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Research Article

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Prevalence and Awareness of Anemia in Chronic Kidney Disease Patients on Dialysis in Chennai, Tamil Nadu

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ABSTRACT

Introduction: Chronic kidney disease poses a significant health risk with high mortality rates. Its common complication is anemia, which leads to adverse outcomes and worsens disease progression. Early detection and management are crucial for reducing associated risks.

Aim/Objectives: The study aimed to assess the prevalence and awareness of anemia among chronic kidney disease dialysis patients in Chennai, Tamil Nadu.

Method/Methodology: The study was conducted in a hospital setting in 2023, using a cross-sectional design. Participants included dialysis patients aged 18 and above from 5 dialysis centres in Chennai, using convenience sampling. The total sample size, including attrition, was 330. The PPS (probability proportional to size) method allocates samples across 5 selected dialysis centres: Aminjikarai, Padi, Ambattur, Valluvarkottam, & Retteri, based on patient visitation at each facility. Data from each facility was collected using SRS method, and data analysis was conducted using "Jamovi-2.0.0" software. Anemia awareness was assessed using a validated quantitative, semi-structured questionnaire. The association between anemia prevalence and sociodemographic traits was evaluated using a chi-square test.

Results: The study enrolled 326 subjects; 259 were anemic at a prevalence of 79.4% with 95% CI. Gender and hypertension were significantly associated with anemia prevalence (p-value = 0.05). Notably, 91.6% (n=84) of females and 81.6% (n=299) of hypertensive individuals had anemia, emphasizing their substantial impact on anemia prevalence. Findings from awareness survey (n=326) found 59% were unaware of anemia. Graduates and long-term dialysis patients (>5 years) had increased awareness (p=0.004 and p=0.047, respectively). Significance was determined by the Mann-Whitney U test at (p=0.005).

Conclusion: The study indicates a higher prevalence of anemia among dialysis patients and limited awareness among chronic kidney disease patients, regardless of anemia status. Medical facilities, adopting patient-centred strategies (education & management guidance), Regular screening & monitoring are crucial for enhancing treatment outcomes and disease management.

Key Words: Anemia, Attitudes, Prevalence, Renal Dialysis, Tamil Nadu, Regular screening & monitoring

INTRODUCTION

Chronic kidney disease is a significant health problem associated with a high mortality rate, according to Global burden of disease 2019.[1] CKD is defined as the condition where the kidneys are damaged and lose their ability to filter waste and fluids out of your blood. It's an irreversible, progressive process defined as abnormal kidney structure or function, present for more than three months with implications for health.[2] In India, the prevalence of (CKD) chronic kidney disease is 17.2%.[3] Findings from a state survey say one in five persons in Chennai, Tamil Nadu, has kidney impairment.[4] The major complication of CKD is Anemia, which ends with poor outcomes, especially Increasing the risk of cardiovascular disease. Anemia becomes more common as renal disease advances and affects nearly all individuals with stage five CKD.[5] Elderly persons with CKD are at higher risk to develop anemia.[6]

Anemia in CKD is caused by insufficient erythropoietin production in the kidneys and due to blood loss, iron insufficiency, and uremic toxin accumulation. A study by Poudel et al. states there is an association and progression of anemia as the disease progresses.[5] A study by Zaawari et al.

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reports that about 82.4% of CKD patients had anemia.[7] A study by Mwenda et al. stated anemia is common among CKD patients.[8] Thus, anemia accelerates the disease's adverse outcomes and causes a decreased quality of life, physical and mental well-being, increased CVD, hospitalization, cognitive impairment, hormonal imbalance[9] and death.[10,11] In renal patients, an inadequate oxygen supply and cardiovascular system stress may harm renal tissues over time and deteriorate kidney function, negatively affect general health and complicate the management of anemia in kidney patients.[12] According to a study by Kulkarni et al. among CKD patients undergoing dialysis in Mumbai, India, 75% of the patients reported anemia.[13] Early identification of anemia in CKD can decrease adverse outcomes.[14] Several studies have found an expanded danger, with attempts to completely treat anemia increasing the chance of developing thromboembolic events, strokes, and mortality.[15,2] This concept is important for patients to understand. Numerous research has shown that anaemia-related CKD patients are unaware of their anaemic condition, which has a major impact on their physical well-being.[16] It's crucial to continuously assess renal anemia so that ESA and iron replacement therapy can be started when necessary.[17] The current study focuses on the prevalence and awareness of anemia in chronic kidney disease patients on dialysis- in Chennai, Tamil Nadu. As a result, understanding the prevalence of anemia and how aware these patients are of it might aid in providing evidence-based suggestions.

METHODOLOGY

Background of the study

The research took place in Chennai, the bustling capital of Tamil Nadu, a densely populated urban area. Chennai is one of India's largest cities, with nearly 10 million residents. The population exhibits diverse socioeconomic backgrounds, including cultural, financial, and ecological factors. Many residents come from highly polluted environments and less prioritization on self-care. Consequently, the study aims to understand their health condition and awareness levels. To maintain confidentiality and anonymity no names were recorded. The study was approved by the institutional ethical committee of Kasturba Medical College at Manipal Academy of Higher Education, Manipal, India (Reference number- IEC2:611/2022).

Study setting

Chennai has a high burden of non-communicable diseases, particularly renal disorders, due to poor dietary habits and inactive lifestyles. This study focuses on Chennai's most densely inhabited areas, including Aminjikarai, Padi, Ambattur, Valluvarkottam, and Rettarie. Some are multi-speciality hospitals, while others are sponsored by trusts. The study specifically involved patients diagnosed with chronic renal disease undergoing peritoneal and haemodialysis treatments in Chennai, Tamil Nadu.

Study Duration & study population

The period for collecting data is February 2023–April 2023. In Chennai, five facilities were chosen, and patients with chronic renal failure undergoing dialysis were included in the study.

Inclusion criteria

- Above the age of 18.
- Chronic kidney failure patients undergoing haemodialysis and peritoneal dialysis for a minimum of six months.

Exclusion criteria:

- Chronic kidney failure patients visiting the hospital are not taking dialysis treatment.
- Pregnant and lactating mother undergoing Dialysis.
- Patients with comorbidities such as haematological disorders.

Study tool

Initially, a developed quantitative, semi-structured questionnaire validated by subject experts was employed to collect data. The first nine questions involved variables including gender, age, education, marital status, occupation, and income. Data was gathered using surveys to understand participants' socio-demographic characteristics. Clinical data, including dialysis type, duration, medications, and comorbidities, were retrieved from medical records. The next set of questions focuses on the patient's behavioural characteristics, gathered using surveys such as eating habits, physical activity levels, smoking, and alcohol consumption. Following this, a series of questions aimed to assess participants' understanding of anemia, probing awareness, haemoglobin levels, and treatment adherence through patient surveys.

Data Collection

To accomplish the initial objective of determining the prevalence of anemia, secondary data collection involved reviewing patients' clinical records. Subsequently, primary data collection entails directly surveying dialysis patients to achieve the study's secondary goal of assessing patient awareness of anemia.

Sample Size calculation and Sampling technique

The required sample size was determined, considering 75% as the prevalence of anemia among dialysis patients from the previous study. Sample size for infinite population: n= Z^2p(1-p) / d^2. With a margin of error d=5% and a

confidence interval of 95%, the total sample size with a 10% non-response rate is found to be 330. Five hospitals were selected for this study based on convenience using the convenience sample methodology. The overall sample size, including the attrition rate, was determined to be 330. The PPS (probability proportional to size) technique was then applied to allocate the total number of samples to be collected in each facility. The dialysis unit in charge provided the list of individuals receiving dialysis at each facility. Using unique identification numbers, patients were chosen using simple random sampling through Microsoft Excel by generating random numbers. This method ensured random selection within each facility.

Data Analysis

All obtained data was entered into Microsoft Excel, cleaned, and prepared for analysis. Descriptive analysis, such as age, gender, level of education, type of work, and monthly income, were developed. To examine the relationship between two variables (continuous and categorical), such as age and the existence of anemia, a chi-square test with a p-value less than or equal to 0.05 was considered statistically significant. Because the normality test failed, the Mann-Whitney U-test was employed to determine the relationship between continuous variables and independent factors such as awareness score and other sociodemographic information. The calculation of the awareness of anemia was given an overall score makes up 25 scores. A possible score ranging from '0 to 25' has been generated by using the 50% percentile and 75% percentile as cut-off points to determine the level of awareness.[18] Normality was determined using the Shapiro-Wilk test. All these statistical analyses were done using Jamovi software version 2.0.0.

RESULTS

A total of 328 participants were enrolled in the study, and their baseline characteristics are presented below.

Baseline Characteristics

The baseline characteristics of a total of 328 individuals are summarised in Table no: 1. 32.2% (105) of the 326 total participants were patients between the ages of 31 and 45. A majority of 242 (74.20%) patients were men, 288 (88.3%) were married, and 105 (32.2%) had completed high school. Among 326 dialysis patients, 99 (or 30.4%) were unemployed. 44.5% of the participants reported monthly incomes of less than Rs.10, 000.

Table 1: Depending on the distribution of the study's population, Socio-demographic characteristics among dialysis patients

Variables	Frequency (N)	Percentage (%)
Present age		
18-30	18	5.5%
31-45	105	32.2%
46-55	91	27.9%
56-69	93	28.5%
above 70	19	5.8%
Gender		
Male	242	74.20%
Female	84	25.80%
Marital status		
Single	36	11.0%
Married	288	88.3%
Others	2	0.6%
Education		
Illiterate	8	2.5%
Literate without schooling	17	5.2%
Primary education (1 to 5th-std)	73	22.4%
High school (8th, 9th, 10th-std)	105	32.2%
Higher Secondary (11th, 12th – std)	42	12.9%
Graduate and above	81	24.8%
Occupation		
Unemployed	99	30.4%
Self-employed	45	13.8%
Government employee	6	1.8%
Private employee	48	14.7%
Housewife	54	16.6%
Retired	71	21.8%
Student	3	0.9%
Monthly income		
below 10,000	145	44.5%
10,000 – 25,000	116	35.6%
26,000- 40,000	34	10.4%
41,000-69,000	13	4.0%
70,000 and above	18	5.5%

CKD prevalence

The study included 326 patients in total, and it was shown that anemia affected 79.4% with a 95% confidence interval of patients with chronic renal illness receiving dialysis over the age of 18. In 259 people, the haemoglobin level was less than 11 g/dl. (Table 2)

Table 2: Prevalence of anemia among adult CKD patients undergoing Dialysis.

PREVALENCE OF ANEMIA (N = 326)	
Anemic (<11 g/dl)	Not Anemic (≥11g/dl and above)
259 (79.4%)	67 (20.6%)

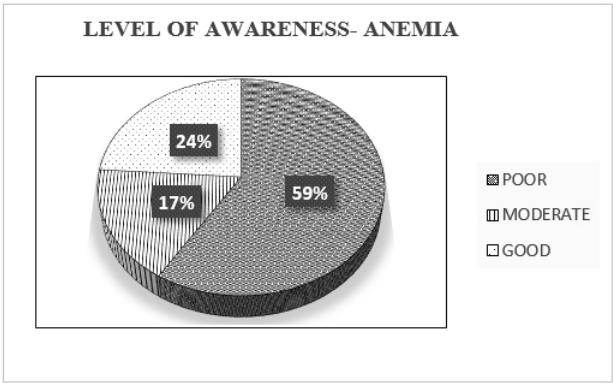
A chi-square test was used to determine the relationship between the prevalence of anemia and other independent variables (sociodemographic characteristics), and the results showed that only the associations between gender and hypertension and the prevalence of anemia were significant (p-value 0.05).

Table 3: Association between prevalence of anemia and demographic variables among dialysis patients.

Variables	Categories	Anemic-N (%)	Non-Anemic-N (%)	p-value
Gender	Male	182 (75.2%)	60(24.7%)	0.001
	Female	77 (91.6%)	7 (8.3%)	
Hypertension	Present	244(81.6%)	55 (18.3%)	0.001
	Absent	15 (55.5%)	12 (44.4%)	

Gender exhibits a significant association with the prevalence of anemia. Among 84 female participants in the study, 77 (91.6%) were found to have anemia. Furthermore, a positive relationship was observed between the prevalence of anemia and hypertension. Specifically, out of the 299 individuals diagnosed with hypertension, 244 (81.6%) were also identified as having anemia. (Table 3)

To evaluate whether dialysis patients with chronic renal disease are aware of anemia. Interviews were conducted using a sample size of 326 chronic renal disease patients. Participants were classified as having "poor awareness" if their score was between 0 and 11, "moderate awareness" if it was between 11 and 13, and "good awareness level" if it was between 13 and 25 using the 50% percentile and 75% percentile as cutoff points.[6]



Graph 1: Distribution of study participants according to their level of awareness of anemia among dialysis patients.

This graph depicts the level of awareness from an overall sample size of 326 patients. 192 patients (or 59%) had a poor understanding of anemia. 56 patients (17%) had moderate awareness, while 78 chronic renal failure patients (24%) had a good understanding of anemia.

The Mann-Whitney U test, with a significance level (p-value of 0.005), was used to assess the association between the awareness score and various sociodemographic characteristics of the patients.

Table 4: Association between awareness of anemia across socio-demographic characteristics among CKD patients undergoing dialysis

Variable	Category	N	%	Awareness Score (25) Mean ±SD	Z-test	p-value
Education	Schooling and below	245	75.153	10.5 ± 3.53	8421	0.04
	Graduates	81	24.847	11.7 ± 4.18		
Years of Dialysis	5 years and lesser	249	76.38	10.6 ± 3.76	8153	0.047
	above 5 years	77	23.62	11.5 ± 3.56		

Awareness of anaemia was found to have a significant link with participants being graduates (p-value 0.004, z=8421), similarly with patients who have been receiving dialysis for more than five years (z= 8153; p=0.047). The interpretations provided in this study do not include any models or adjustments, and the associations seen in the data and significance levels (as shown by p-values) are all based on unadjusted analyses.

DISCUSSION

The health facility-based study was conducted to find out the prevalence of anemia and the level of awareness regarding anemia among chronic renal disease patients undergoing both haemodialysis and peritoneal dialysis in Chennai, Tamil Nadu. The prevalence of anemia was found to be 79.4%, with a 95% confidence interval among the overall sample of 326 study participants. When prevalence rates are reviewed

globally, the prevalence found in the study conducted in the [19] United States is 15.4%, which is five times lower than the current study, which was conducted among institutionalised civilians with CKD patients more than 18 years. Likewise, 53.5% of CKD patients over the age of 18 who visit hospitals in [20]Ethiopia have a prevalence rate lower than the current study. In hospitals in Shanghai, [21]China the percentage of non-dialysis CKD patients is again lower at 51.5%. Due to free medical access to free medical care, the prevalence is lower 43.18% in [14]South Africa, when compared to the current study. When the prevalence is compared nationally, it is found to be 39%, which is lower than the current study among CKD patients in the Kaveri Delta Region of Tamil Nadu.[22] The prevalence among dialysis patients with CKD is again lower in [5]Nepal, with a value of 13.5%. And once more, haemodialysis patients with CKD have a lower prevalence in [13]Mumbai—75%—than in the current study. The anemia prevalence in [7]Hyderabad, India, is 82.4%, which was greater than the current study.

As discussed by Alemu et al., these differences in prevalence may be influenced by changes in anemia definitions, study population, and survey time. Methodology variations, care and reporting quality variations, policy differences, and strategic differences. Differences in the Prevalence of anemia can also be influenced by geographic location (altitude), lifestyle, racial makeup, and genetic makeup. In contrast to our study, the reduced prevalence of anemia seen in many studies, according to Nalado et al., may be attributable to CKD patients having increased access to free medical care facilities and other health services. These imply the requirement for global campaigns to develop laws that will lessen the expense and burden of CKD on patients and their families. This can have a favourable effect on prognostic variables like anemia and enhance outcomes.

Considering the association between the prevalence of anemia and other demographic factors, it was observed that gender is associated with the prevalence of anemia; most of the participants were males, but among 84 female patients, 77 had anemia. Therefore, it is prominent that females have a higher chance of getting anemia than males. Findings from the previous study conducted in [20] Ethiopia report that females have two times more likely to develop anemia when compared with males. In a similar study among CKD patients in [23]Korea [RYU et al.], more than half of female CKD patients, 51.8%, had anemia. According to the study by Rushton et al., This can be due to Menstrual Blood Loss: Menstrual bleeding can lead to significant blood loss, resulting in iron deficiency anemia.[24,25]

It is found that hypertension is associated (p-value-0.001) with the prevalence of anemia. About 94.2% of the study population who has hypertension also have anemia. Similarly, in a study conducted in [20] Ethiopia, patients with hypertension had three times more likely to develop anemia as compared to patients with non-hypertensive (AOR = 2.776; 95% CI: 1.597, 4.827). In addition, there was another study done in Kenya.[26] According to the findings, respondents with hypertensive CKD have a higher prevalence of anemia than respondents without hypertension. It can be due to reduced oxygen delivery: hypertension and CKD can lead to decreased blood flow to the kidneys and other organs. Oxygen supply is compromised by insufficient blood flow, which can also impede erythropoiesis and cause anemia.[27] According to Kim et al. strongly states factors such as stress and insulin resistance are major factors that cause anemia in hypertensive patients.[28]

CONCLUSION

The current study's findings regarding awareness revealed that patients had a low level of awareness about Anemia. 59% of the patients had low levels of awareness, 17% had moderate levels, and only 24% had a high comprehension of the disease. There are only a few studies regarding awareness of anemia among dialysis patients. The studies conducted among 21Chinese patients established anemia awareness of 67.5%. Higher awareness rates in these studies may have resulted from differences in cultural and demographic differences, alterations in the research design, timing, and context, as well as health education initiatives. Disparities in awareness levels could be related to differences in health education efforts[16] and campaigns implemented in the populations.

In the current study, knowledge on awareness of anemia questionnaires was given scores, and it was compared with demographic details and found an association between education and level of awareness of anemia. The current study showed study population who are graduates has a higher awareness score when compared with people who have done their schooling and below it. (p-value 0.04). There is one more variable that shows an association: years of dialysis that a CKD patient undergoes is associated with the level of awareness, and results show that the study population who have undergone long periods of dialysis for more than 5 years have greater awareness scores when compared with people who undergone dialysis for less than 5 years. Other variables such as age, gender, and occupation do not show any association with the awareness. A study by Plantinga et al. To raise people's level of awareness, healthcare provider training that concentrates on recognising anemia symptoms, accurately diagnosing the condition, and providing suitable treatment and management options;[29] Information campaigns that include educational brochures, posters in healthcare facilities, online resources, and community outreach programmes; patient education that creates patient-friendly educational materials that easily explain anemia and offer practical guidance on management techniques that may be distributed in medical facilities.[30]

Limitations and strengths

According to the study, self-reported data may be biased toward social desirability. The reliability and accuracy of the findings may be impacted by this bias. Respondents may underreport, particularly when it comes to the behavioural characteristics that have an impact on the reliability of the findings. Additionally, as the study was only conducted at a few hospitals, the findings might not be generalizable to just a few districts of Chennai. It might not represent Chennai's whole population. This study provides information on the disease's prevalence and awareness levels, which may be used to identify gaps in knowledge and implement evidence-based interventions at the institutional level to reduce the disease burden.

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Author's contribution: Shainy Soundarya (Conception and design of study**,** Data acquisition**,** Data analysis and interpretation**,** Manuscript writing); Kumar Sumit (Provided guidance in sample calculations and manuscript drafting, critically revised the manuscript for important intellectual content throughout the process).

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