and Prescribing Patterns of Anti-Anaemic Medications in Chronic Kidney Disease Dialysis Patients at a Tertiary Care Hospital

Atta Ur Rahman[1], Kadari Jerusha Prasanna[1], Vadthya Rajeshwari[1], Nanapuram Himabindu[1], Mamidi Pranith Ram[2], Gollapalli Rajeev Kumar[1]*D. Krishna Prasad[3]
[1] Department of Pharmacy Practice, School of Pharmacy, Anurag University, Hyderabad, Telangana, India
[2] Department of Nephrology, Yashoda Hospital, Secunderabad, Telangana, Indi
[3] Department of Pharmacology, School of Pharmacy, Anurag University, Hyderabad, Telangana, India
Corresponding Author Email: rajeevgollapalli@gmail.com

ABSTRACT
When it comes to the elderly, chronic kidney disease (CKD) and its consequences are common, and dialysis is the main therapy for end-stage renal disease (ESRD). Demographic, clinical, and treatment-related patient data from tertiary care dialysis centre were analysed to uncover important patterns and difficulties. This was observational cross-sectional research that included 126 dialysis participants. We gathered information on the patient's demographics, medical history, comorbidities, dialysis treatments, medication use, and laboratory values. Excel 2019, SAS 9.4, and GraphPad 10.0.0 were utilized for statistical analysis. For continuous variables, the mean ± standard deviation (SD) is utilized, whereas for categorical variables, percentages are employed. We used chi-square tests to assess the associations, and we fixed the significance level at $p < 0.05$. Men made up 61.11% of the patient population, while the age group 61–70 accounted for 38.88% of the total. Haemodialysis was the primary treatment modality (88.23%), and 63.4% of the population had a normal BMI (18.5-24.9). Hypertension (51.82%) and diabetes mellitus (37%) were the most prevalent comorbidities. Most patients (82.56%) relied on allopathic treatments. The mean haemoglobin level was 10.13 ± 1.86 g/dL, while the mean eGFR was 20.41 ± 22.88 mL/min/1.73m^2, reflecting advanced renal impairment. ESA (46.98%) and iron preparations (25.3%) were the most commonly used haematinics. This study highlights the high burden of ESRD among older adults, with significant comorbidities such as hypertension and diabetes. Haemodialysis remains the dominant treatment option, emphasizing the need for continued investment in dialysis services. The reliance on ESA and iron supplements underscores the importance of addressing anaemia management in this population. Tailored healthcare strategies focusing on geriatric care, chronic disease management, and patient education are critical to improving outcomes in this population.
Keywords: Chronic kidney disease, Dialysis, Haemodialysis, Comorbidities, Anaemia, ESA, Hypertension, Diabetes Mellitus, Geriatric care.

Received 19.05.2025 Revised 26.06.2025 Accepted 06.07.2025

How to cite this article:
Atta Ur R, Kadari J P, Vadthya R, Nanapuram H, Mamidi P R, Gollapalli R K, D. Krishna Prasad.. Prevalence of Anaemia and Prescribing Patterns of Anti-Anaemic Medications in Chronic Kidney Disease Dialysis Patients at a Tertiary Care Hospital. Adv. Biores. Special Issue [3] 2025. 164-176

INTRODUCTION

Chronic kidney disease (CKD) is defined by the National Kidney Foundation's Kidney Dialysis Outcomes and Quality Initiative (K/DOQI) as the presence of structural kidney damage and/or functional anomalies in glomerular filtration rate (GFR) that have lasted for three months or more [1,2]. The secondary complications are majorly two i.e. bone mineral loss and anemia. The complex relationships between hormones and how they affect the kidneys, parathyroid gland, gastrointestinal (GI) system, and bone, which mediate calcium-phosphorus balance. Phosphate removal falls with deteriorating kidney function, leading to hyperphosphatemia and a drop in serum calcium levels. PTH secretion is stimulated by hypocalcemia. Serum calcium balance is only preserved at the cost of a rise in bone loss when kidney function deteriorates, which changes the physical strength of bones and has other effects. Anemia is the condition characterized by a drop in the volume of hemoglobin (Hb) or red blood cells (RBCs), which

lowers the blood's ability to transport oxygen. Hypohemoglobinemia is defined by the World Health Organization (WHO) as a hemoglobin level below 12 g/dL for women and 130 g/L for men, or 8.07 mmol/L and 7.45 mmol/L, respectively [3,4]. As many as one third of people worldwide suffer from anemia, a very prevalent illness. It often has no symptoms, is moderate, and doesn't need to be treated. The prevalence rises with age and is higher in older adults, pregnant women, and women of reproductive age. Over fifteen percent of people over the age of eight have this condition. Anemia affects 50–60% of those living in nursing homes. About one-third of older individuals suffer from a dietary deficit. Evidence of chronic inflammation or renal failure is found in a further third of individuals. Traditionally, low dietary iron intake combined monthly iron loss during menstrual cycles cause mild a lack of iron anemia in women of reproductive age. Anemia, which is commonly caused by poor food, especially with regard to the nutrients iron and folic acid, is common in elderly individuals [5]. Alcoholics, the homeless, and people who have been neglected or abused are among the other populations who are at danger. anemia of recent onset, particularly in people over 55. When males of any age exhibit anemia, this is particularly true. In addition to both sex and age, race is a significant predictor of anemia, and its frequency is rising among African Americans. Red haemoglobin (RBCs) are declining. causes anemia, which in turn causes a drop in the hematocrit and red cell hemoglobin concentration (also Red Blood Cell Production). Anaemia can arise from one or more of three fundamental causes, as the RBC mass is a measure of the equilibrium between the RBC production, loss, or destruction. Blood loss A) Deficient or ineffective erythropoiesis B) Excessive haemolysis (RBC destruction)

Blood loss can be acute, chronic. Because the fluid spreads into the area inside the blood artery and dilutes the remainder of RBC mass, anemia may not appear for several hours following an acute blood loss. However, in the first few hours, there may be an uptick in polymorphonuclear granulocytes, platelets, and, in extreme episodes of bleeding, normoblasts and immature white blood cells. Anemia is caused by chronic blood loss if the loss occurs more quickly than it can be restored or, more frequently, if the body's iron stores are depleted by accelerated erythropoiesis (iron deficiency anemia).

There are numerous reasons for ineffective or deficient erythropoiesis. When erythropoiesis is completely stopped, RBCs decrease by roughly 7–10% each week (1% per day). Aberrant RBC size and shape are frequently the result of impaired erythropoiesis, even if it is insufficient to reduce the quantity of RBCs. Unless erythropoietin shortage or the depletion of iron or other vital elements occurs, hemolysis usually leads to an increase in reticulocyte production. RBCs may have intrinsic defects that induce excessive hemolysis, or they may be destroyed prematurely by extrinsic agents like complement or antibodies on their surface. RBCs are sequestered and destroyed more quickly than usual by an enlarged spleen [6]. The pathophysiology of anemia can be greatly affected by its underlying etiology. The external and internal fluid required to restore blood volume, for example, dilutes the other red blood cells (RBCs) in severe anemia. Hematocrit and hemoglobin levels become erroneously regular when serum and red blood cells decline proportionately. In the bone marrow, RBC are produced and then released into the bloodstream. The daily removal of RBCs from circulation is about 1%. Anemia results from a connection between the production and degradation of red blood cells. Anemia is caused by the following primary mechanisms:

Increased RBC destruction blood Loss can be acute which Menorrhagia, trauma, surgery, and bleeding and chronic: severe menstrual bleeding, persistent blood loss in the gastrointestinal tract (due to hookworm infestation, ulcers, etc.), and urine losses (BPH, renal cancer, schistosomiasis, etc). Haemolytic Anaemia are of main two causes. Acquired which is Immune-mediated infection, owing to hypersplenism, microangiopathic, and associated with blood transfusions and hereditary which is Enzymopathies, sickle cell hemoglobin diseases, red blood cell metabolism abnormalities (G6PD and pyruvate kinase deficiencies), and abnormalities in the synthesis of red blood cell membranes (inherited spherocytosis and elliptocytosis). It might because of Deficient/Defective Erythropoiesis.

Treatment of dialysis patient having anemia involves: Erythropoietin Stimulating Agents: Those suffering from chronic kidney disease (CKD), marked by damage to the kidneys and reduced EPO generation by peritubular cells, are typically advised to take ESAs. Dialysis patients with chronic kidney disease benefit from ESAs. The ESA powder is buffered by an isotonic solution and can be injected intravenously or applied subcutaneously.

The following powder and buffer dilutions are available:

Darbepoetin: The following powder and buffer dilutions are available for darbepoetin: Single-dose powder vials containing 25 µg, 40 µg, 60 µg, 100 µg, and 200 µg, as well as premixed, single-dose syringes. 100 µg in 0.5 mL, 300 µg in 0.6 mL, 40 µg in 0.4 mL, 60 µg in 0.3 mL, 1000 µg in 1 mL, and 10 µg in 0.4 mL concentrations.

Epoetin alfa: Epoetin alfa comes in single-dose vials containing 2,000 IU/mL, 3,000 IU/mL, 4,000 IU/mL, and 10,000 IU/mL. Additionally, it is available in multiple-dose vials with benzyl alcohol concentrations of 10,000 and 20,000 IU/mL.

Methoxy polyethylene glycol-epoetin β: The following doses of methyl polyethylene glycol-epoetin β are available in single-dose, prefilled, injectable syringes: 30 µg, 50 µg, 75 µg, 100 µg, 120 µg, 150 µg, 200 µg, or 250 µg in 0.3 mL solution. For once-monthly dosing, a single-dose prepared syringe via 360 µg in 0.6 mL solution is also available

Epoetin alfa: For CKD-associated anemia, begin with three doses per week of 50–100 units/kg either intravenously or subcutaneously. For hemodialysis patients, intravenous dosage is recommended.

Darbepoetin alfa: For CKD-associated anemia, begin with an intravenous or subcutaneous dose of 0.45 µg/kg once a week.

Methoxy polyethylene glycol-epoetin β: If the patient is already on epoetin or darbepoetin, make sure their hemoglobin level is stable before starting this medicine. Checking the patient's iron level is important both before starting ESA treatment and on a regular basis thereafter. If the serum ferritin levels are below 100 µg/L or if the transferrin saturation is below 20%, then more iron should be administered.

Individuals who have not started ESAs are advised to:

Start taking 0.6 µg/kg once every two weeks while on dialysis.

Start with 1.2 µg/kg subcutaneously once a month if you are not on dialysis. As an alternative, a starting dose of 0.6 µg/kg can be given once every two weeks, either subcutaneously or intravenously [7].

Anemia caused by chronic kidney disease is treatable with a novel family of oral medications called hypoxia-inducible factor-prolyl hydroxylase domain inhibitors (HIF-PHIs), which are now in the latter stages of clinical trials throughout the world. By triggering the HIF oxygen-sensing pathway, HIF-PHIs efficiently maintain and adjust hemoglobin levels for those with dialysis-dependent & non-dialysis-dependent CKD. HIF-PHIs not only increase endogenous erythropoietin production, which promotes erythropoiesis, However, they also change iron metabolism, lowering hepcidin levels and raising transferrin levels & total iron binding capacity. Which could reduce the requirement for iron supplements administered intravenously. The effects of HIF-activating medications are anticipated to go beyond erythropoiesis as well. This study delves into the pharmacologic features and action mechanisms of HIF-PHIs, along with their consequences for the management of anemia in individuals afflicted with chronic renal illness and worries regarding safety. The current HIF-PHI study is a compilation of clinical data from individuals with chronic kidney disease anemia [8]. Iron intake recommendations for those with chronic renal disease are not well-defined. Oral or intravenous iron administration is an option for people with chronic kidney disease (CKD) who are not on peritoneal dialysis. Among patients who develop iron deficiency or insensitivity, many physicians primarily choose the intravenous route when providing oral iron therapy. Placing an intravenous access and giving CKD patients who do not currently not yet undergoing dialysis the necessary doses of parenteral iron is challenging and requires multiple office visits. In the US, iron dextran, sodium ferric gluconate, and iron sucrose are the three most accessible intravenous iron formulations. Many practitioners have stopped using iron dextran because of concerns about possibly deadly anaphylactoid responses, while it is still often used in rare circumstances. Intravenous iron can cause major adverse effects such as hypotension, shivering, back discomfort, nausea, dyspnea, coughing, stridor, chest pain, face flushing, rash, and cutaneous indications of porphyria. Iron studies should be performed on a frequent basis during the initial phase of ESA therapy because of the high iron intake from erythropoiesis and the demand for sufficient iron. According to the 2006 KDOQI anemia treatment guidelines, routine intravenous iron therapy is not recommended if the ferritin level is more than 500 ng/ml since there is not enough evidence. Others, however, believe that 800–1,200 ng/ml is the top safe range of ferritin.24 50% is the generally acknowledged maximum for TSAT.3. Iron can be checked very rarely, but thrice a year, once the ESA and Hb dosages are stabilized. Iron levels may need to be checked more frequently during hospital stays, following major blood loss or surgery, or to track how well an intravenous iron course is working.3, 4, 10, and 27 [9].

The need for this study is due to the: Rising Burden of CKD and ESRD: Targeted research is needed to enhance therapy and management techniques for chronic kidney disease (CKD) and end-stage renal disease (ESRD), which are increasing worldwide health issues, especially among the elderly. High Prevalence of Comorbidities: Dialysis patients have a very high prevalence of comorbidities like hypertension and diabetes and these need to be taken into consideration in relation to disease progression and treatment outcomes. Limited Insight into Local Trends: Knowing the demographic and clinical trends of dialysis patients in a tertiary care setting offers context specific insights for guiding the regional health practices and policies. Need for Optimal Dialysis Strategies: Hemodialysis clearly tends to

dominate as the treatment modality and it is imperative to assess the approach of other treatment methods vis a vis hemodialysis to ensure that the patient care and resource expenditure is optimized. Anemia Management Challenges: Use patterns, efficacy and improvement potential of iron preparations and erythropoiesis stimulations agents (ESAs) that are required for management of anemia in chronic kidney disease (CKD) patients must be evaluated. The purpose of this research is to examine the medication usage patterns and prevalence among dialysis patients in a tertiary hospital in relation to the treatment of anemia.

The objective includes the following: To evaluate the prevalence of anemia & demographic trends in dialysis patients. To explore the influence of social behaviors, dietary habits, and substance use on the health outcomes of patients with CKD. To investigate the patterns of medication use and evaluate the adherence to treatment protocols among dialysis patients. To analyze anemia management through hematinics and evaluate key biochemical markers (e.g., eGFR, hemoglobin, serum creatinine) in dialysis patients.

MATERIAL AND METHODS

STUDY PROTOCOL

Over the course of six months, a cross-sectional observational study is being carried out. The study will involve patients who fulfill the requirements. The patient's prescriptions and interview will be used to get the necessary data. To determine the prevalence of anemia and the trends in anti-anemic medicine prescriptions among CKD dialysis patients, the collected data will be analyzed.

STUDY DESIGN

Observational cross-sectional study

"STUDY SITE

The study was conducted in YASHODA HOSPITAL, SECUNDERABAD.

STUDY PERIOD

The study was conducted for a period of 6 months

STUDY POPULATION

The study comprised 126 patients.

STUDY CRITERIA

INCLUSION CRITERIA

Age more than or equal to 18 years, i.e. (18-80 years) having anaemia".

CKD patient on more than 3 months on dialysis.

Dialysis patients receiving blood transfusion due to severe anaemia.

EXCLUSION CRITERIA

Patients less than 18 years or age or patients needing legal supervision

Pregnant or lactating women

Renal/liver transplant recipients.

Patients with recent surgery (within 90 days), trauma, history of malignancies

STATISTICAL PROCEDURES

GraphPad 10.0.0, SAS Version 9.4, and Excel 2019 were used for statistical analysis. All continuous data is represented by the mean ± standard deviation, or SD. For the purpose of displaying categorical data, percentages and numbers are employed. To find significant relationships between continuous and categorical data, use the chi-square test. To determine the probability of observed differences, P-values were computed; a 95% confidence interval (CI) was used to determine a threshold of $P < 0.05$ as significant [10-12].

RESULTS AND DISCUSSION

The study utilized a sample size of 126 participants. Data analysis was conducted using SAS Version 9.4 software. Statistical significance was determined using a 95% confidence interval, with a P value of less than 0.05 considered significant. The chi-square test was employed to evaluate the relationships between variables.

The study population's distribution according to age criteria

The data shows that the majority of individuals fall within the 61-70 age group, accounting for 38.88% of the population. The second-highest group is 51-60, making up 21.42%. The smallest representation is in the 20-30 age group, contributing just 6.34% depicted in **Table 1.** This suggests that the studied group is heavily weighted toward individuals likely to experience age-related health conditions, including chronic diseases such as hypertension and diabetes mellitus, which are significant comorbidities in this population. Such an age distribution highlights the pressing need for healthcare systems to prioritize

geriatric care and chronic disease management. Moreover, the underrepresentation of younger age groups, particularly those under 30, underscores the importance of proactive health initiatives aimed at younger populations to mitigate the progression of chronic diseases before they manifest in later years [13].

Table 1: The study population's distribution according to age criteria

Age group	N	%
21-30	8	6.34
31-40	9	7.14
41-50	22	17.46
51-60	27	21.42
61-70	49	38.88
71-80	11	8.73

Gender-Based Composition of the Study Community

Table 2 reveals gender distribution across various age groups. The table shows a higher number of males than females in most age groups, especially in the 61-70 range where males (36) significantly outnumber females (13). In the 31-40, 41-50, and 51-60 groups, the gender distribution is relatively balanced, with a slight male majority. The 71-80 group also shows more males (8) than females (3). This disparity could point to societal or biological factors influencing health-seeking behaviour or disease prevalence. The complete absence of females in the 20-30 age group may indicate potential gender-specific barriers to healthcare access or sociocultural norms that discourage younger women from engaging with healthcare services. These findings suggest a need for gender-sensitive health policies and outreach programs tailored to address barriers faced by women, particularly in preventive and chronic care settings [14].

Table 2: Gender-Based Composition of the Study Community

	Gender		
Age group	Male	Female	P value
21-30	8	0	0.081
31-40	4	5	
41-50	12	10	
51-60	14	13	
61-70	36	13	
71-80	8	3	

The study population's distribution according to gender and BMI

Table 3 shows that the average BMI for males is 24.79, while for females, it is slightly lower at 24.01. This suggests a marginal difference in BMI between genders, with males having a slightly higher average BMI. The slightly higher average BMI in males (24.79) compared to females (24.01) could be attributed to differences in dietary habits, physical activity levels, or metabolic profiles. These findings underline the importance of gender-specific health promotion programs focusing on weight management, physical activity, and balanced nutrition to curb the rising trends of overweight and obesity [15].

Table 3: The study population's distribution according to gender and BMI

Gender	BMI(Mean)
Male	24.79
Female	24.01

The study population's distribution according to BMI

Table 4 reveals the distribution of BMI categories across the population. A significant portion of individuals (63.4%) fall within the "Normal" BMI range (18.5-24.9). Overweight individuals (BMI 25-29.9) account for (26.9%), while only a small percentage (7.9%) are classified as obese (BMI ≥30). The underweight category (<18.5) is the least represented at (1.5%). However, the prevalence of overweight (26.9%) and obese individuals (7.9%) raises concerns about the increasing burden of lifestyle-related conditions such as cardiovascular disease and diabetes.

Table 4: The study population's distribution according to BMI

BMI	Category	%	P value
<18.5	Underweight	1.5	0.095
18.5-24.9	Normal	63.4	
25-29.9	Overweight	26.9	
≥30	Obese	7.9	

Study population distribution according to dialysis type

Table 5 reveals the distribution of dialysis types, with the majority of individuals (88.23%) receiving haemodialysis. Hemodiafiltration is the next most common at (5.88%). Ultrafiltration and the combined HD+HDF treatment each make up (2.94%). This indicates that haemodialysis is the dominant treatment option in the population. However, other modalities, including hemodiafiltration, ultrafiltration, and combined HD+HDF treatments, are used much less frequently, however, they could provide benefits to certain categories of patients. This demonstrates the need for individualized treatments plans that take into account the patient's clinical profile, expected cost, and other patient preferences. Additionally, the reliance on haemodialysis, the writing states, shows the requirement of uninterrupted expenditure on dialysis infrastructure, training of workforce, and assigning resources to cope up with the increase in the basic requirement of renal replacement therapeutics [16].

Table 5: Study population distribution according to dialysis type

Type of Dialysis	**N**	**%**
Hemodiafiltration	6	5.88
Hemodialysis	90	88.23
Ultrafiltration	3	2.94
HD+HDF	3	2.94

The study population's distribution according to dialysis frequency

Table 6 shows the frequency of dialysis treatment across different duration ranges. The highest number of individuals (36) with dialysis experience between 1-3 years have a more balanced distribution between those who dialyze twice (17) and thrice (19) a week. As the duration of dialysis increases, the number of individuals receiving treatment thrice a week remains relatively high compared to those receiving it twice a week. Increasing dialysis duration leads to a clear shift to thrice weekly dialysis as renal disease progresses and greater physiological demands are placed on patients. All of these trends highlight the importance of ongoing monitoring and prompt dialysis regimen adjustments to improve patient outcomes and preserve quality of life. Patient education and counselling are essential for educating the patient to follow the regimen along with other psychosocial aspects of long-term dialysis [17].

Table 6: The study population's distribution according to dialysis frequency

		FREQUENCY OF DIALYSIS		
NO OF YEARS	**N**	**TWICE**	**THRICE**	**P VALUE**
>1YEAR	22	14	8	0.055
1-3YEARS	36	17	19	
3-5YEARS	13	3	10	
5-7YEARS	5	1	4	
7-9YEARS	4	0	4	
<9YEARS	4	1	3	

Study Population Distribution by Dialysis Comorbidities

The data shows that hypertension is the most prevalent comorbidity, affecting (51.82%) of individuals, followed by diabetes mellitus at (37%). Other conditions such as hypothyroidism (5.97%) and hypoglycemia (1.49%) are less common. Rare comorbidities like hypothyroidism, chronic liver disease, nephrosclerosis, and cardiovascular issues are present in only a small percentage of the population, represented in **Table 7.** To address the comorbidities, it is necessary to have a multidisciplinary approach

to care involving nephrologists, endocrinologists, cardiologists, and primary care providers to provide comprehensive and coordinated attention [18].

Table 7: Study Population Distribution by Dialysis Comorbidities

Comorbidities	N	%	P value
Hypertension	71	51.82	2.85×10^{-83}
Hypotension	1	0.74	
Diabetes Mellitus	47	37	
Hypothyroidism	8	5.97	
Hyperthyroidism	1	0.74	
Hypoglycemic	2	1.49	
CLD	1	0.74	
Nephrosclerosis	1	0.74	
CAD	1	0.74	
PVD	1	0.74	

Study Population Distribution by Past Medication History

The data shows that a significant majority (82.56%) of individuals have a medical history involving allopathic treatments. Ayurveda is used by (9.17%) of the population, and homeopathy is slightly less common, with (8.25%), detailed in **Table 8.** This indicates that a fraction of patients appreciates alternative and traditional therapies. Nevertheless, healthcare providers should recognize and respect these preferences of the patients, while ensuring that alternative therapies do not interfere with the efficacy of standard treatments. Trust and open communication with patients and providers can increase treatment adherence and satisfaction with care overall [19].

Table 8: Study Population Distribution by Past Medication History

Past Medication History	N	%
Allopathy	90	82.56
Ayurveda	10	9.17
Homeopathy	9	8.25

Distribution of Study Population Based on Social History

The data reveals that the majority of individuals (68.64%) have no history of alcohol, smoking, or toddy consumption. Alcohol consumption alone is the most common social behaviour (11.86%). Other combinations like alcohol with smoking (5.08%), toddy (6.77%), or all three (2.54%) are less frequent as represented in **Table 9.** This is a positive public health indicator. Yet these habits are evident in a minority of the population, and such examples point to the necessity for behavioural interventions targeted at reducing substance use. Especially important, these efforts can be for those already compromised from chronic conditions, since increases in substance use can also make the disease worse and more difficult to manage [20].

Table 9: Distribution of Study Population Based on Social History

Social History	N	%	P value
Alcohol	14	11.86	2.49×10^{-48}
Smoking	6	5.08	
Toddy	8	6.77	
Alcohol+Smoking	6	5.08	
Alcohol+Smoking+Toddy	3	2.54	
None	81	68.64	

Distribution of Study Population Based on Education Status

The data reveals that a large portion of individuals (33.98%) have no formal education. The retired group is also significant, comprising (33%) of the population. The working population accounts for (29.12%), while only (3.88%) of individuals are graduates as shown in **Table 10.** The lack of education on the matters of health conditions can stop the patients from understanding and dealing with their health in an effective manner. In addition, low literacy levels present difficulties for healthcare providers in education about health and making sure people make informed decisions. Given the gaps in this population's

knowledge, tailored educational initiatives for this population to bridge this gap and empower patients are essential. A significant portion of the population fall under the group that is retired and the working for which the health programs must be flexible enough to be able to accommodate their schedules and economic limitations. The small proportion of graduates underscores the need for accessible, inclusive strategies for the health education to be provided [21].

Table 10: Distribution of Study Population Based on Education Status

Education Status	N	%
Graduation	4	3.88
Retired	34	33
Working	30	29.12
None	35	33.98

Study population distribution according to dietary status

The data shows that most individuals (78.37%) follow a non-vegetarian diet. A smaller portion (21.62%) adhere to a vegetarian diet, depicted in **Table 11.** Unbalanced non vegetarian diet may lead to hyperuricemia or hyperphosphatemia in renal patients. This is consistent with dietary diversity, in which the smaller proportion of vegetarians supports the idea that dietary recommendations need to be individualized based on each patient's cultural preferences and clinical needs. The dietitians and nutritionists participate in educating about a renal friendly diet to promote good health outcomes [22].

Table 11: Study population distribution according to dietary status

Dietary Status	%
Non veg	78.37
Veg	21.62

Study Population Distribution via Blood Transfusion

Table 12 shows that (33.30%) of individuals have received a blood transfusion, while (66.60%) have not. This suggests that the majority of individuals in the population have not required a transfusion. Reduced erythropoietin production and iron shortage lead to anemia, a frequent consequence in ESRD patients. Dietary therapies, iron supplements, and erythropoiesis stimulating agents (ESAs) can be of great help to patients in the case of anemia as it can improve their health and wellbeing. The high percentage not requiring transfusions indicates that severity of anemia varies greatly among patients and the treatments should be individualized.

Table 12: Study Population Distribution via Blood Transfusion

Blood Transfusion	%
Yes	33.30%
No	66.60%

Information Derived from the Mean and Standard Deviation of Different Blood and Biochemical Measurements

The data in **Table 13** shows the mean and standard deviation (SD) of various blood and biochemical parameters. Hemoglobin (Hb) has a mean of 10.13 g/dL and SD of 1.86. Renal parameters such as eGFR have a low mean of 20.41 (±22.88), indicating possible kidney dysfunction, while serum creatinine averages 7.45 (±2.52). Electrolytes like sodium and potassium average 136.9 (±3.17) and 6.5 (±8.8), respectively, with a high SD for potassium. Liver enzymes such as AST (149.5 ± 181.7) and GGT (108.7 ± 166.3) show high variability, suggesting potential liver involvement. Electrolyte imbalances, require close monitoring and close dietary management to reduce complication such as arrhythmias. The large variation in liver enzyme levels implies hepatic involvement, which should be investigated and monitored for possible underlying liver disorders.

Table 13: Information Derived from the Mean and Standard Deviation of Different Blood and Biochemical Measurements

	Mean	SD
Hb (12.0-17.5 g/dL)	10.13	1.86
MCV (80-100 fL)	91.13	7.02
MCH (27-31 pg/cell)	28.44	3.09
MCHC (32-36 g/dL)	31.47	1.26
SrFerritin (13-300 ng/mL)	426.59	399.98
PT (11-13.5 sec)	16.37	2.71
INR (0.8-1.1)	1.2	0.17
APTT (25-35 sec)	29.71	2.31
TLC (4000-11000 cell/µL)	7110	2313
PLT (150,000-400,000 cell/µL)	2.211	1.05
Tranferrin (215-380 mg/dL)	50.83	4.38
Sr.Iron (60-170 mcg/dL)	142	88.23
Protein (6-8.3 g/dL)	6.5	0.15
Albumin (3.4-5.4 g/dL)	3.4	0.57
Globulin (2.0-3.5 g/dL)	3.166	0.6
eGFR (>90 ml/min)	20.41	22.88
BUN (6-24 mg/dL)	93.9	29.5
Sr.Creatinine (0.6-1.3 mg/dL)	7.45	2.52
Uric acid (2.6-7.2 mg/dL)	11.8	20.03
Sodium (135-145 mEq/L)	136.9	3.17
Potassium (3.5-5.0 mEq/L)	6.5	8.8
Chloride (96-106 mEq/L)	104.4	5.14
Calcium (8.5-10.5 mg/dL)	8.2	0.65
Phosphorous (2.8-4.5 mg/dL)	5.8	1.08
Phosphate (2.5-4.5 mg/dL)	5.85	2.65
ALP (44-147 IU/L)	142	8.3
AST (8-33 IU/L)	149.5	181.7
GGT (5-40 IU/L)	108.7	166.3

Distribution of Various Drug Classes Used by Individuals

Table 14 shows the distribution of various drug classes used by individuals. The most common drug class is anti-hypertensives (11.12%), followed by anticoagulants (10.73%) and antibiotics (9.55%) which coincide with the high prevalence of hypertension and need for thromboprophylaxis in ESRD patients. Other drug classes, such as antiulcers, vitamin supplements, and antihistamines, also make up a significant portion of the medications used. The frequent use of antibiotics, antiulcer, and vitamin supplements underscores the complexity of managing comorbidities and complications associated with chronic kidney disease. Polypharmacy is a significant concern in this population, necessitating regular medication reviews to minimize drug interactions and adverse effects [23].

Table 14: Distribution of Various Drug Classes Used by Individuals

Drug Class	N	%
ANTI-HYPERTENSIVES	85	11.12
ANTICOAGULANTS	82	10.73
ANTIPLATELETS	44	5.57
ANTIDIABETIC	24	3.14
ANTIHISTAMINE	42	5.49
ANTICONVULSANTS	26	3.4
THYROID AGENTS	19	2.48
ANTIULCERS(PPI)	69	9.03
LIPID LOWERING DRUGS	29	3.79

ANTIPYRETICS	40	5.23
ANTICANER	13	1.7
PHOSPHATE BINDERS	43	5.62
NSAIDS	15	1.96
CORTICOSTEROIDS	17	2.22
ANALGESICS	43	5.62
ANTIBIOTICS	73	9.55
VITAMIN SUPPLEMENTS (EXCEPT VITB)	65	8.5
ANTIEMETIC	35	4.58

Distribution of Haematinics Usage

The data reveals the distribution of hematinic usage. ESA (46.98%) is the most frequently used, followed by iron preparations (25.3%) and Vitamin B12 (18.67%). Folic acid accounts for 7.22%, while HIF-PHI inhibitors are the least utilized at 1.8%. This highlights ESA's dominance in anemia management and the selective use of other hematinic as represented in **Table 15.** Hematinics and ESAs have an important role in treating anemia, according to the findings, especially in CKD patients. The mainstay of treating anemia, erythropoiesis-stimulating agents (ESAs) are used by nearly half of the population (44.98%). Their ability to stimulate red blood cell production effectively combats anemia linked to reduced erythropoietin production in CKD. The significant use of iron preparations (25.3%) highlights the importance of correcting iron deficiency, a frequent contributing factor to anemia in this population. Vitamin B12 supplementation (18.67%) further reflects the recognition of macrocytic anemia as a coexisting issue.

Table 15: Distribution of Haematinics Usage

Hematinics	**N**	**%**
ESA	78	46.98
Folic acid	12	7.22
Vit B12	31	18.67
Iron Preparations	42	25.3
HIF-PHI Inhibitors	3	1.8

Distribution of ESA, Folic Acid, Vitamin B12, Iron Drugs, Drugs and its Use

Table 16 lists ESA drugs with details on their usage. The most commonly administered drug is Recombinant Human Erythropoeitin (60 doses), followed by Darbepoeitin alfa (20 doses). The mode of administration further emphasizes adherence to clinical best practices. Subcutaneous (SC) administration of ESAs offers consistent absorption and reduced risk of adverse reactions, making it a preferred option for long-term management. Similarly, the intravenous (IV) route for iron preparations ensures rapid correction of iron deficiency, especially critical in severe anemia or when oral supplementation is ineffective or poorly tolerated [24]. It also shows the distribution of folic acid drugs, their routes of administration (ROA), and dosages. Most drugs are administered orally, including Folic acid (5 mg). The data reveals that Oral drugs make up 80% of the listed medications, while IV drugs account for 20%. The dosage varies widely, with a significant portion of drugs (80%) used only once detailed in **Table 16.** The data reveals that iron drugs are predominantly administered intravenously (70% of cases), with dosages ranging from 100 mg to 500 mg. Subcutaneous (SC) and oral (PO) routes account for the remaining 30%. The most frequently used drugs are Ferric carboxymaltose and Iron Sucrose as represented in **Table 16.**

Table 16: Distribution of Drugs with Details on their Usage

Drugs	**N**	**Dose**	**Route**
Erythropoietin Stimulating Agents			
Recombinant Human Erythropoietin	60	6000IU	SC
Darbepoetin Alfa	20	40mg	SC
Pegylated Recombinant Human Erythropoietin	2	30mcg	SC
Folic Acid			
Folic acid	7	5mg	PO
Iron+folic acid	1	1 Tab	PO
Vitamin B12 Drugs			
Methylcobalamin, Alpha Lipoic Acid	1	1 amp	IV

Methylcobalamin	5	1500 mcg	PO
Iron Drugs (Generic Name)			
Iron sucrose	15	200mg	IV
Iron and folic acid complex	7	1 tab	PO
Ferric carboxymaltose	21	500mg	IV
Ferric derisomaltose	4	500mg	IV

Distribution of HIF-PIF Drugs, Route of Administration and Dosages

Table 17 highlights HIF-PHI inhibitors, specifically Desidustat, administered orally (PO). It is available in doses of 50mg and 100mg. Patients with chronic kidney disease (CKD) are usually treated for anaemia with these inhibitors. The targeted use of folic acid and HIF-PHI inhibitors illustrates the growing sophistication in anemia management. HIF-PHI inhibitors, a relatively newer class, represent an advancement by modulating hypoxia-inducible factors to enhance endogenous erythropoietin production. Their selective use points to their role in specific clinical scenarios, particularly for patients unresponsive to conventional ESAs or with contraindications [25]. These findings highlight the necessity for personalized anemia management strategies that go beyond standardized protocols. Tailored approaches must consider individual patient profiles, including the severity of anemia, underlying comorbidities, and treatment tolerability. The growing availability of newer therapies, such as HIF-PHI inhibitors, promises to reshape future management approaches, offering alternative pathways for patients who are unresponsive to or unable to access traditional treatments. Continued advancements in pharmacological and supportive care hold the potential to improve both hemoglobin levels and overall patient well-being, reinforcing the importance of research and innovation in this field [26].

Table 17: Distribution of HIF-PIF Drugs, Route of Administration and Dosages

HIF-PHI-inhibitor	Dose	Route
Desidustat	100mg	PO
Desidustat	50mg	PO

CONCLUSION AND LIMITATIONS

This study highlights the complex health challenges of an older population with ESRD, compounded by significant comorbidities such as hypertension and diabetes mellitus. The demographic data reveals gender disparities and underrepresentation of younger age groups, emphasizing the need for gender-sensitive and youth-focused health policies. The dominance of hemodialysis underscores the necessity of sustained investment in dialysis infrastructure and individualized treatment plans. Culturally tailored nutritional counselling and weight management programs are needed for rapidly rising rates of obesity and dietary imbalances. ESAs and emerging therapies such as HIF-PHI inhibitors should be used for management of anaemia to enhance patient outcomes. Stress is placed on the importance of education and behavioural interventions in people with low literacy levels and dependence on substances. It is a concern that polypharmacy remains a problem and requires regular medication reviews to avoid adverse effects. Addressing these challenges is multi-disciplinary care involving nephrologist, dietitians and primary care providers. Finding personalized care strategies and research into promising new therapies are crucial for achieving the best outcomes we can. The need is for a comprehensive approach to improve quality of life for this vulnerable group.

The observational cross-sectional design may not allow for causality to be established between variables and outcomes. If the study is confined to only one tertiary care facility the results of the study may not be applicable to other groups or healthcare systems. Some of the variables like social history or dietary habits may require reliance on patient reported information, which introduces recall bias. With a relatively small sample size (126 patients), the statistical power may be limited to find a significant association between less prevalent conditions or treatments. One cannot know whether these changes in health status or treatment outcomes had been made over time because of lack of follow up or longitudinal data.

Acknowledgement

We thank the management, staff, and faculty of Anurag University, Hyderabad for helping us in this research study. We also like to thank the physicians of Yashoda Hospital, Secunderabad for guiding us and allowing us to conduct patient interviews and collect data from the facility.

Competing Interest
None

Ethical Approval
This study was approved by Institutional Review Board of Anurag University bearing the research proposal number: IRB-AU/2024-2025/03.

REFERENCES

1. Levey AS, Coresh J. (2012). Chronic kidney disease. Lancet. 379(981):165-80.
2. Tambuna IAW |Dominica PS |Hani S |Betty A. (2025). Non-human leukocyte antigen (non-HLA) antibodies in a kidney transplant recipient: A case report. J Med Pharm Chem Res.;7(March):2788–98.
3. Joseph T DiPiro. Haematological Disorders. Anemias, Cecily V DiPiro, Pharmacotherapy Handbook, 11th Edition, New Delhi:Mc Graw Hill 2021 p 357
4. Moorhead JF, Chan MK, El-Nahas M, Varghese Z. (1982). Lipid nephrotoxicity in chronic progressive glomerular and tubulo-interstitial disease. Lancet, 2(8311):1309 11.
5. Liana DS, Endaryanto A, Dewa Gede Ugrasena I, Rantam FA, Basuki S, Andarsini MR, et al. (2025). The relationship between HAMP gene G71R polymorphism and malaria infection with hemoglobin level to develop genotype-based treatments in endemic malaria areas. J Med Pharm Chem Res.;7(10):2118–26.
6. Johnson RJ, Nakagawa T, Jalal D, Sánchez-Lozada LG, Kang DH, Ritz E. (2013). Uric acid and chronic kidney disease: which is chasing which? Nephrol Dial Transplant,28(9):2221-8
7. Baker RJ, Mark PB, Patel RK, Stevens KK, Palmer N. (2017) Renal association clinical practice guideline in post-operative care in the kidney transplant recipient. BMC Nephrol., 18(1):174
8. Fishbane S, Agoritsas S, Bellucci A, Halinski C, Shah HH, Sakhiya V, Balsam L. (2017). Augmented Nurse Care Management in CKD Stages 4 to 5: A Randomized Trial. Am J. Kidney Dis; 70(4):498-505.
9. Kitamoto Y, Tomita M, Akamine M, Inoue T, Itoh J, Takamori H, Sato T. (1993) Differentiation of hematuria using a uniquely shaped red cell. Nephron, ;64(1):32-68.
10. Hegazy HA, Abdelhameed M, Ahmed A, Rashad S. (2025). Endocrine interplay between cortisol dysregulation and thyroid dysfunction in smokers with chronic stress: A correlational analysis. J Med Pharm Chem Res.;7(March):2663–75.
11. Remella VS, Neelamegan H. (2025). Structural and Computational Analysis of a Triclinic Pentafluorophenylurea Based Pyridine Derivative: A DFT-Based Approach. Chem Methodol.;9(4):301–25.
12. Anna N, Sadyah C, Putra A. (2025). Investigating the Therapeutic Potential of Human Umbilical Cord- Derived Mesenchymal Stem Cell for Diabetic Foot Ulcer: A Systematic Review and Meta-Analysis. J Med Chem Sci.; 8:201–11.
13. Singh AK. (2008). The controversy surrounding haemoglobin and erythropoiesis stimulating agents: What should we do now? Am J Kidney Dis.;52: S5–S13.
14. Parfrey PS, Foley RN, Wittreich BH, Sullivan DJ, Zagari MJ, Frei D. (2005) Double-blind comparison of full and partial anaemia correction in incident hemodialysis patients without symptomatic heart disease. J Am Soc Nephrol.;16:2180–2189.
15. Reddan D, Lappin DW, Tierney M, Szczech LA. (2007). What have we learned about PD from recent major clinical trials? Perit Dial Int.; 27:395–399.
16. Zhang Y, Thamer M, Stefanik K, Kaufman J, Cotter DJ. (2004) Epoetin requirements predict mortality in hemodialysis patients. Am J Kidney Dis.; 44:866–876
17. Krapf R, Hulter HN.(2009). Arterial hypertension induced by erythropoietin and erythropoiesis- stimulating agents (ESA) Clin J Am Soc Nephrol.;4:470–480.
18. Levey A, Bosch J, Lewis J (1999) A more accurate method to estimate glomerular filtration rate from serum creatinine; a new prediction equation. Ann Intern 130(6):461- 470
19. Shemesh O, Golbetz H, Kriss JP, Myers BD (1985) Limitations of creatinine as a filtration marker in glomerulopathic patients. Kidney Int 28(5):830–838
20. Liu X, Chen J, Wang C, Shi C, Cheng C, Tang H, Lou T (2013) Assessment of glomerular filtration rate in elderly patients with chronic kidney disease. Int UrolNephrol 45(5):1475–1482
21. Pottel H, Hoste L, Dubourg L, Ebert N, Schaeffner E, Eriksen BO, Melsom T, Lamb EJ, Rule AD, Turner ST, Glassock RJ, De Souza V, Selistre L, Mariat C, Martens F, Delanaye P (2016) An estimated glomerular filtration rate equation for the full age spectrum. Nephrol Dial Transplant 31(5):798–806
22. Coca SG, Yusuf B, Shlipak MG, Garg AX, Parikh CR (2009) Long-term risk of mortality and other adverse outcomes after acute kidney injury: a systematic review and meta-analysis. Am J Kidney Dis 53(6):961–973
23. Long CL, Raebel MA, Price DW, Magid DJ. (2004). Compliance with dosing guidelines in patients with chronic kidney disease. Ann Pharmacother ;38:853-8
24. Manley HJ, Cannella CA, Bailie GR, St Peter WL. (2005). Medication-related problems in ambulatory hemodialysis patients: A pooled analysis. Am J Kidney Dis;46:669-80
25. USRDS 1998 Annual Data Report. Bethesda, (1998). National Institutes of Health, National Institutes of Diabetes and Digestive and Kidney Disease.

26. Khan SS, Kazmi WH, Abichandani R, Tighiouart H,Pereira BJ, Kausz AT. (2002). Health care utilization among patients with chronic kidney disease. Kidney Int 2002;62:229-36.