

بسم الله الرحمن الرحيم



The Republic of Sudan  
Ministry of Higher Education and Scientific Research  
Elsheikh Abdallah Elbadri University  
Faculty of Medicine



## **Prevalence and Control of Hypertension Among Patients on Hemodialysis in Aldammer Teaching Hospital 2025**

**by:**

Mohamedalmagzoub Abdalmajed Abdawahid Abdalmaged  
Mohammed Ahmed Hamid Ahmed  
Abdalgader Khalid Abdalgader Hassan  
Abazer Omer Dafalla Ali

A research submitted in partial fulfillment for the requirement of  
MBBS Degree

**Supervisor:**

Dr. Ahmed Almortaja Mosa  
*Consultant of Nephrology*

August 2025

الاستهلال

قال تعالى :

(وَإِذَا مَرِضْتُ فَهُوَ يَشْفِينِ)

صدق الله العظيم

سورة الشعراء الآية (80)

## **Dedication**

My beloved family, who supported me through every step of this journey.

And to all patients fighting silently through chronic illness - this work is for you.

## **Acknowledgements**

We would like to express our deepest gratitude to Dr. [Ahmed Almortaja, Alwathig Yahia, Mortada, and Ahmed Saeed], for their invaluable guidance and encouragement.

We also thank the staff of Aldammer Teaching Hospital and all the patients who participated in this study.

Special thanks to our colleagues and families for their continued support.

**Abstract:****Background:**

Hypertension is one of the most common and serious comorbidities among patients undergoing hemodialysis. It plays a significant role in increasing cardiovascular disease incidence and mortality.

**Objective:**

To assess the prevalence and control of hypertension and the factors affecting its control among hemodialysis patients at Aldammer Teaching Hospital 2025.

**Methods:**

A cross-sectional study was conducted among 136 patients undergoing hemodialysis. Data were collected using a structured questionnaire and review of patient records.

**Results:**

The study found that 75.7% of the patients were hypertensive. Contributing factors included a history of hypertension, presence of comorbidities, poor adherence to medication, and non-compliance with dietary recommendations.

**Conclusion:**

Hypertension is highly prevalent among hemodialysis patients. There is a need to enhance patient education, improve treatment and dietary adherence, and strengthen follow-up protocols at the hospital.

## ملخص الأطروحة

### الخلفية:

ارتفاع ضغط الدم هو من أكثر الأمراض المصاحبة شيوعاً وخطورة بين مرضى الغسيل الكلوي، وله دور كبير في زيادة نسبة الإصابة بالأمراض القلبية والوفيات.

### الهدف:

تقييم مدى انتشار ارتفاع ضغط الدم، والعوامل المؤثرة في السيطرة عليه بين مرضى الغسيل الكلوي بمستشفى الدامر التعليمي.

### المنهج:

تم إجراء دراسة مقطعية على 136 مريضاً يخضعون للغسيل الكلوي، وتم جمع البيانات من خلال استبيان مباشر وملفات المرضى.

### النتائج:

تبين أن 75.7% من المرضى يعانون من ارتفاع ضغط الدم، في حين كانت نسبة السيطرة على الضغط 24.3% فقط. تشمل العوامل المرتبطة بذلك: وجود تاريخ مرضي لارتفاع الضغط، ووجود أمراض مصاحبة، وضعف الالتزام بالأدوية والنظام الغذائي.

### الاستنتاج:

ارتفاع ضغط الدم شائع بين مرضى الغسيل الكلوي، وتوجد حاجة لتحسين التفقيف الصحي، وزيادة الالتزام العلاجي والذائي للمرضى، وتحسين بروتوكولات المتابعة بالمستشفى.

## Table of Contents

| Content               | No page |
|-----------------------|---------|
| Title page            | I       |
| Dedication            | II      |
| Acknowledgment        | III     |
| Abstract in English   | IV      |
| Abstract in Arabic    | V       |
| Table of Contents     | VI      |
| List of Tables        | VII     |
| List of Figures       | VIII    |
| List of Abbreviations | IX      |
| <b>Chapter One</b>    |         |
| Introduction          | 1       |
| Literature Review     | 2       |
| Problem Statement     | 4       |
| Justification         | 5       |
| Objectives            | 6       |
| <b>Chapter Two</b>    |         |
| Materials and Methods | 7       |
| <b>Chapter Three</b>  |         |
| Results               | 10      |
| <b>Chapter Four</b>   |         |
| Discussion            | 55      |
| Conclusion            | 57      |
| Recommendations       | 58      |
| References            | 59      |
| <b>Appendix</b>       |         |

## List of Tables

| <b>Table No.</b> | <b>Contents</b>                                                                                          | <b>Page No.</b> |
|------------------|----------------------------------------------------------------------------------------------------------|-----------------|
| 3.1              | Sociodemographic data                                                                                    | 10              |
| 3.2              | Dialysis                                                                                                 | 11              |
| 3.3              | Causes of renal failure                                                                                  | 13              |
| 3.4              | Anti-hypertensive medication use                                                                         | 21              |
| 3.5              | Complications with HTN                                                                                   | 28              |
| 3.6              | Association between prevalence of hypertension among pre-dialysis patients & compliance with medications | 30              |

## List of Figures

| <b>Figure No.</b> | <b>Contents</b>                                                   | <b>Page No.</b> |
|-------------------|-------------------------------------------------------------------|-----------------|
| 3.1               | Prevalence of hypertension among pre-dialysis patients            | 12              |
| 3.2               | Percentage of patient with hypertension before dialysis           | 12              |
| 3.3               | Patients with family history of hypertension                      | 14              |
| 3.4               | Patients' comorbidities                                           | 14              |
| 3.5               | Diseases affect blood pressure                                    | 15              |
| 3.6               | Dietary control and life style                                    | 15              |
| 3.7               | Caffeine use                                                      | 16              |
| 3.8               | Nicotine and stimulants use                                       | 16              |
| 3.9               | Blood pressure based on the last three dialysis-sessions readings | 17              |
| 3.10              | Smoking status                                                    | 17              |
| 3.11              | Alcohol abuse                                                     | 18              |
| 3.12              | Body mass index                                                   | 18              |
| 3.13              | Physical activities                                               | 19              |
| 3.14              | Salt intake                                                       | 19              |
| 3.15              | Fluid restriction compliance                                      | 20              |
| 3.16              | Anti-hypertensive medication use                                  | 20              |
| 3.17              | Anti-hypertensive medication use                                  | 22              |
| 3.18              | Compliance with medication                                        | 22              |
| 3.19              | Reasons for not compliant                                         | 23              |
| 3.20              | Visit doctor in the last six months                               | 23              |
| 3.21              | Received dietary counseling                                       | 24              |
| 3.22              | Following the recommended diet                                    | 24              |
| 3.23              | Vascular access type                                              | 25              |
| 3.24              | Committed to dialysis                                             | 25              |
| 3.25              | Believe clotting during dialysis                                  | 26              |
| 3.26              | Understand blood pressure                                         | 26              |
| 3.27              | Received session during dialysis                                  | 27              |
| 3.27              | Erythropoietin use                                                | 27              |
| 3.28              | Any effect of heparin                                             | 29              |
| 3.28              | Anemia low Hb                                                     | 29              |

## **Acronyms and Abbreviations**

|       |                                               |
|-------|-----------------------------------------------|
| BP    | Blood Pressure                                |
| BMI   | Body Mass Index                               |
| ESRD  | End-Stage Renal Disease                       |
| DOPPS | Dialysis Outcomes and Practice Patterns Study |
| HD    | Hemodialysis                                  |
| USA   | United State of America                       |

# Chapter One

# **1. Introduction**

## **1.1 Background**

Hypertension is a common and serious comorbidity among patients undergoing hemodialysis worldwide. It contributes significantly to cardiovascular morbidity and mortality, which are the leading causes of death in patients with end-stage renal disease (ESRD).

In hemodialysis patients, hypertension can result from fluid overload, activation of the renin-angiotensin system, sympathetic nervous system hyperactivity, and non-adherence to treatment protocols<sup>(1)</sup>.

Globally, the prevalence of hypertension in hemodialysis patients ranges between 60% to 90%, and controlling it is often challenging due to complex interactions between medications, volume status, and dialysis schedules. In Africa, and particularly in Sudan, the burden is amplified by limited resources, low awareness, and gaps in routine follow-up<sup>(1)</sup>.

In Sudan, patients receiving dialysis frequently face constraints such as delayed access to medical care, high medication costs, and lack of consistent dietary counseling. Aldammer Teaching Hospital is one of the referral centers providing dialysis services in River Nile State, serving a population with a high burden of chronic kidney disease.

Despite routine blood pressure monitoring during dialysis, many patients still present with uncontrolled hypertension, leading to complications such as left ventricular hypertrophy, stroke, and early mortality.

Understanding the local prevalence, associated risk factors, and effectiveness of control strategies for hypertension in hemodialysis patients is crucial. This research aims to assess these aspects among patients at Aldammer Teaching Hospital and contribute to improving their care outcomes<sup>(2)</sup>.

## 1.2 Literature Review:

Several studies have highlighted the high prevalence of hypertension among hemodialysis patients. In a multicenter study conducted in the United States, over 85% of dialysis patients had hypertension, and more than 50% of them had poorly controlled blood pressure despite medication<sup>(3)</sup>. Similarly, a study from Nigeria showed that 78% of dialysis patients were hypertensive, with poor adherence being a major factor.

the Dialysis Outcomes and Practice Patterns Study (DOPPS) in the USA found that around 85% of HD patients were hypertensive, with many requiring multiple antihypertensive agents and some remaining uncontrolled despite treatment (Agarwal et al., 2003)<sup>(3)</sup>. Similar high prevalence rates have been reported in other regions: a single-center study in India reported 92% prevalence with nearly half of patients having uncontrolled hypertension due to factors such as fluid overload and poor adherence (Kaur et al., 2017)<sup>(4)</sup>; in Egypt, 86.6% of HD patients were hypertensive with only 52% achieving controlled blood pressure, where interdialytic weight gain and inadequate dialysis were implicated (Saleh et al., 2020)<sup>(5)</sup>; and in Saudi Arabia, 89% of patients were hypertensive with 58% control rates, where volume control was a primary management strategy (Alshahrani et al., 2021)<sup>(6)</sup>.

In Sudan, though data are limited, hypertension prevalence in HD patients is estimated at 90%, with poor control attributed to inconsistent dialysis adequacy and limited antihypertensive availability (Elhassan et al., 2019)<sup>(7)</sup>. The control of blood pressure in these patients is challenged by factors such as volume overload, medication non-adherence, residual renal function, and dialysis adequacy. Effective management typically combines non-pharmacologic strategies like fluid and salt restriction and dialysis optimization with pharmacologic therapy. The DOPPS emphasizes prioritizing volume control before escalating antihypertensive medications. Overall, hypertension remains a major clinical issue in the hemodialysis population, with suboptimal control

often linked to fluid management issues and treatment adherence, highlighting the need for integrated strategies to improve outcomes.

In Sudan, local data remains limited, but a study conducted in Khartoum showed that approximately 74% of patients on chronic hemodialysis were hypertensive, and only 42% had controlled blood pressure levels. Risk factors associated with uncontrolled hypertension included long dialysis duration, excess fluid retention, use of erythropoietin, and inadequate dietary sodium restriction<sup>(8)</sup>.

Previous studies have also found a strong association between non-compliance with antihypertensive medications and poor blood pressure control. Factors like low education level, lack of health education, and limited access to medications play a role in poor adherence<sup>(9)</sup>.

Despite advancements in dialysis care, few studies in Sudan have assessed the effectiveness of current control strategies or examined patient behavior and knowledge regarding hypertension management. This study seeks to fill that gap.

### **1.3 Problem Statement:**

Hypertension is a leading contributor to mortality and morbidity in patients on hemodialysis. Despite regular monitoring and availability of antihypertensive drugs, many patients remain hypertensive during and after dialysis. In Aldammer Teaching Hospital, there is no published data regarding the prevalence, risk factors, and control of hypertension among the hemodialysis population. The problem lies in the inadequate control of blood pressure and a lack of understanding of patient-related and system-related contributing factors.

This research addresses a knowledge gap on whether hypertension is being effectively managed among these patients and what factors are contributing to poor control. Understanding these issues is essential for improving patient outcomes and designing better clinical protocols for dialysis units.

#### **1.4 Justification:**

This study may provide essential data on the prevalence and control of hypertension in hemodialysis patients in Aldammer Teaching Hospital. Identifying the most common risk factors and barriers to effective blood pressure control will help clinicians improve hypertension management. The study also explores the role of patient adherence and education, which can guide future interventions at the community and hospital levels.

Findings from this study may support the implementation of targeted strategies such as stricter fluid management, regular counseling, or improved drug access policies. Ultimately, the study aims to contribute to better cardiovascular outcomes, improved quality of life for patients, and evidence-based decision-making within the Sudanese healthcare system.

## **1.5 Objectives of the Study**

### **General Objective**

To assess the prevalence and control of hypertension among patients undergoing hemodialysis at Aldammer Teaching Hospital 2025.

### **Specific Objectives**

1. To determine the prevalence of hypertension among hemodialysis patients at Aldammer Teaching Hospital 2025.
2. To identify the common risk factors associated with hypertension in this group at Aldammer Teaching Hospital 2025.
3. To evaluate the effectiveness of current control measures for hypertension among hemodialysis patients at Aldammer Teaching Hospital 2025.
4. To assess patient adherence to antihypertensive medication and dietary recommendations at Aldammer Teaching Hospital 2025.

# Chapter Two

## **2. Materials and Methods**

### **2.1 Study Design:**

This study is a descriptive cross-sectional hospital-based study.

### **2.2 Study Area and Setting:**

The study was conducted at Aldammer Teaching Hospital, located in Aldammer City, River Nile State, Sudan. The hospital is one of the main referral centers for nephrology services in the region and provides regular hemodialysis services for patients with end-stage renal disease (ESRD). The dialysis unit is staffed by trained nurses and nephrologists, and serves both urban and rural populations.

### **2.3 Study Duration**

The study was conducted over a period of three months, from May to August 2025.

### **2.4 Study Population:**

The study population included all adult patients undergoing maintenance hemodialysis at Aldammer Teaching Hospital during the study period.

#### **2.4.1 Inclusion Criteria:**

Patients aged 18 years or older.

Undergoing regular hemodialysis for at least 3 months.

Willing to participate and provide informed consent.

#### **2.4.2 Exclusion Criteria:**

Patients with incomplete medical records.

Patients with acute kidney injury.

Patients who refused participation

Pediatrics

Patients who are not on regular dialysis

### **2.5 Sample Size:**

Total coverage including the entire population in the study without selecting a subset. This approach, also called a census, ensures that all individuals are studied, eliminating sampling error. Total coverage is used when the population is small or when complete data is required for accuracy.

## **2.6 Sampling techniques:**

Total coverage.

## **2.7 Data Collection Methods:**

Data was collected using a structured questionnaire, patient interviews, Tape, scale, sphygomanometer, stethoscope, and medical record reviews. The questionnaire include:

Socio-demographic information: Age, sex, residence, occupation, and education level.

Medical history: Duration and frequency of dialysis, cause of renal failure, history of hypertension, family history, and comorbidities.

Blood pressure records: Pre-dialysis blood pressure, average readings from the last three sessions, and classification of hypertension.

Risk factors for hypertension: Smoking, alcohol use, BMI, physical activity, salt intake, and compliance with fluid restriction.

Medication and control: Use of antihypertensive drugs, compliance, reasons for non-compliance, medication adjustments, dietary counseling, and adherence to dietary advice.

Dialysis-related factors: Dry weight, pre/post-dialysis weight, ultrafiltration volume, interdialytic weight gain, and type of vascular access.

Patient knowledge and awareness: Understanding of hypertension, dietary impact, and education received on hypertension.

## **2.8 Data Management and Analysis:**

Data was entered and analyzed using SPSS

Descriptive statistics (frequencies, means, standard deviations) were used for sociodemographic and clinical variables.

Prevalence was calculated as a percentage of hypertensive patients.

Chi-square and logistic regression tests were used to assess associations between hypertension control and independent variables (e.g., dialysis duration, adherence).

A p-value < 0.05 was considered statistically significant.

## **2.9 Study Variables:**

Dependent Variable: Hypertension control status (controlled / uncontrolled).

Independent Variables: Independent Variables Related to Hypertension.

1. Socio-demographic factors: [Age, Sex, Residence (Urban/Rural), Occupation, Education level].

2. Medical history: [Duration of hemodialysis, Frequency of dialysis sessions per week, Cause of renal failure, History of hypertension before dialysis, Family history of hypertension, Comorbidities (Diabetes Mellitus, Cardiovascular disease, Obesity, etc.)].

3. Lifestyle and behavioral factors: [Smoking status, Alcohol use, Physical activity level, Salt intake].

Fluid restriction compliance

4. Clinical and anthropometric factors: [Body Mass Index (BMI), Dry weight, pre- and post-dialysis weight, Ultrafiltration volume, Interdialytic weight gain, Vascular access type].

5. Medication and treatment: [Use of antihypertensive medication, Number of antihypertensive drugs, Medication compliance, Recent changes in treatment, Dietary counseling and adherence].

6. Knowledge and awareness: [Awareness of importance of BP control, understanding of dietary effect on BP, Received hypertension education].

## **2.10 Ethical Consideration:**

Ethical approval was obtained from the Faculty of Medicine department of community medicine, Elsheikh Abdallah Elbadri University.

Approval was also sought from Aldammer teaching hospital hemodialysis department.

Informed verbal consent were obtained from all participants before data collection.

Confidentiality and anonymity of patient data were ensured.

Participation was voluntary, and patients could withdraw at any time without affecting their treatment.

# Chapter Three

### 3. Results

**Table (3.1):** Sociodemographic data:

| Variables                       |                     | Frequency  | Percent     |
|---------------------------------|---------------------|------------|-------------|
| Sex                             | Female              | 41         | 30.1%       |
|                                 | Male                | 95         | 69.9%       |
|                                 | <b>Total</b>        | <b>136</b> | <b>100%</b> |
| Age group                       | < 30 years          | 17         | 12.5%       |
|                                 | 30-40 years         | 29         | 21.3%       |
|                                 | 41-50 years         | 26         | 19.1%       |
|                                 | 51-60 years         | 33         | 24.3%       |
|                                 | > 60 years          | 31         | 22.8%       |
|                                 | <b>Total</b>        | <b>136</b> | <b>100%</b> |
| Residence                       | rural               | 69         | 50.7        |
|                                 | urban               | 67         | 49.3        |
|                                 | <b>Total</b>        | <b>136</b> | <b>100%</b> |
| Residence                       | Free worker         | 38         | 27.8%       |
|                                 | No job              | 37         | 27.2%       |
|                                 | Housewife           | 17         | 12.5%       |
|                                 | Driver              | 6          | 4.4%        |
|                                 | Student             | 6          | 4.4%        |
|                                 | Merchant            | 6          | 4.4%        |
|                                 | Farmer              | 5          | 3.7%        |
|                                 | Teacher             | 5          | 3.7%        |
|                                 | Gold miner          | 2          | 1.5%        |
|                                 | Lawyer              | 2          | 1.5%        |
|                                 | Midwife             | 2          | 1.5%        |
|                                 | Engineer            | 2          | 1.4%        |
|                                 | Army soldier        | 1          | 0.7%        |
|                                 | Bakery              | 1          | 0.7%        |
|                                 | Butcher             | 1          | 0.7%        |
|                                 | Counter             | 1          | 0.7%        |
|                                 | Free Worker         | 1          | 0.7%        |
|                                 | Government officer  | 1          | 0.7%        |
|                                 | Doctor              | 1          | 0.7%        |
|                                 | Policeman           | 1          | 0.7%        |
|                                 | <b>Total</b>        | <b>136</b> | <b>100%</b> |
| Educational level               | Illiterate          | 15         | 11.0%       |
|                                 | Primary             | 47         | 34.6%       |
|                                 | Secondary           | 42         | 30.9%       |
|                                 | University or above | 32         | 23.5%       |
|                                 | <b>Total</b>        | <b>136</b> | <b>100%</b> |
| Displaced patients out of total | Displaced           | 51         | 37.5%       |
|                                 | Not displaced       | 85         | 62.5%       |
|                                 | <b>Total</b>        | <b>136</b> | <b>100%</b> |

**Table (3.2):** Dialysis:

|                                             | <b>Variables</b>          | <b>Frequency</b> | <b>Percent</b> |
|---------------------------------------------|---------------------------|------------------|----------------|
| <b>Duration of hemodialysis</b>             | Less than 1 year          | 21               | 15.4%          |
|                                             | 1 - 5 years               | 63               | 46.3%          |
|                                             | 6 - 10 years              | 40               | 29.4%          |
|                                             | More than 10 years        | 12               | 8.8%           |
|                                             | <b>Total</b>              | <b>136</b>       | <b>100%</b>    |
| <b>Number of dialysis sessions per week</b> | 1                         | 1                | 0.7%           |
|                                             | 2                         | 134              | 98.5%          |
|                                             | 3                         | 1                | 0.7%           |
|                                             | <b>Total</b>              | <b>136</b>       | <b>100%</b>    |
| <b>Pre-dialysis blood pressure</b>          | Below normal              | 17               | 12.5%          |
|                                             | Normal < 120/80           | 16               | 11.8%          |
|                                             | Elevated 120-129/80       | 6                | 4.4%           |
|                                             | Stage 1 HTN 130-139/80-89 | 22               | 16.2%          |
|                                             | Stage 2 HTN >140/>90      | 75               | 55.1%          |
|                                             | <b>Total</b>              | <b>136</b>       | <b>100%</b>    |
| <b>Post dialysis blood pressure</b>         | Not hypertensive          | 79               | 58.1%          |
|                                             | Hypertensive              | 57               | 41.9%          |
|                                             | <b>Total</b>              | <b>136</b>       | <b>100%</b>    |

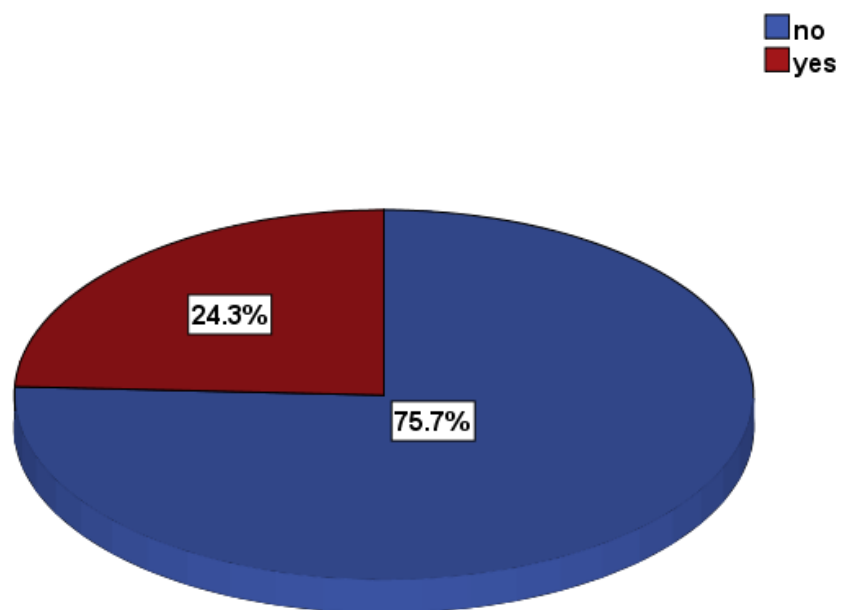


**Figure (3.1):** Prevalence of hypertension among pre-dialysis patients

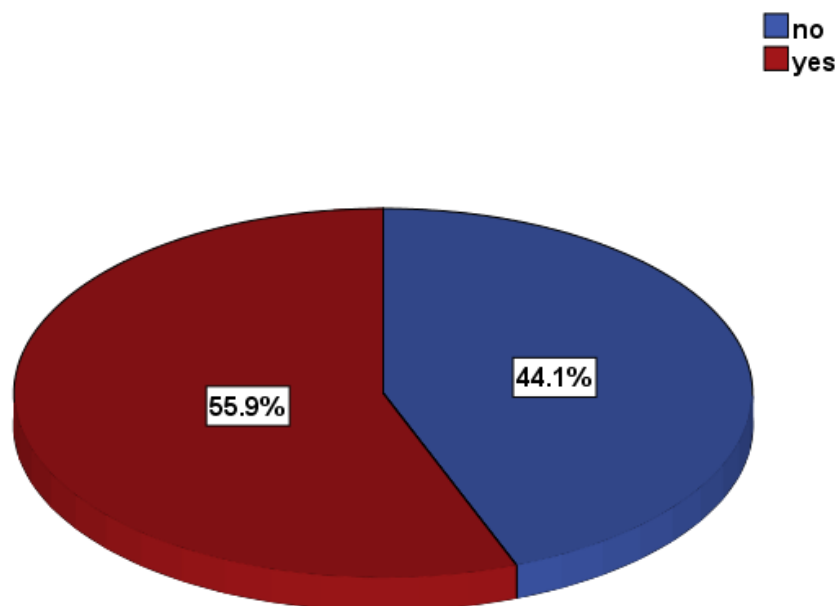


**Figure (3.2):** Percentage of patient with hypertension before dialysis

**Table (3.3):** Distribution of participants according to causes of renal failure:

| <b>Causes of renal failure</b> | <b>Frequency</b> | <b>Percent</b> |
|--------------------------------|------------------|----------------|
| Hypertension                   | 66               | 48.5%          |
| Unknown                        | 20               | 14.7%          |
| Hypertension and DM            | 8                | 5.8%           |
| Renal stone                    | 8                | 5.8%           |
| Infection                      | 7                | 5.1%           |
| DM                             | 6                | 4.4%           |
| Drug induced                   | 5                | 3.5%           |
| Hypoperfusion and dehydration  | 3                | 2.1%           |
| Genetic                        | 2                | 1.4%           |
| Refractory UTI                 | 2                | 1.4%           |
| Renal toxicity                 | 2                | 1.4%           |
| Nephrotic syndrome             | 2                | 1.4%           |
| Congenital                     | 2                | 1.4%           |
| Trauma                         | 1                | 0.7%           |
| SLE                            | 1                | 0.7%           |
| Gout                           | 1                | 0.7%           |
| <b>Total</b>                   | <b>136</b>       | <b>100%</b>    |

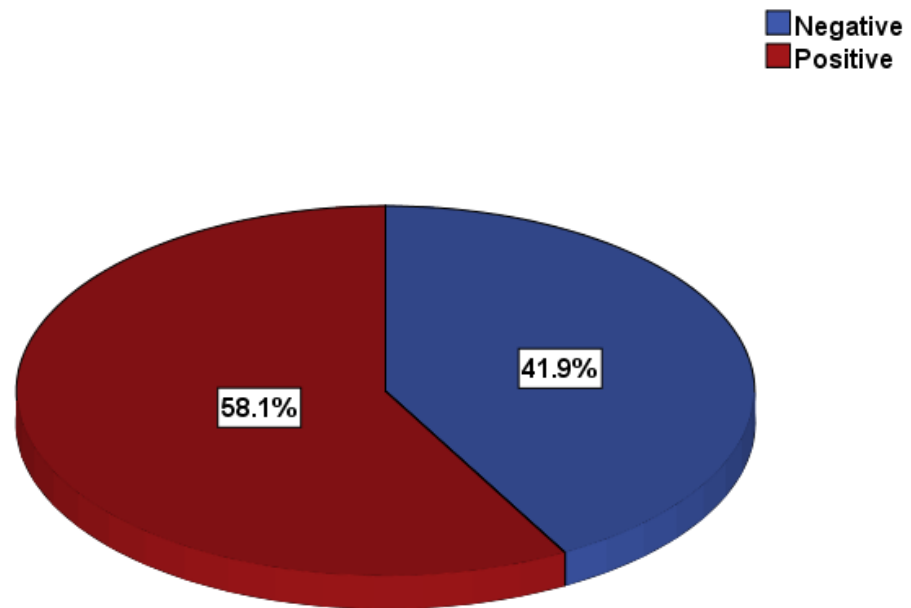


**Figure (3.3):** Patients with family history of hypertension

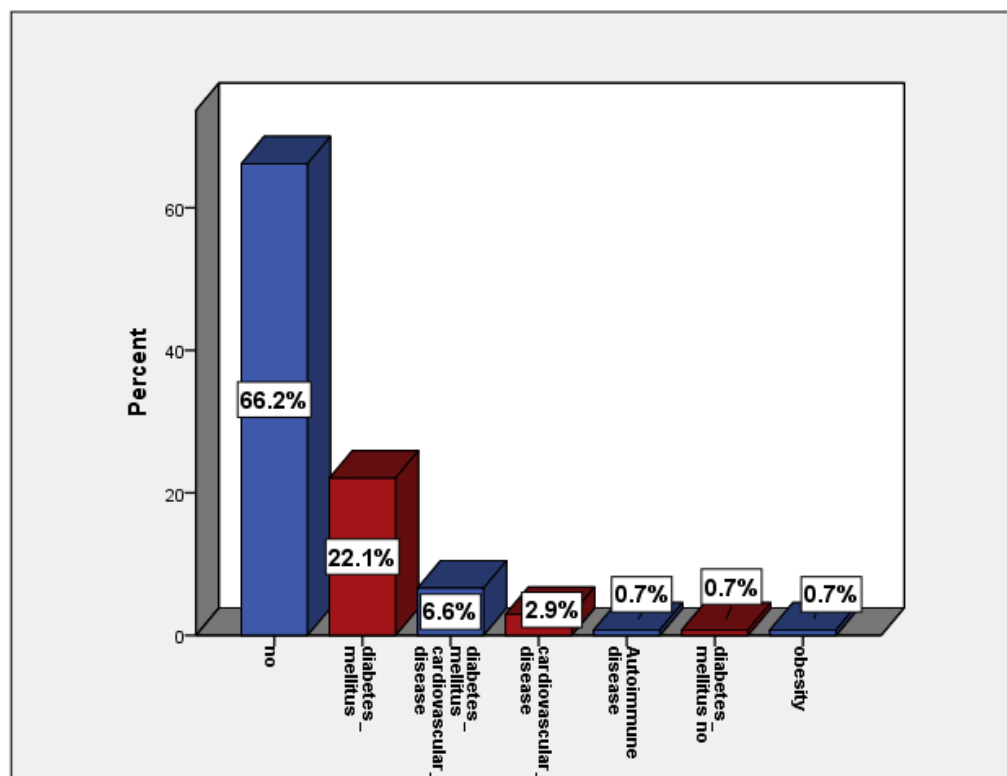


**Figure (3.4):** Patients' comorbidities

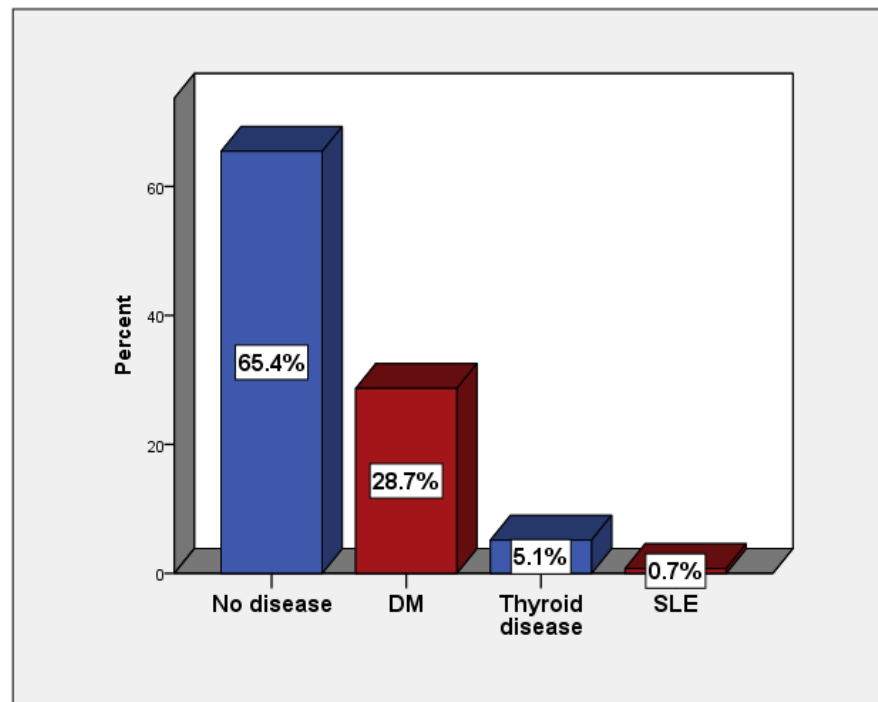


**Figure (3.5):** Diseases affect blood pressure

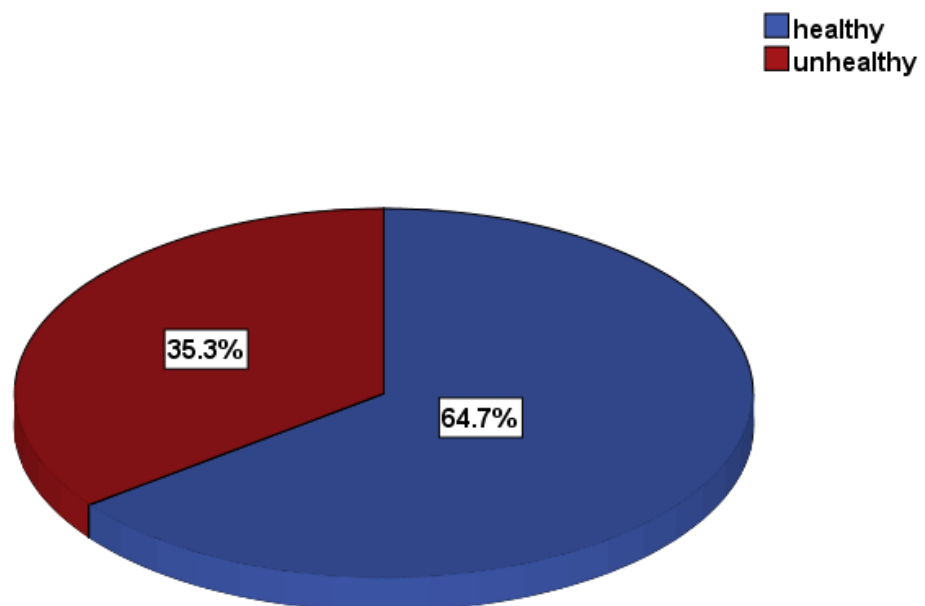


**Figure (3.6):** Dietary control and life style

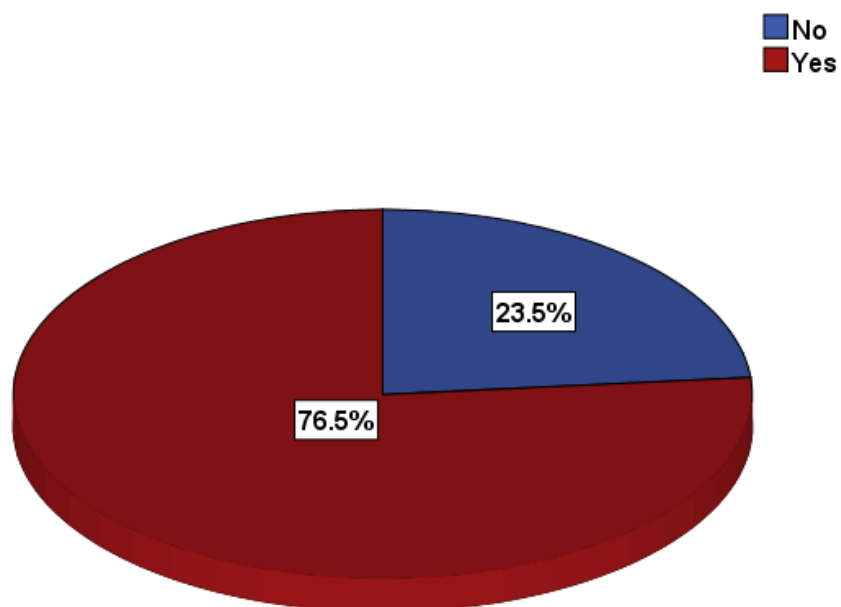


**Figure (3.7):** Caffeine use

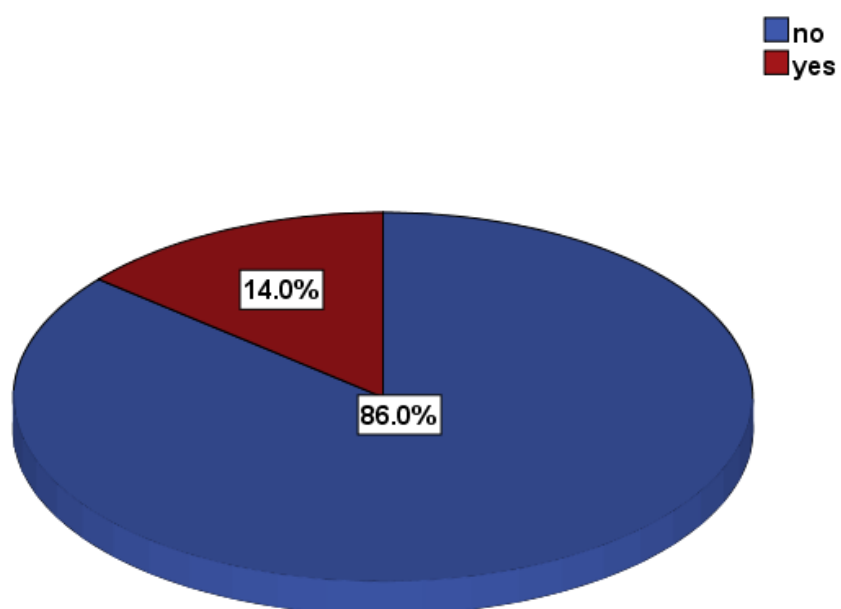


**Figure (3.8):** Nicotine and stimulants use

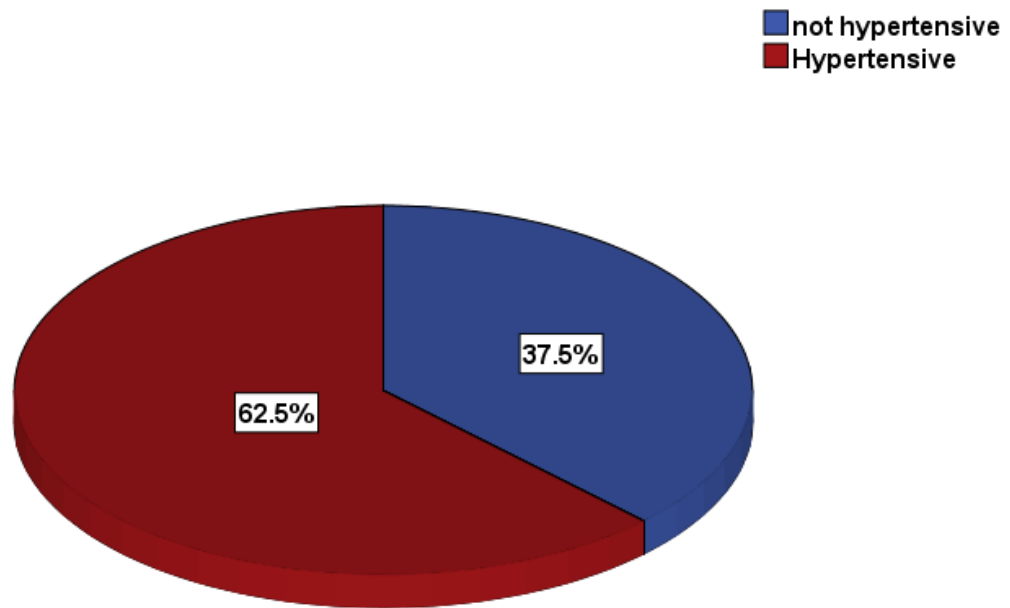


**Figure (3.9):** Blood pressure based on the last three dialysis-sessions readings

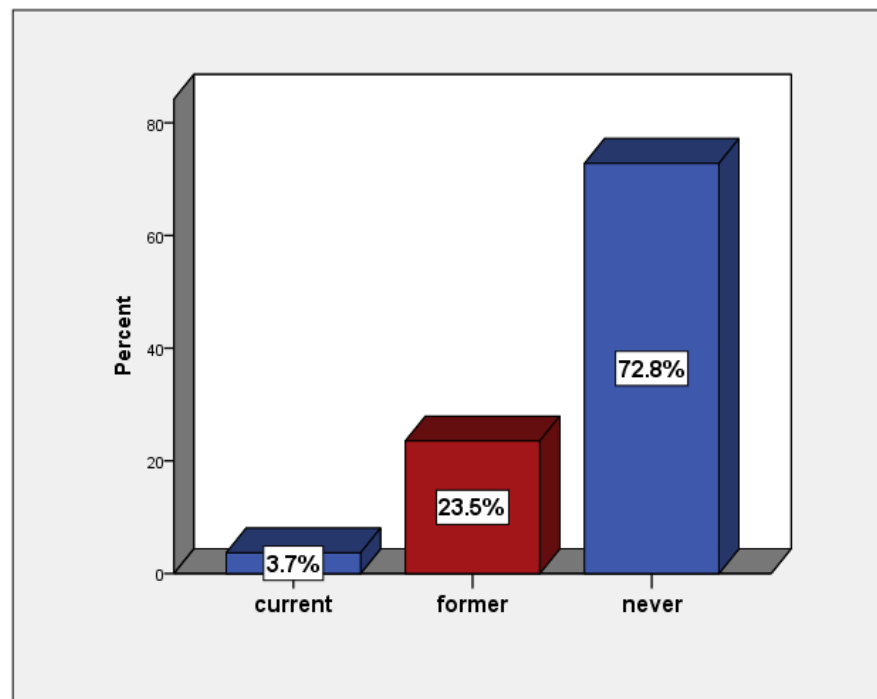


**Figure (3.10):** Smoking status

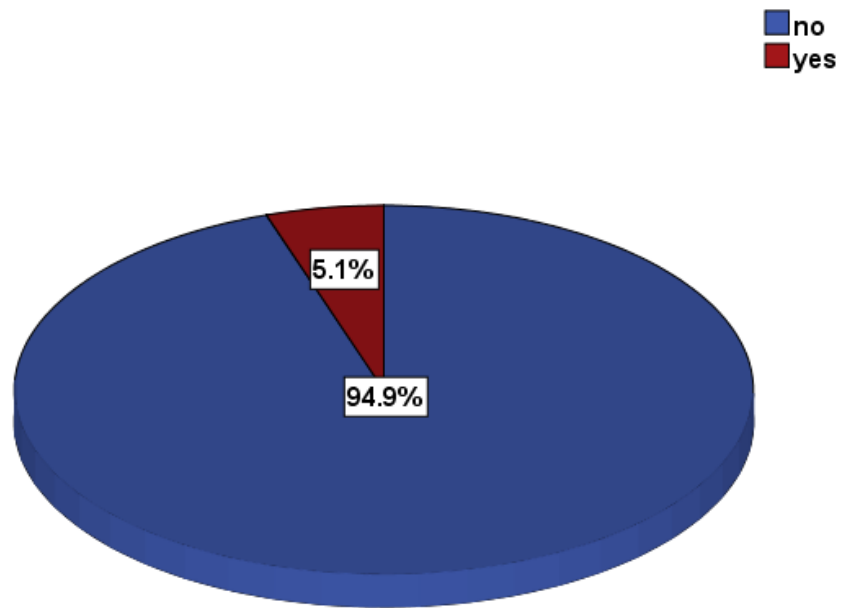


**Figure (3.11):** Alcohol abuse

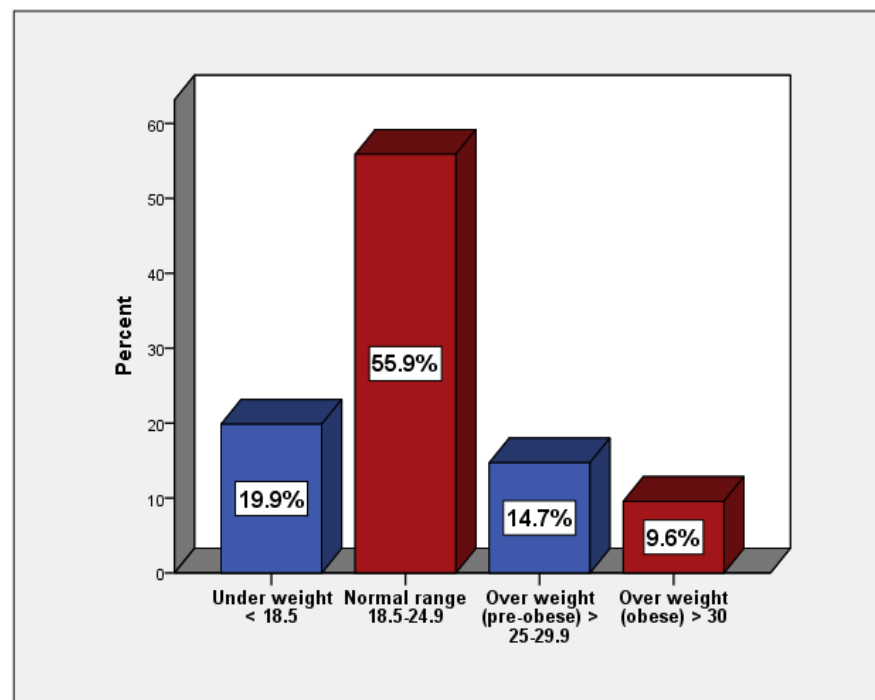


**Figure (3.12):** Body mass index

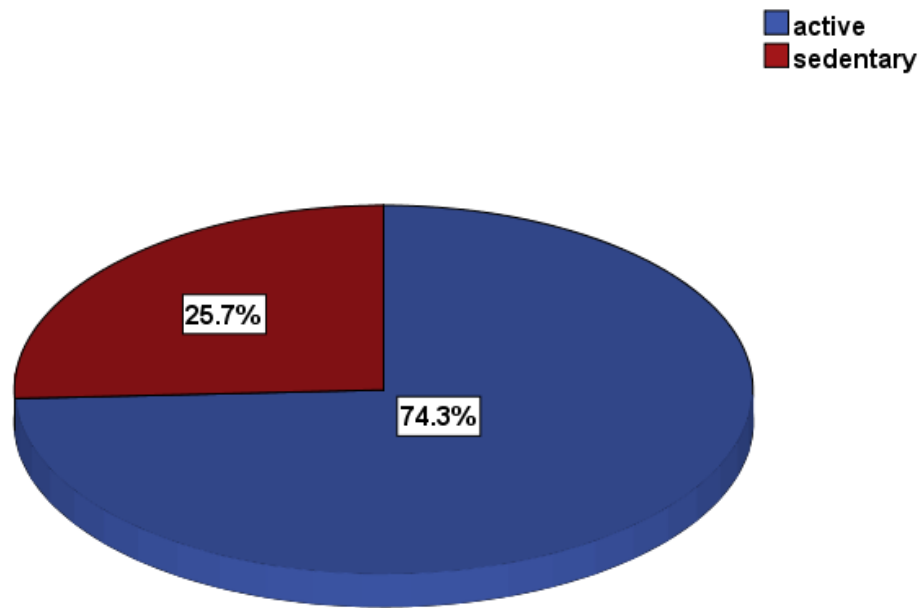


**Figure (3.13):** Physical activities

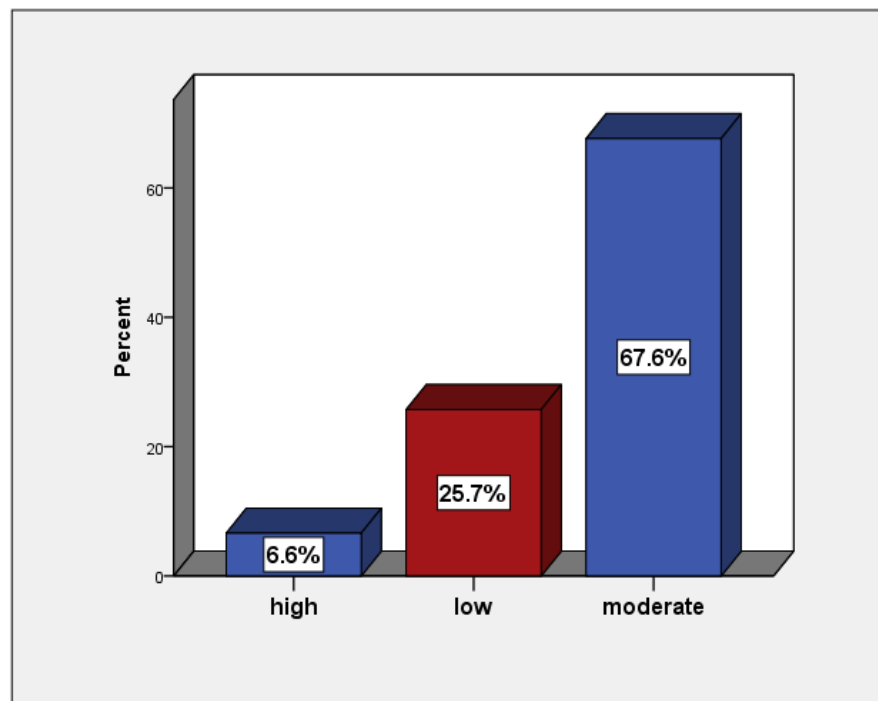


**Figure (3.14):** Salt intake

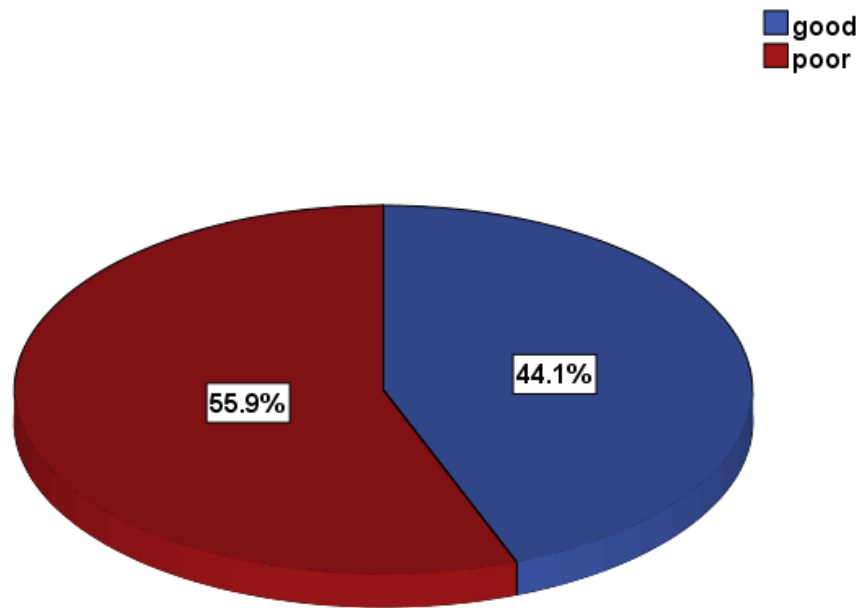


**Figure (3.15):** Fluid restriction compliance

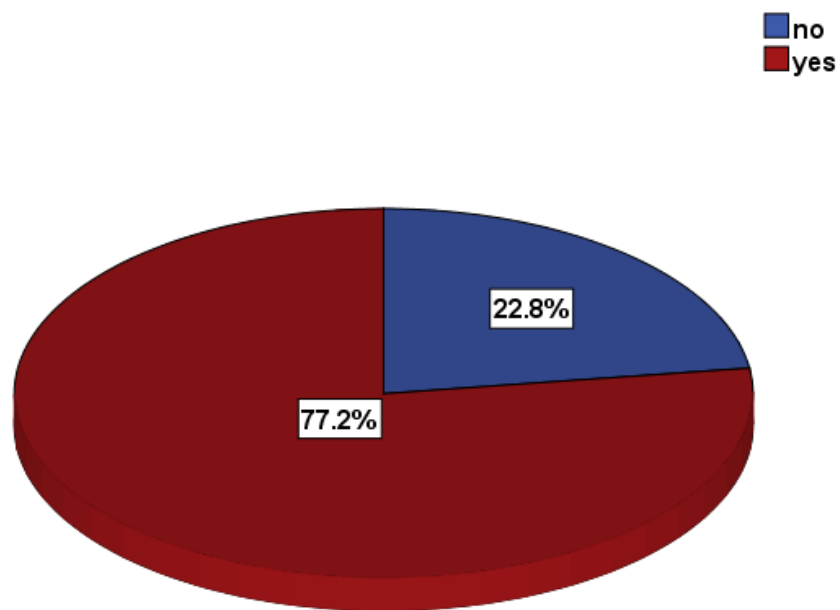


**Figure (3.16):** Anti-hypertensive medication use

**Table (3.4):** Anti-hypertensive medication use:

| <b>Anti-hypertensive medication use</b> | <b>Frequency</b> | <b>Percent</b> |
|-----------------------------------------|------------------|----------------|
| Amilo10                                 | 51               | 37.2%          |
| Not on anti-hypertensive                | 30               | 22.1%          |
| Amilo and losartan                      | 23               | 16.6%          |
| Amilo 5                                 | 19               | 13.9%          |
| Candesartan                             | 3                | 2.2%           |
| Alpha blocker ,Amilo 10                 | 1                | 0.7%           |
| Amilo 10 , furosemide                   | 1                | 0.7%           |
| Candesartan ,diuretics                  | 1                | 0.7%           |
| Candesartan and hydralazine             | 1                | 0.7%           |
| Famotidine ,diuretic                    | 1                | 0.7%           |
| CCB ,carvedilol                         | 1                | 0.7%           |
| Lotevan 10/160 ,thiazide12.5            | 1                | 0.7%           |
| Methyldopa ,Amlodipine                  | 1                | 0.7%           |
| Methyldopa, lazix                       | 1                | 0.7%           |
| Nifedipine , prazosin ,clonidine        | 1                | 0.7%           |
| <b>Total</b>                            | <b>136</b>       | <b>100.0</b>   |

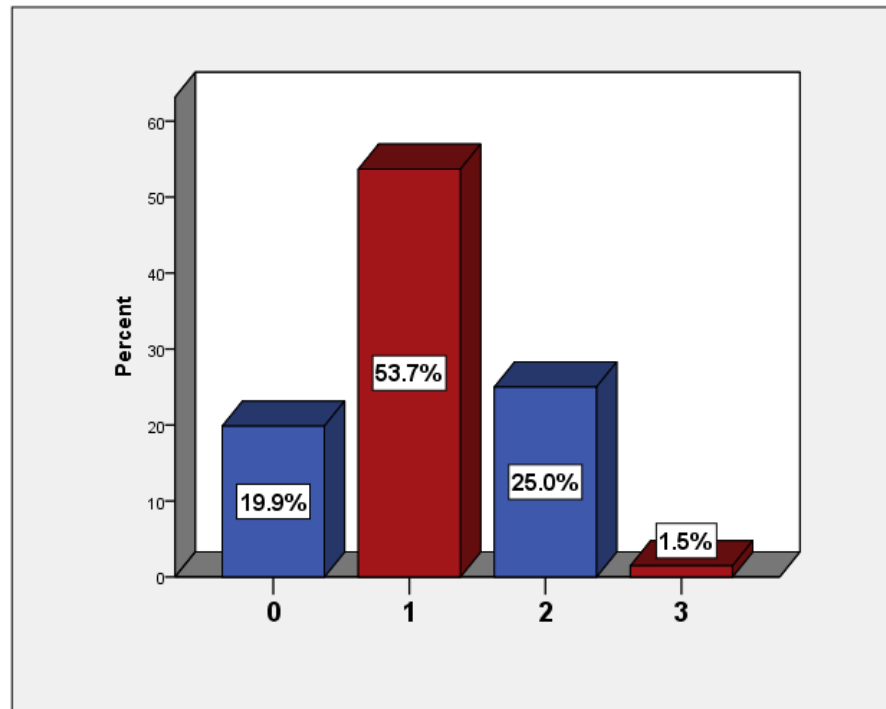


**Figure (3.17):** Number of antihypertensive drugs used

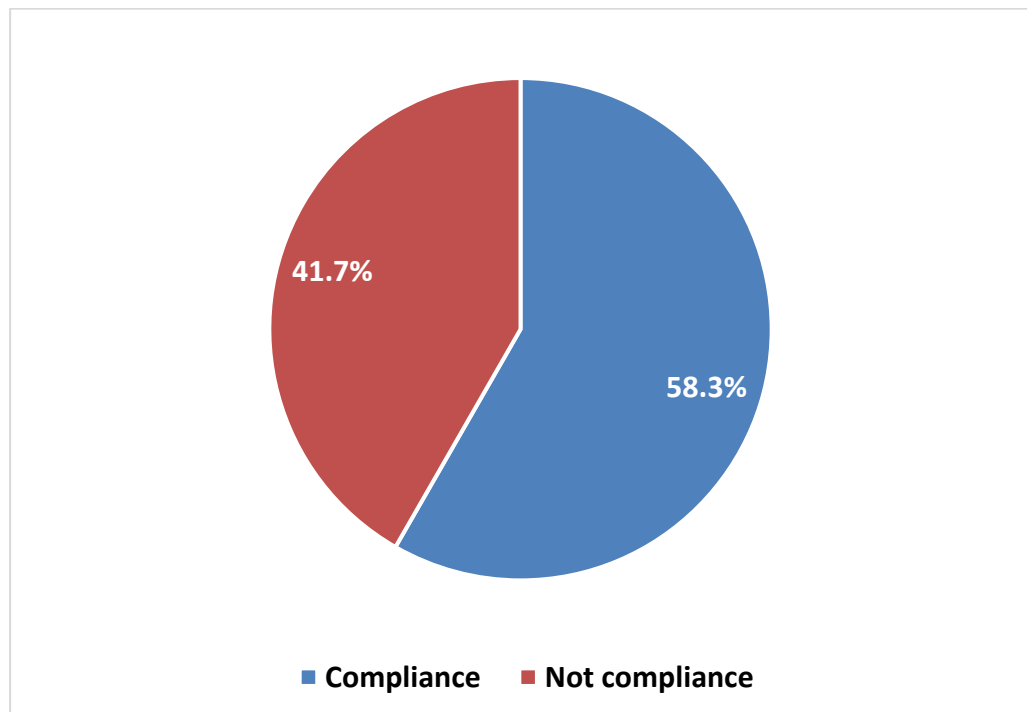


**Figure (3.18):** Compliance with medication

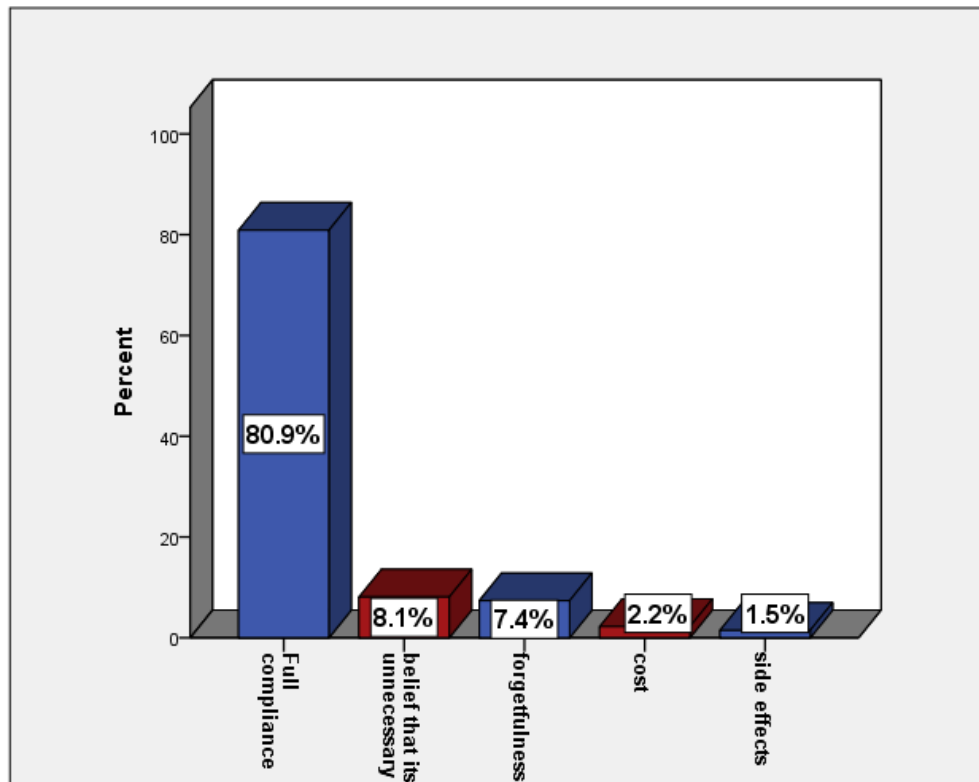


**Figure (3.19):** Reasons for not compliant

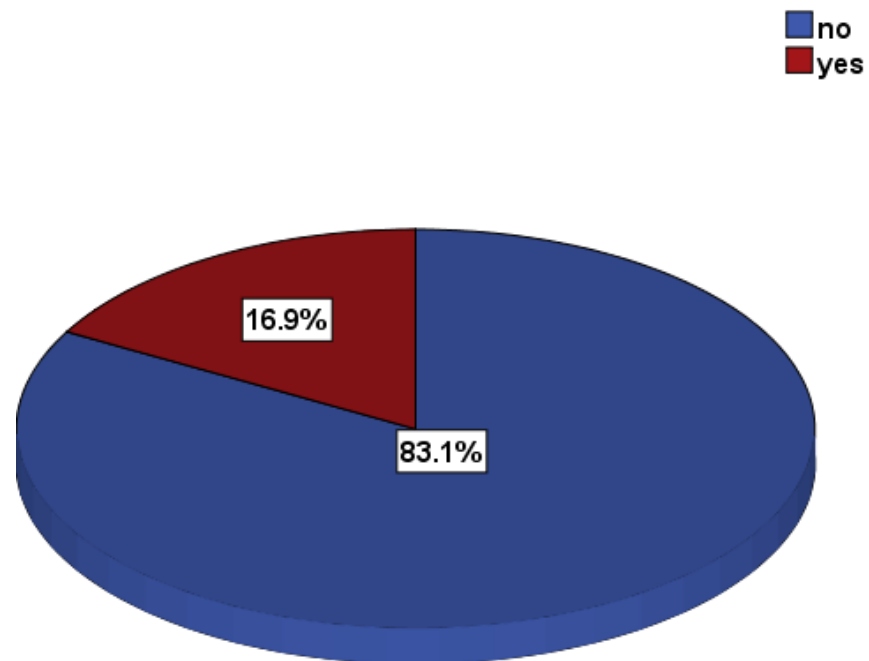


**Figure (3.20):** Visit doctor in the last six months

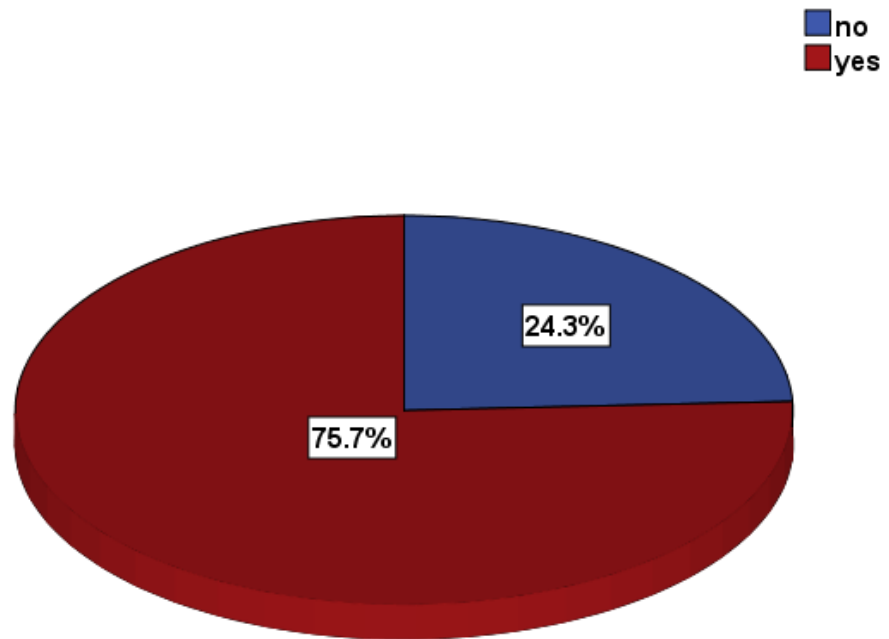


**Figure (3.21):** Received dietary counseling

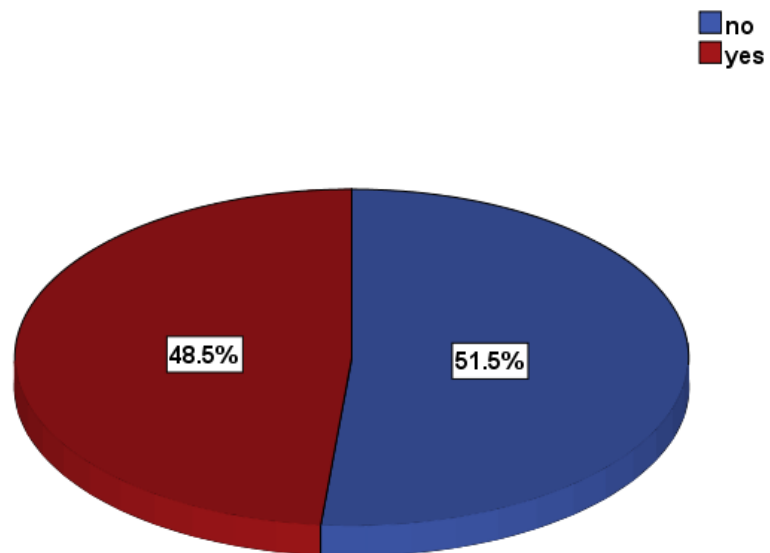


**Figure (3.22):** Following the recommended diet

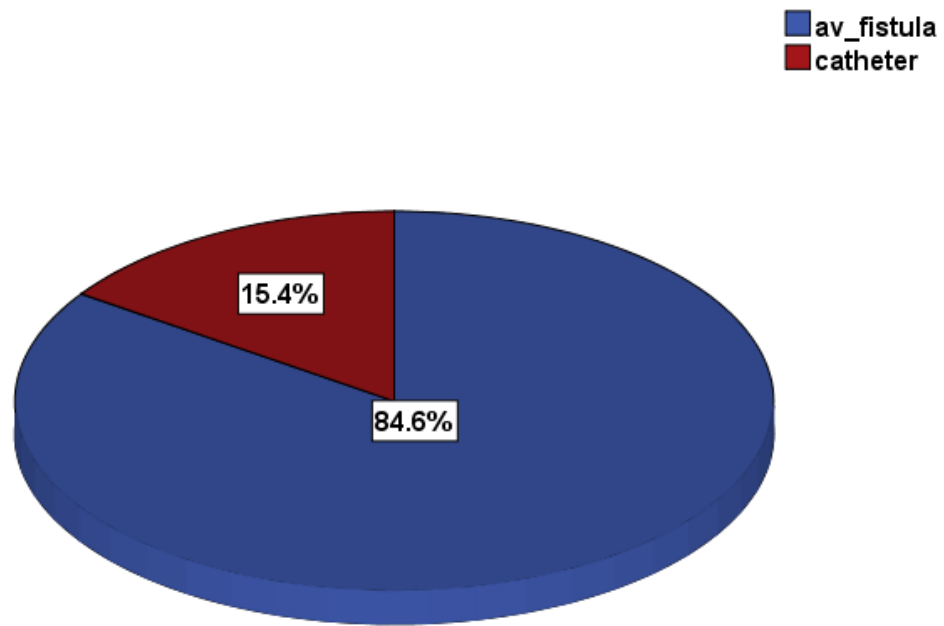


**Figure (3.23):** Vascular access type

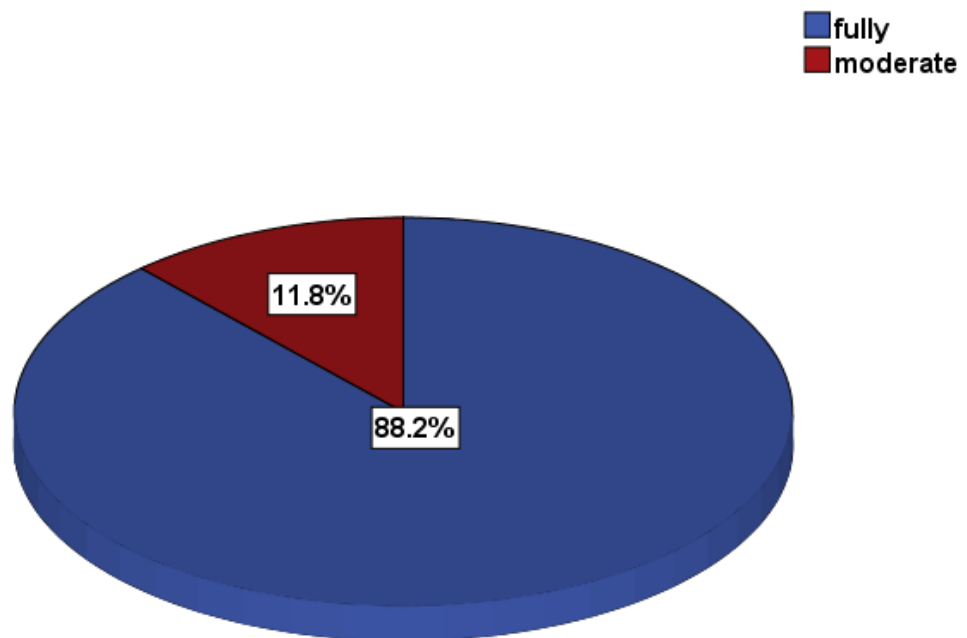


**Figure (3.24):** Committed to dialysis

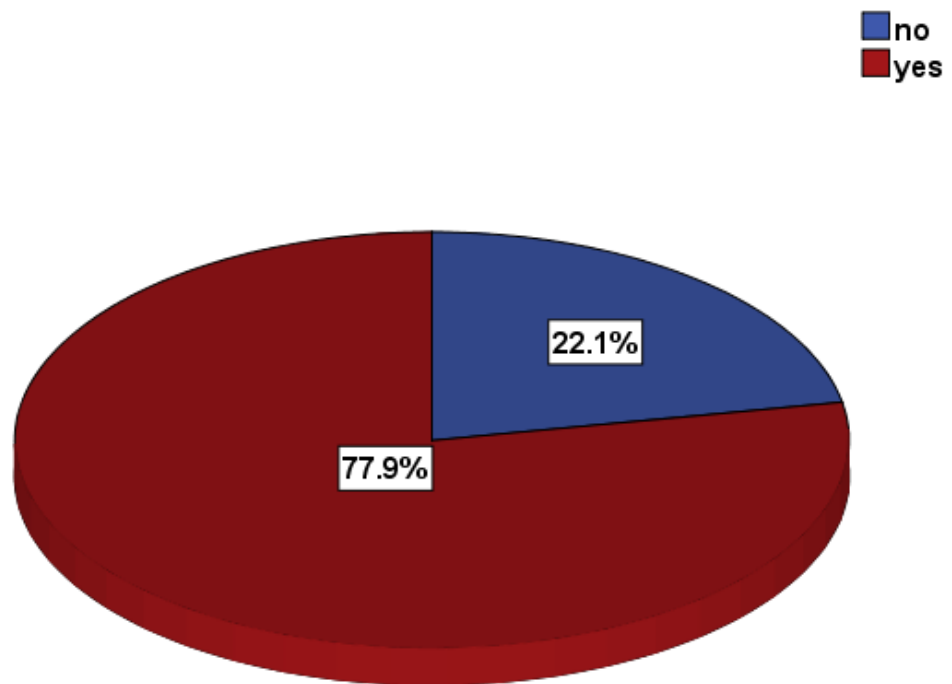


**Figure (3.25):** Believe clotting during dialysis

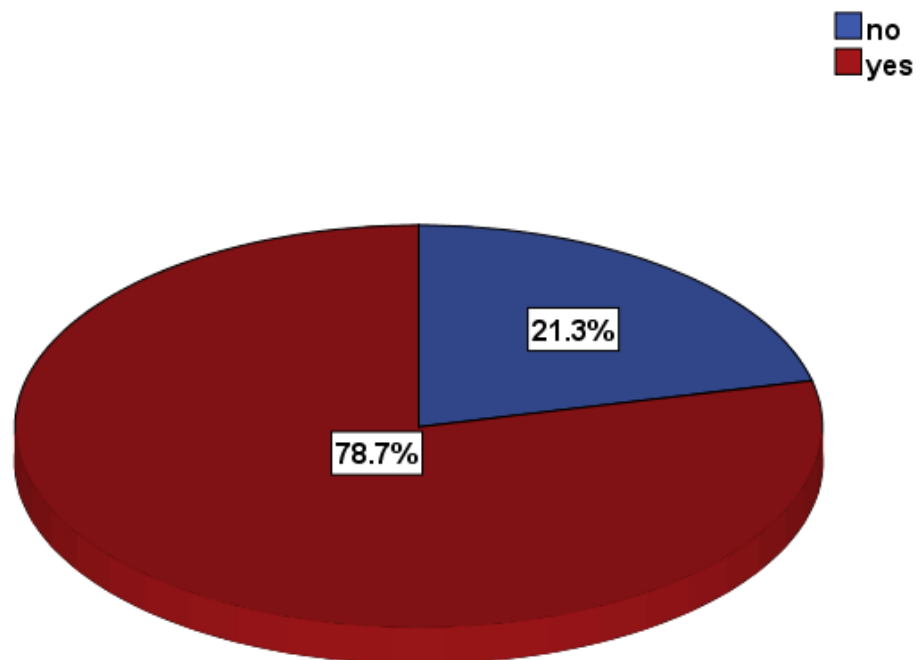


**Figure (3.26):** Understand blood pressure

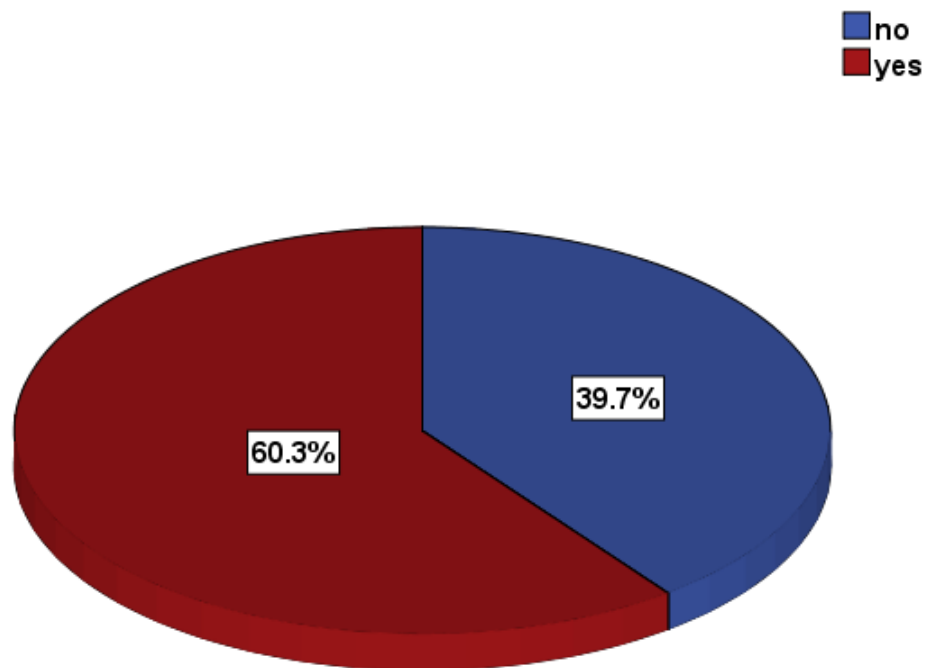


**Figure (3.27):** Received session during dialysis

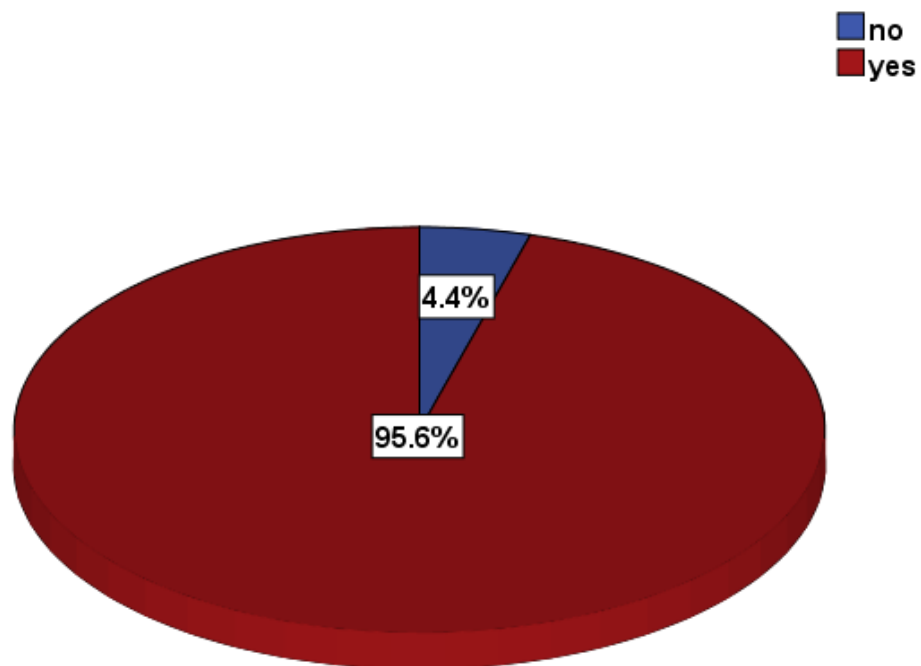


**Figure (3.28):** Erythropoietin use

**Table (3.5):** Complications with HTN:

| <b>Complications with HTN</b>           | <b>Frequency</b> | <b>Percent</b> |
|-----------------------------------------|------------------|----------------|
| Non                                     | 113              | 83.1%          |
| Cardiovascular event                    | 9                | 6.6%           |
| Hemodynamic disorders                   | 6                | 4.4%           |
| CNS event                               | 3                | 2.2%           |
| Fluid and electrolytes disturbance      | 2                | 1.5%           |
| CNS event hematological complications   | 1                | 0.7%           |
| CNS event musculoskeletal complications | 1                | 0.7%           |
| Musculoskeletal complications           | 1                | 0.7%           |
| <b>Total</b>                            | <b>136</b>       | <b>100%</b>    |

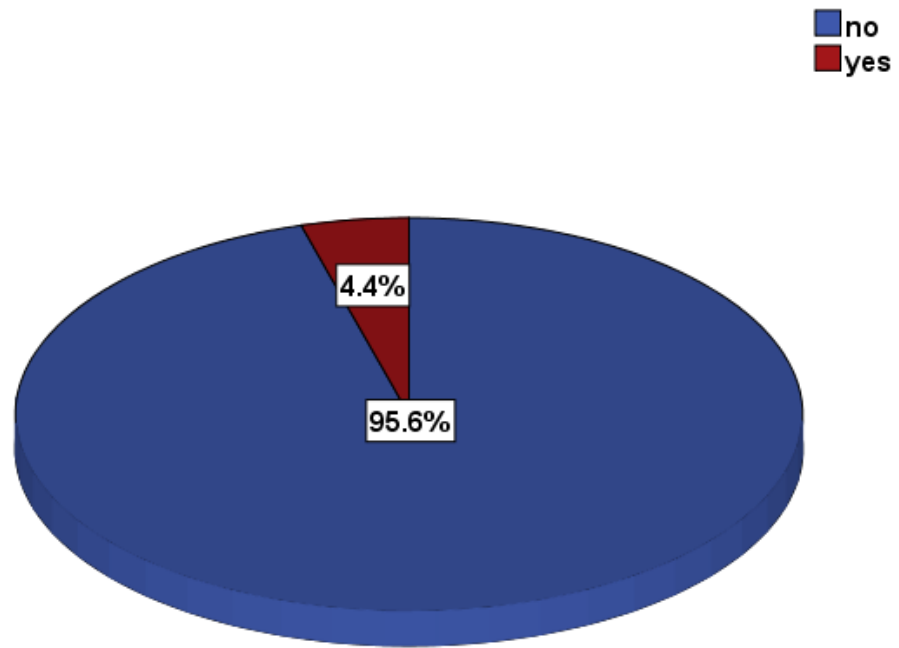


**Figure (3.29):** Any effect of heparin

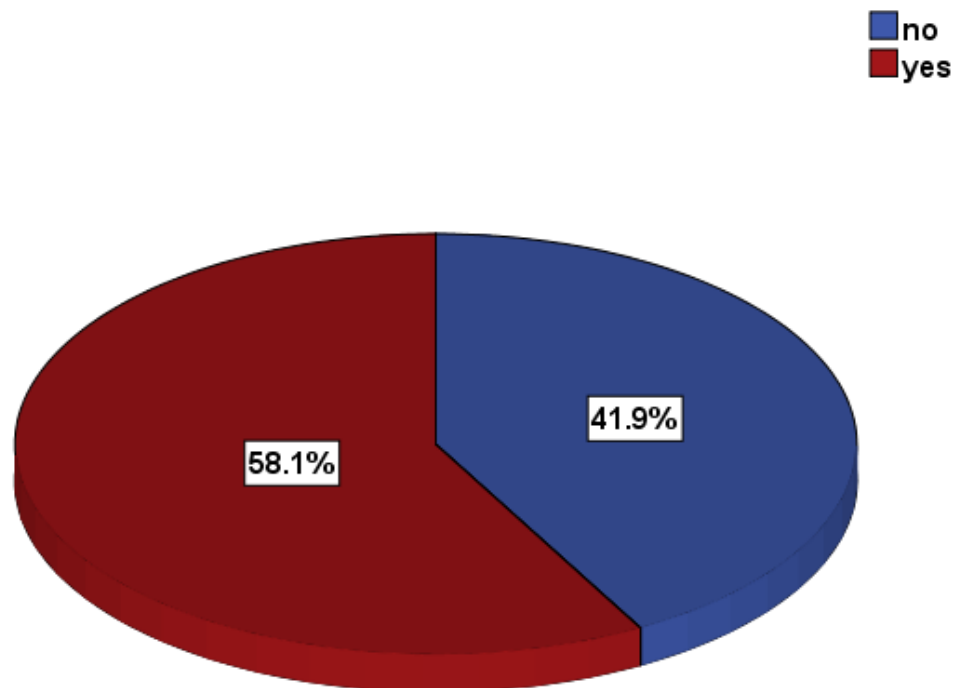


**Figure (3.30):** Anemia low Hb

**Table (3.6):** Association between prevalence of hypertension among pre-dialysis patients & compliance with medications

| Compliance with medication | Prevalence of hypertension among pre-dialysis patients |                                               | Total         | P. value | Odd ration |
|----------------------------|--------------------------------------------------------|-----------------------------------------------|---------------|----------|------------|
|                            | Hypertensive with controlled blood pressure            | Hypertensive with uncontrolled blood pressure |               |          |            |
| Compliance                 | 44<br>73.3%                                            | 16<br>26.7%                                   | 60<br>100.0%  | 0.023    | 1.084      |
| Non compliance             | 13<br>30.2%                                            | 30<br>69.8%                                   | 43<br>100.0%  |          |            |
| Total                      | 57<br>55.3%                                            | 46<br>44.7%                                   | 103<br>100.0% |          |            |

# Chapter

# Four

#### **4.1 Discussion:**

This study assessed the prevalence, risk factors, and control of hypertension among hemodialysis patients at Aldammer Teaching Hospital. The prevalence of hypertension among the participants was found to be 75.7%, consistent with other regional and international studies. For example, studies in Nigeria and Sudan have reported prevalence rates ranging from 65% to over 80% among hemodialysis populations.

One notable finding was that although a high proportion of patients were on antihypertensive medications (77.2%), only 24.3% had controlled blood pressure based on post-dialysis readings. This suggests that despite pharmacologic management, many patients remain hypertensive during dialysis, highlighting the need for better strategies in volume control, medication selection, and adherence.

Common risk factors identified included a positive family history of hypertension (58.1%), a history of hypertension prior to dialysis (54.9%), diabetes mellitus (29.4%) as a comorbidity, and moderate-to-high salt intake (over 74%). These findings are in line with studies from similar settings, suggesting that the underlying burden of non-communicable diseases contributes significantly to persistent hypertension during dialysis.

Regarding behavioral and educational factors, only 80.9% of patients were compliant with medications, and 48.5% reported following the recommended diet. Despite 75.7% receiving dietary counseling, adherence remains suboptimal. Fluid restriction compliance was also poor in over half the population (55.9%). This reveals gaps in patient education, motivation, and possibly social or economic barriers that hinder adherence.

A high percentage of patients believed in the importance of BP control and understood the role of diet (64.7%), which suggests that knowledge exists, but translating that knowledge into behavior change is still a challenge. Most patients received their dialysis once per week, which is below international standards (usually two to three times per week), possibly affecting BP control and volume overload.

The use of erythropoietin was common (95.6%), but very few reported side effects. Similarly, heparin use was well-tolerated. Most patients had AV fistulas as vascular access, which is favorable for long-term dialysis outcomes.

This prevalence is in line with other reports from Sudan (estimated at 74% and 90% in two different studies) and Nigeria (78% to over 80%).

It is comparable to, though slightly lower than, some international figures, such as the United States (over 85% in a multicenter study and the DOPPS study) and studies from Egypt (86.6%), Saudi Arabia (89%), and India (92%).

This confirms the underlying burden of non-communicable diseases contributes significantly to persistent hypertension during dialysis in our setting, similar to global trends.

A major difference lies in the blood pressure control rate, which is significantly lower in your study, suggesting greater challenges in management:

This study finding that only 24.3% of patients achieved controlled blood pressure post-dialysis is notably poor compared to other regional and international centers.

Control rates were reported to be 42% in a Khartoum study in Sudan and 52% in Egypt. Control rates were reported around 42% in the US DOPPS, and 58% in Saudi Arabia.

The low control rate in this study despite a high proportion on medications (77.2%) highlights a critical need for better strategies in volume control, medication selection, and adherence.

The factors identified in this study are also consistent with global findings that link poor control to non-adherence and inadequate dialysis:

\* Non-Adherence: Poor adherence to fluid restriction (55.9% poor compliance), salt restriction (over 74% moderate-to-high salt intake), and medications (only 80.9% compliance) are all recognized challenges in international literature, including Nigeria.

This study's finding that knowledge exists but is not translated into behavior change aligns with other research indicating gaps in education, motivation, and potential social/economic barriers to adherence.

The observation that most patients receive dialysis once per week is a significant finding that is below international standards (two to three times per week) and is a likely contributor to poor BP control and volume overload. Inadequate dialysis frequency and inconsistent adequacy have been implicated in poor control in Sudan and other regions.

The common risk factors found family history of hypertension, pre-dialysis hypertension, and diabetes mellitus (29.4%) are well-established in similar settings and worldwide studies.

## **4.2 Conclusion:**

This study found that hypertension is highly prevalent (75.7%) among hemodialysis patients at Aldammer Teaching Hospital, with only 24.3% achieving adequate blood pressure control. Key contributing factors include pre-existing hypertension, comorbidities like diabetes, poor dietary and medication adherence, and inadequate dialysis frequency.

Although most patients are aware of the importance of BP control and receive counseling, actual adherence to fluid restriction, salt intake, and medications remains low. Addressing these gaps requires a multifaceted approach involving better education, support, follow-up, and resource allocation.

Also, it has been observed that most hemodialysis patients are prescribed only a few antihypertensive medications, despite the persistence of uncontrolled hypertension. This may be due physicians intentionally prescribe fewer drugs due to concerns about intradialytic hypotension or drug accumulation in renal impairment until prove that by recommending research about this point.

This study fills a critical gap by assessing the effectiveness of current control strategies and examining patient behavior in this setting. The findings highlight the urgent need for resource allocation and systemic changes to improve both dialysis delivery and patient self-management to mitigate the associated morbidity and mortality risks of uncontrolled hypertension.

### **4.3 Recommendation:**

1. Improve frequency and quality of dialysis sessions to meet international standards (2–3 sessions/week).
2. Enhance patient education on fluid and salt restriction through repeated, simplified counseling and visual materials.
3. Strengthen adherence support by addressing common barriers such as forgetfulness, side effects, and medication cost.
4. Implement regular monitoring of blood pressure pre- and post-dialysis with documentation and follow-up actions.
5. Train staff to identify uncontrolled hypertension early and escalate care appropriately.
6. Ensure access to affordable medications, including combination antihypertensives where needed.
7. Promote multidisciplinary care, including dietitians, nurses, nephrologists, and social workers.
8. Conduct future studies to evaluate interventions on BP control and assess their long-term outcomes.
9. We recommend research on the relationship between the number of used medications and the prevalence of hypertension among hemodialysis patients.

## References:

1. Agarwal R, Nissenson AR, Battle D, Coyne DW, Trout JR, Warnock DG. Prevalence, treatment, and control of hypertension in chronic hemodialysis patients in the United States. *Kidney Int.* 2003;64(2):682-91.
2. Flythe JE, Chang TI, Gallagher MP, Lindley E, London GM, Macdougall IC, et al. Blood pressure and volume management in dialysis: conclusions from a KDIGO Controversies Conference. *Kidney Int.* 2020;97(5):861-76.
3. Agarwal R, Nissenson AR, Battle D, Coyne DW, Trout JR, Warnock DG. Prevalence, treatment, and control of hypertension in chronic hemodialysis patients in the United States. *Am J Med.* 2003;115(4):291–297.
4. Kaur S, et al. Prevalence and control of hypertension among hemodialysis patients in India. *Indian J Nephrol.* 2017;27(5):373–378.
5. Saleh A, et al. Prevalence and predictors of uncontrolled hypertension in hemodialysis patients in Egypt. *Egypt J Intern Med.* 2020;32:12.
6. Alshahrani S, et al. Hypertension among hemodialysis patients: prevalence, control, and associated factors in Saudi Arabia. *Saudi J Kidney Dis Transpl.* 2021;32(3):681–688.
7. Elhassan EA, et al. Hypertension among patients on maintenance hemodialysis in Sudan: prevalence and associated factors. *Sudan J Med Sci.* 2019;14(2):85–94.
8. Elfaki AMH, Mohamed STA. Prevalence of Hypertension and Diabetes Mellitus among Haemodialysis Patients at Elobeid Haemodialysis Unit – West Sudan. *J Adv Med Med Res.* 2019;29(3):1–5.
9. [Nigeria study] Okaka EI, Erohubie P. Prevalence and control of hypertension in chronic hemodialysis patients in Nigeria. *Niger J Clin Pract.* 2015;18(6):790–794.

# Appendix

## Questionnaire

Age:

### Section A: Socio-demographic Information

1. Patient Code: \_\_\_\_\_
2. Age: \_\_\_\_\_ years
3. Sex: ☐ Male ☐ Female
4. Residence: ☐ Urban ☐ Rural
5. Occupation: \_\_\_\_\_
6. Education level:
  - ☐ Illiterate
  - ☐ Primary
  - ☐ Secondary
  - ☐ University or above

### Section B: Medical History

1. Duration of hemodialysis: \_\_\_\_\_ months/years
2. Number of dialysis sessions per week: ☐ 2 ☐ 3
3. Cause of renal failure (if known): \_\_\_\_\_
4. Do you have a history of hypertension before starting dialysis? ☐ Yes ☐ No
5. Family history of hypertension? ☐ Yes ☐ No
6. Other comorbidities:
  - ☐ Diabetes Mellitus
  - ☐ Cardiovascular Disease
  - ☐ Obesity
  - ☐ Others: \_\_\_\_\_

### Section C: Blood Pressure Records

(To be filled by the investigator from medical records)

1. Pre-dialysis BP today: / mmHg
2. Average BP during last 3 sessions:  
Session 1: /

Session 2: /

Session 3: /

3. Is the patient classified as hypertensive based on records? ☐ Yes ☐ No

**Section D: Risk Factors for Hypertension**

1. Smoking status: ☐ Current ☐ Former ☐ Never

2. Alcohol use: ☐ Yes ☐ No

3. Body Mass Index (BMI): \_\_\_\_\_ kg/m<sup>2</sup>

4. Physical activity: ☐ Active ☐ Sedentary

5. Salt intake: ☐ Low ☐ Moderate ☐ High

6. Fluid restriction compliance: ☐ Good ☐ Poor

**Section E: Medication and Control**

1. Are you currently taking antihypertensive medication? ☐ Yes ☐ No

2. Number of antihypertensive drugs used: ☐ 1 ☐ 2 ☐ ≥3

3. Are you compliant with medication? ☐ Yes ☐ No

4. If not compliant, why?

☐ Side effects

☐ Forgetfulness

☐ Cost

☐ Belief that it's unnecessary

☐ Others: \_\_\_\_\_

5. Has your doctor changed your antihypertensive treatment in the last 6 months?

☐ Yes ☐ No

6. Have you received dietary counseling? ☐ Yes ☐ No

7. Are you following the recommended diet? ☐ Yes ☐ No

**Section F: Dialysis Factors**

1. Dry weight (kg): \_\_\_\_\_

2. Pre-dialysis weight: \_\_\_\_\_

3. Post-dialysis weight: \_\_\_\_\_

4. Ultrafiltration volume: \_\_\_\_\_ L

5. Interdialytic weight gain: \_\_\_\_\_ kg

6. Vascular access type: ☐ AV Fistula ☐ Catheter ☐ Graft

**Section G: Patient Knowledge and Awareness**

1. Do you believe controlling blood pressure is important during dialysis?

☐ Yes ☐ No

2. Do you understand how diet affects your blood pressure? ☐ Yes ☐ No

3. Have you received education on hypertension during dialysis? ☐ Yes ☐ No

Erythropoietin use:

Other Nicotines and stimulant use

Events and complications of Hypertension in those who got htn:

Are you displaced from a place due to war or any other reasons? ☐ Yes ☐ No

Caffeines (tea, coffee, energy drinks) ☐ Yes ☐ No

Anemia /low Hb ☐ Yes ☐ No

Is there is any related side effects of heparin ☐ Yes ☐ No

☐ Yes ☐ No

Have you had any side effects of erythropoietin ☐ Yes ☐ No