



**A PROSPECTIVE STUDY ON ADVERSE EFFECTS ASSOCIATED WITH
HEMODIALYSIS IN PATIENTS WITH CHRONIC KIDNEY DISEASE**

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ABSTRACT

A six-month study was conducted in a Tertiary Care Hospital, Kerala, India examined the adverse effects of haemodialysis in 54 patients with chronic kidney disease (CKD). Data were collected from patient records and interviews with patients or their caregivers. The prevalence of hemodialysis was found in older age groups, with the highest percentage observed in the age >60 (53.70%). The study found that most haemodialysis patients were male (72.2%) and underwent haemodialysis twice a week (79.62%). Common habits among CKD patients included alcoholism (31.48%) and smoking (11.11%). Hypertension (88.89%) and diabetes (55.56%) were prevalent comorbidities, with some patients also experiencing anaemia (11.11%). The most observed adverse effects of haemodialysis were hypertension (44.4%) and itching (51.9%), with other significant concerns including hypotension, bleeding, and infections. Data analysis was conducted using paired t-tests to determine the significance of these adverse effects.

KEYWORDS: Kidney, patients, complications, ADR, CKD.

INTRODUCTION

Chronic kidney disease (CKD) as it was historically termed that encompasses all degrees of decreased kidney function, from damaged-at risk through mild, moderate and severe chronic kidney failure.^[1] Chronic kidney disease is a worldwide public health problem.

Chronic kidney disease is more prevalent in the elderly population. Almost half of the patients with chronic kidney disease are older than 60 years. However, while younger patients with chronic kidney disease typically experience progressive loss of kidney function.

Chronic kidney disease is associated with an increased risk of cardiovascular disease and end-stage kidney disease.

The guidelines define CKD as either kidney damage or a decreased glomerular filtration rate of less than 60 mL/min /1.73 m² for at least 3 months. Whatever the underlying etiology, once the loss of nephrons and reduction of functional renal mass reaches a certain point, the remaining nephrons begin a process of

irreversible sclerosis that leads to a progressive decline in the GFR.^[2]

Hemodialysis is a life-sustaining treatment for individuals whose kidneys can no longer effectively filter waste products and excess fluids from their blood. This condition, often a consequence of CKD, poses a significant threat to health and well-being. Hemodialysis steps in as a vital intervention, replicating the kidney's function through a complex yet efficient process.

The Process: The procedure typically occurs in a specialized medical facility known as a dialysis Centre. Patients, referred to as "dialysis patients," undergo hemodialysis sessions regularly, often several times a week, depending on their condition's severity. The process involves the use of a hemodialysis machine, which acts as an artificial kidney. During a session, blood is drawn from the patient through a catheter or vascular access point, commonly an arteriovenous fistula or graft. This blood is then filtered through the dialyzer, a component of the machine containing semi-permeable membranes. These membranes facilitate the removal of waste products, toxins, and excess fluids from the

bloodstream. Subsequently, the purified blood is returned to the patient's body.

Impact on Patients: For individuals reliant on hemodialysis, the procedure is more than just a medical necessity—it's a lifeline. Hemodialysis grants them the opportunity to lead relatively normal lives despite their kidney condition. However, the regimen demands significant adjustments, both physically and emotionally.

The need for regular sessions, coupled with the uncertainty surrounding their health, can lead to feelings of anxiety, depression, and frustration. Moreover, the time commitment required for treatment may disrupt their daily routines, impacting work, family life, and social interactions.^[3]

The main adverse effects of hemodialysis are

1. CKD is an important health problem with a high level of morbidity and mortality rates. CKD patients require a special therapeutic way to treat complications such as diabetes, anemia, swelling etc.
2. The reduction in renal function will form changes of exact function in other organs. The reduced amount of glomerular filtration rates, the renal clearance of drugs is changed, and it affects our clearance from the liver.
3. Patients that undergo hemodialysis may form changes in drug absorption rate and decrease efflux transporter activity. This will lead to changes in the pharmacological response of the drug.
4. Adverse effects of hemodialysis is an important issue that forms the cause of hospital admission. Adverse effects may adversely affect patient quality of life.

Some problems associated with hemodialysis are

Hemodialysis may cause problem with your vascular access, which is the most common reason someone on hemodialysis needs to go to the hospital. Any kind of vascular admission might also additionally grow to be infected.

Sudden adaptation to your body's water and chemical stability for the duration of a remedy can cause extra issues, such as

1. Muscle cramps
2. An amazing drop in blood stress, known as hypotension. Hypotension can make you sense weak, dizzy, or ill in your stomach.^[4]

Age wise distribution

Age in years	Frequency(n)	Percentage (%)
18-40	2	3.70
41-60	23	42.59
>60	29	53.70

N=54

MATERIALS AND METHODS

Sampling size determination

Hemodialysis patient in nephrology department.

Sample size for a given mean is:

$$N = \frac{(Z_{1-\frac{\alpha}{2}})^2 \sigma^2}{E^2}$$

σ is the standard deviation and

E is the margin of error

Data from a previous study found a standard deviation of 18.0

Here = 18.0

z= 1.96 (95% confidence level)

E= 5

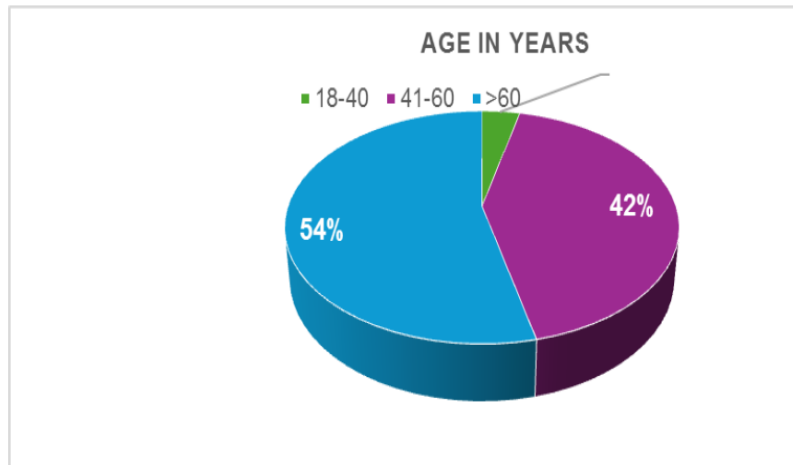
$$N = \frac{z^2 \sigma^2}{E^2} \\ = \frac{1.96^2 \times 18.0^2}{5^2} \\ = 49.8$$

Anticipating loss to follow up and missing of data, the minimum sample size was rounded to be **60**.

A prospective study was conducted over a period of six months in dialysis OPD in a tertiary care hospital in Kerala, India after IRB approval. A total of 60 patients were in the haemodialysis department during the study period. Out of these, 54 patients who met the inclusion criteria were analysed. The inclusion criteria were the patients of dialysis OPD of 18 years or older and both the genders who were diagnosed with chronic kidney disease in nephrology department. The Patient who are not willing to participate in the study, pregnant women and children, the inpatients who were undergoing hemodialysis, critically ill patients were excluded from the study. Patient came to the OPD of a tertiary care hospital, SH medical Centre Kottayam over 6-month period (prospective) was identified from dialysis department. All the relevant and necessary data of patients coming to the dialysis department was collected from the patient case record. Adverse effects of hemodialysis patients were determined by direct observation, patient interview and case records. Data was entered using Microsoft Excel and statistical analysis were done using paired t test.

RESULT AND DISCUSSION

A total of 54 patients met with the inclusion criteria were included in the study.



Age wise distribution of study population

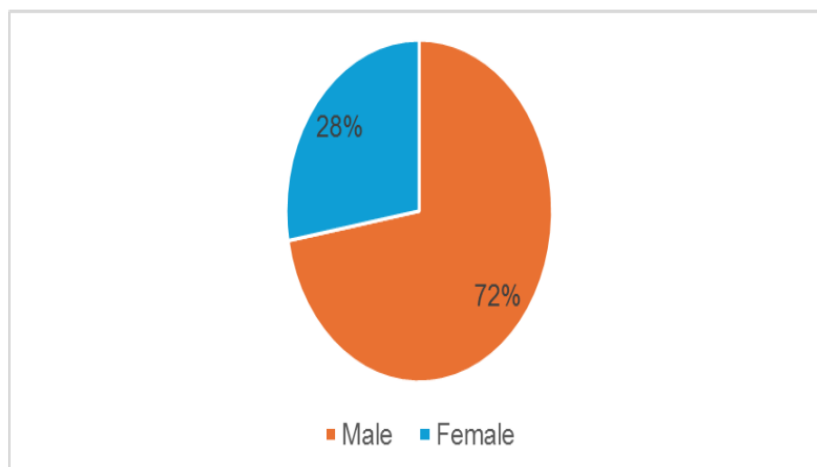
Inference: This chart shows the distribution of hemodialysis patients across these age brackets. It highlights the prevalence of hemodialysis in older age groups, with the highest percentage observed in the age

>60 (53.70%). This is due to the age-related decline in kidney function, prevalence of chronic diseases and longevity.

Gender wise distribution

Sex	Frequency(n)	Percentage (%)
Male	39	72.2
Female	15	27.8

N=54



Gender wise distribution of the study population

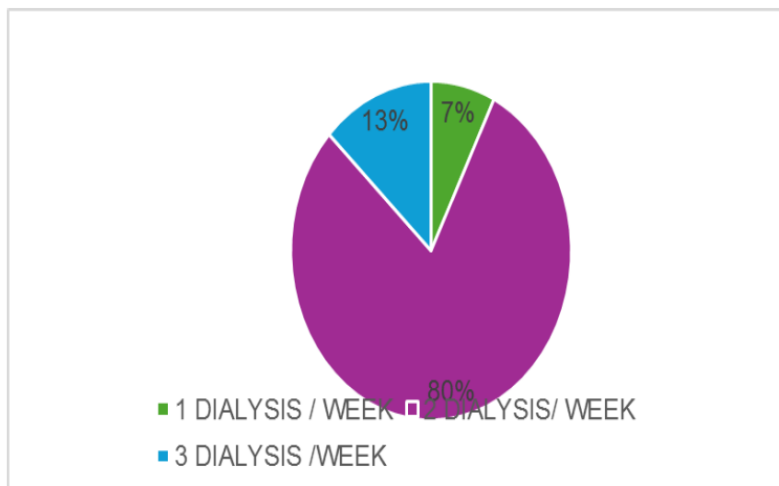
Inference: The data highlights the prevalence of hemodialysis in older age groups, with a higher percentage observed in males (72.2%). Men may be at increased risk of reaching kidney failure sooner than women because of differences in hormone level. Higher

testosterone levels in men may cause a loss in kidney function. On the other hand, men’s kidneys may not be protected by estrogen, which is higher in women until menopause. Men may have unhealthier lifestyle thereby leading to a higher risk for kidney failure.

Frequency of hemodialysis / week

Frequency / week	Number (n)	Percentage (%)
1 Dialysis / Week	4	7.40
2 Dialysis/ Week	43	79.62
3 Dialysis /Week	7	12.96

N = 54



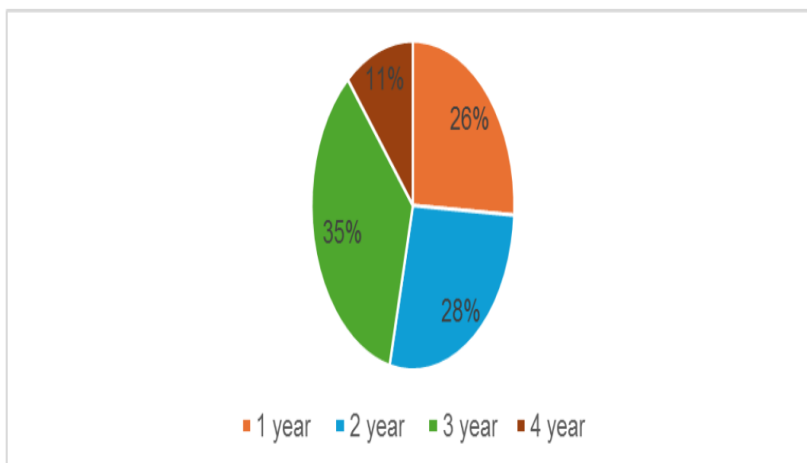
Frequency of hemodialysis/ week in the study population

Inference: Most patients (79.62%) undergo hemodialysis twice a week, while a smaller proportion receive it once or three times weekly. This data is essential for managing treatment schedules and optimizing patient care.

Duration of hemodialysis

Duration (years)	Number of patients (n)	Percentage (%)
1 year	14	25.92
2 years	15	27.78
3 years	19	35.18
4 years	6	11.12

N=54



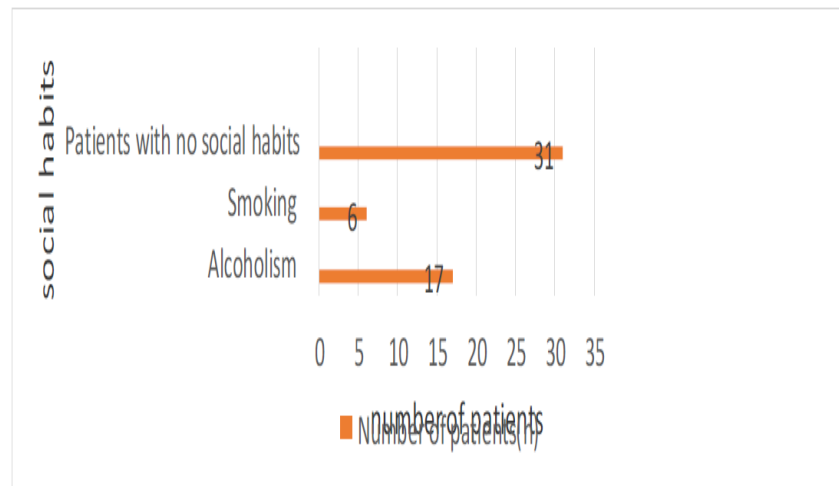
Duration of hemodialysis in the study population

Inference: This data shows an increasing trend in the number of patients over the first three years, with a significant drop in the fourth year (11.12%) due to Patient Outcomes: Some patients may have received a kidney transplant, recovered kidney function, or unfortunately, may have passed away. Treatment Changes: Patients might have switched to a different treatment modality, such as peritoneal dialysis or conservative management.

Social habits of patients before dialysis

Habits	Number of patients(n)	Percentage (%)
Alcoholism	17	31.48
Smoking	06	11.11
Patients with no social habits	31	57.40

N=54



Social habits of patients before dialysis in the study population

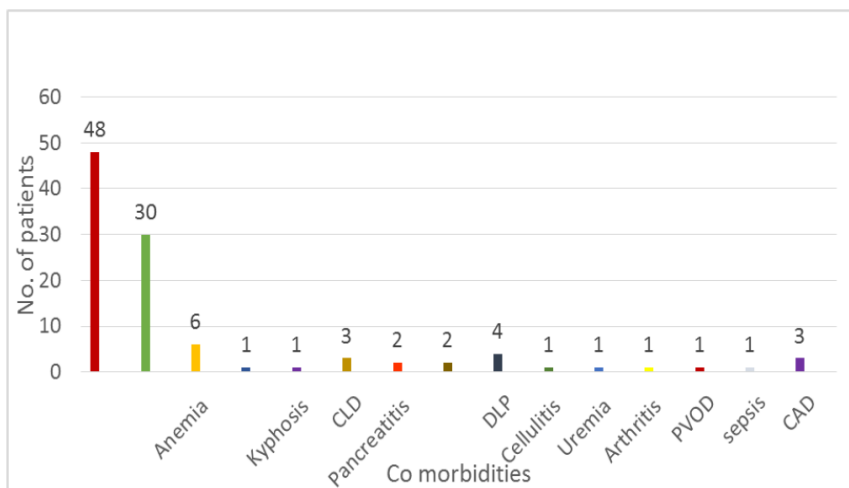
Inference: In this study, 31.48% of the patients had a history of alcoholism, which can lead to liver disease and high blood pressure, both risk factors for chronic kidney disease (CKD). Additionally, 11.11% of the patients were smokers, a habit known to damage blood vessels, reduce blood flow to the kidneys, and increase the risk of kidney disease. However, the majority of patients (57.40%) did not have these social habits, suggesting that other factors such as genetics, medical conditions, or environmental exposures may play a significant role in the development of CKD.

Furthermore, social determinants of health, including economic stability, education, and access to healthcare, were also found to influence the risk of developing CKD. Poor socioeconomic conditions can lead to inadequate nutrition, exposure to environmental toxins, and limited access to healthcare, all of which can contribute to the onset and progression of CKD. Therefore, addressing these modifiable lifestyle and social factors is crucial in preventing CKD and improving patient outcomes.

Comorbidities of patients

Comorbidities	Number of patients (n)	Percentage (%)
Hypertension	48	88.8
Diabetes	30	55.5
Anemia	6	11.11
Cardiomegaly	1	1.85
Kyphosis	1	1.85
CLD	3	5.55
Pancreatitis	2	3.70
Hypothyroidism	2	3.70
DLP	4	7.40
Cellulitis	1	1.85
Uremia	1	1.85
Arthritis	1	1.85
PVOD	1	1.85
sepsis	1	1.85
CAD	3	5.55

N=54



Comorbidities of patients in the study population

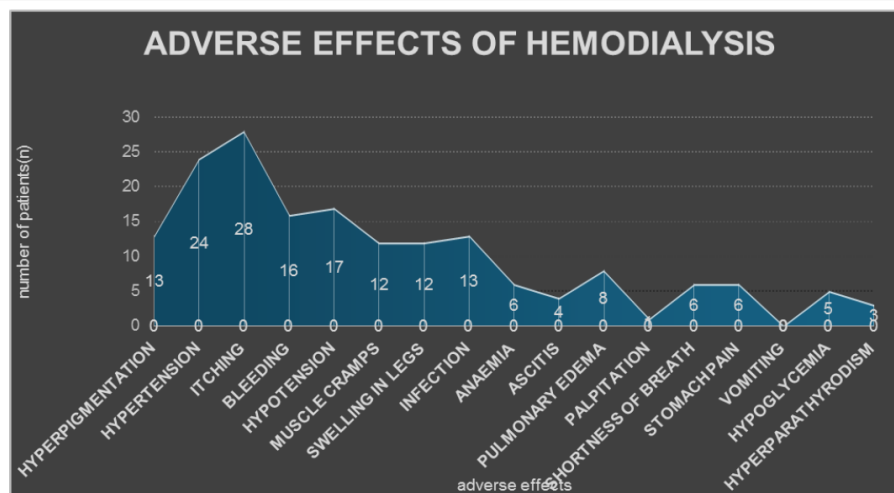
Inference: In this study, 88.89% of patients had hypertension as a co-morbidity, likely due to damaged kidneys not filtering blood effectively, leading to fluid retention and increased blood pressure. Additionally, kidneys affected by CKD may produce more renin, a hormone that raises blood pressure. Diabetes affected 55.56% of patients, as high blood sugar levels can damage the blood vessels in the kidneys, affecting their ability to filter waste, which can lead to CKD. Anemia was experienced by 11.11% of patients, as CKD can

result in reduced production of erythropoietin (EPO), a hormone that stimulates the bone marrow to make red blood cells. Other conditions like cardiomegaly, kyphosis, chronic liver disease (CLD), pancreatitis, hypothyroidism, and dyslipidemia (DLP) were present but in smaller numbers. Single cases of cellulitis, uremia, arthritis, peripheral vascular occlusive disease (PVOD), and sepsis were also reported. This highlights the complex and multifaceted health challenges faced by patients undergoing hemodialysis.

Adverse effects of hemodialysis

Sl. No	Adverse effects	Frequency(n)	Percentage (%)
1	Hyperpigmentation	13	24.1
2	Hypertension	24	44.4
3	Itching	28	51.9
4	Bleeding	16	29.6
5	Hypotension	17	31.5
6	Muscle cramps	12	22.2
7	Swelling in legs	12	22.2
8	Infection	13	24.1
9	Anaemia	6	11.1
10	Ascites	4	7.4
11	Pulmonary oedema	8	14.8
12	Palpitation	1	1.9
13	Shortness of breath	6	11.1
14	Abdominal pain	6	11.1
15	Hypoglycaemia	5	9.3
16	Hyperparathyroidism	3	5.6

N=54



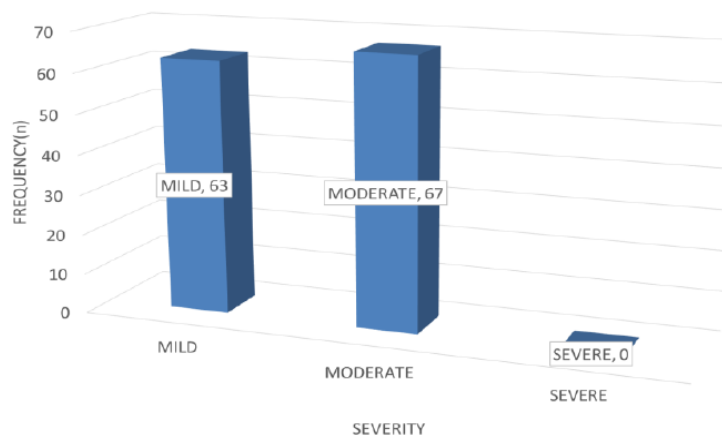
Adverse effects of hemodialysis in the study population.

Inference: This data suggests that while hypertension (44.4%) and itching (51.9%) were the most prevalent adverse effects, other issues like hypotension, bleeding,

infections and hyperpigmentation were also significant concerns for hemodialysis patients. Addressing these effects is crucial for patient care and quality of life.

Hartwig’s severity assessment of adverse effects in hemodialysis

Severity	Frequency(n)
Mild	63
Moderate	67
Severe	0



CONCLUSION

This study offers valuable insights into the multifaceted challenges faced by hemodialysis patients. The study population was predominantly male, with the majority of patients being over 60 years old. Most patients underwent hemodialysis twice a week, and the duration of hemodialysis increased over the first three years, with a significant drop in the fourth year. The study highlighted the prevalence of comorbidities such as hypertension, diabetes, and anemia among these patients. It also sheds light on the common social habits of alcoholism and smoking among this population. The study also identified the most common adverse effects of hemodialysis, including hypertension and itching, along with other significant concerns like hypotension,

bleeding, and infections. Hemodialysis is crucial for treating ESRD but has many adverse effects that can affect patient health and survival.

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Conflict of interest

The authors declare no conflict of interest in conducting this study, the design, data collection, analysis, interpretation, reporting its findings or publication of this research.

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