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# Factors Associated with Unplanned Emergency Hemodialysis Initiation among Adult Sudanese Patients with Chronic Kidney Disease: A Cross-Sectional, Single-Center Study

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## Abstract

**Background:** The number of patients starting hemodialysis is increasing worldwide. In Sudan, most patients with chronic kidney disease undergo emergency, unplanned initiation of hemodialysis, which is associated with higher costs and increased risks of morbidity and mortality. Studies have shown that patients with arteriovenous fistulas have better survival compared with those with central venous catheters (CVCs). **Objective:** This study aimed to identify factors associated with the unplanned initiation of emergency hemodialysis among patients known to have chronic kidney disease. **Study design:** A descriptive cross-sectional, hospital-based study. Setting and participants: Data were collected from 129 adult Sudanese who received emergency hemodialysis at Bahri Hemodialysis Center, Khartoum State, Sudan. Since this is a cross-sectional study, a simplified formula to calculate the sample size was used. Data were entered into an Excel sheet, then exported to SPSS version 25.0 for data analysis. **Results:** 24.8% (n = 32) of the study participants were in the age group 41 - 50 years. 67.4% (n = 87) were males, while 32.6% (n = 42) were females, with a male to female ratio of 2:1. 55.8% (n = 72) of the study participants were diagnosed with chronic kidney disease at least one year before starting dialysis. 69% (n = 89) were on regular follow-up, 58.1% (n = 75) with a nephrologist. Only 12.4% (n = 16) had an arteriovenous (AV) fistula before initiation of hemodialysis. 41.9% (n = 54) were vaccinated against the hepatitis B virus, while 58.1% (n = 75) were not vaccinated. 53.7% (n = 29) of the vaccinated group received vaccination after initiation of hemodialysis. 89.4% (n = 67) of those not vaccinated reported that none had told them to take the

vaccine. 52.7% (n = 68) were compliant with their medications for chronic kidney disease, while non-compliant ones were 47.3% (n = 61); the main reasons for non-compliance were negligence and financial issues in 62.4% (n = 38) and 19.6% (n = 12) of the non-compliant, respectively. 51.9% (n = 67) of the study participants received blood transfusions during emergency hemodialysis. The results reported that patients with arteriovenous (AV) fistula access before initiation of hemodialysis, in association with a duration of diagnosis of one year or more, plus regular follow-up, were statistically significant (p values < 0.05). **Conclusion:** Lack of patient preparedness and an emergency start to hemodialysis are associated with lower survival and higher morbidity. Only 12.4% (n = 16) had an arteriovenous (AV) fistula before the initiation of hemodialysis. The circumstances of dialysis initiation and the choices regarding initial modality and access can significantly affect patient experiences and outcomes. Awareness-raising campaigns should be implemented at the community level to increase knowledge among patients with chronic kidney disease about the importance of regular follow-up and adherence to medication. Hepatitis B vaccination sessions should be mandatory for all patients with chronic kidney disease. Research is urgently needed to inform policy and guide clinical decision-making and preventive strategies for preparing patients with chronic kidney disease for hemodialysis.

## Keywords

Unplanned Emergency Hemodialysis, Arteriovenous Fistula, Chronic Kidney Disease, Sudan

## 1. Introduction

Chronic kidney disease is highly prevalent (10% - 13% of the population), irreversible, progressive, and associated with higher cardiovascular risk. Patients with this pathology remain asymptomatic most of the time, presenting the complications typical of renal dysfunction only in more advanced stages. Its treatment can be conservative (patients without indication for dialysis, usually those with a glomerular filtration rate above 15 ml/minute) or renal replacement therapy (hemodialysis, peritoneal dialysis, and kidney transplantation) [1]. It has been estimated that the prevalence of CKD will rise over the next few decades, driven by population aging and the increasing prevalence of diabetes mellitus and hypertension [2]. This will occur predominantly in developing countries, such as those in sub-Saharan Africa (SSA), where poverty is rampant. In addition to non-communicable diseases, communicable diseases, especially infections (HIV, viral hepatitis), are common causes of CKD in Africa [3]. During the past three decades, the number of persons undergoing maintenance dialysis globally has increased dramatically [4]. In 2010, it was estimated that the number of patients on hemodialysis was more than 2 million worldwide, and modeling data suggest this number will more than double by 2030 [4]. Several factors have contributed to the increase of

hemodialysis patients, e.g., improved survival of the general population, reduction in mortality of dialysis patients, an increase in the incidence of chronic kidney disease (CKD), broadening of kidney replacement therapy acceptance criteria, and greater access to maintenance dialysis in low- and middle-income countries [5]. The circumstances of dialysis initiation and the choices regarding initial modality and access can significantly affect patient experiences and outcomes [2]. Lack of patient preparedness and an urgent start to dialysis are associated with lower survival and higher morbidity. Home modalities such as home hemodialysis and peritoneal dialysis can improve patients' perception of autonomy [5]. Lower mortality, fewer medical complications, and lower costs are associated with hemodialysis vascular access via an arteriovenous fistula (AVF) versus arteriovenous graft (AVG) or central venous catheter (CVC). Yet in some circumstances—such as in older patients or those with poor arteriovenous access—an AVG or CVC may be preferred. Historically, the evaluation of "hemodialysis adequacy" has been based on small solute clearance. This limited focus excludes the multidimensional parameters involved in achieving optimal hemodialysis and overlooks necessary evaluations that reflect the many comorbidities present in the hemodialysis population and how well or how satisfied the patients feel about their treatment. Patients and clinicians can have divergent and sometimes conflicting goals for hemodialysis treatment, with clinicians focused on outcomes such as mortality and biochemical markers and patients prioritizing their well-being and lifestyle [6]. For example, some patients on home hemodialysis have reported a willingness to trade months of survival for the ability to travel. With the increasing recognition of the importance of patient preferences and satisfaction for shared decision-making and assessing outcomes, it has become clear that a more multifaceted approach is needed for evaluating dialysis as a treatment modality [6]. The general recommendation for vascular access in patients on hemodialysis has been fistula first, although recently, emphasis has been placed on a catheter last strategy. Much of the encouragement for fistula first, catheter last has been motivated by the large survival advantage reported for patients receiving dialysis with a fistula rather than a catheter [7].

Another strong force has been economically motivated by the possible penalties of reduced Medicare reimbursement and lower five-star ratings exacted on dialysis facilities and hospitals for having too few fistulas or too many catheters. Even in the elderly, studies have shown that patients with arteriovenous fistulas have better survival compared with those with central venous catheters (CVCs), with the next best vascular access being arterio-venous grafts [7]. Many patients with chronic kidney disease (CKD) start dialysis in an unplanned fashion and/or under urgent circumstances despite regular follow-up by a nephrologist. Most studies report a prevalence of unplanned dialysis between 40% and 60%. However, the prevalence varies, likely in large part due to inconsistent definitions across studies. An unplanned dialysis start is defined by varying criteria that may include dialysis initiation with a central venous catheter (CVC) as opposed to a permanent access (arterio-venous fistula, arterio-venous graft, or peritoneal dialysis catheter), and/or he-

modialysis initiation during an acute hospitalization, and/or dialysis initiation under emergent circumstances. Unfortunately, there is no established consensus definition [8]. Unplanned dialysis is of concern because, theoretically, patients forego the opportunity to make an informed, shared decision with respect to the timing and modality of renal replacement therapy (RRT). Instead, most centers in North America only offer one option for RRT under emergency conditions, which is hemodialysis with a CVC. In addition, unplanned dialysis is associated with increased patient morbidity and mortality and added health care costs [9].

## 2. Objectives

### 2.1. General Objective

To determine factors associated with emergency unplanned initiation of hemodialysis among known chronic kidney disease patients.

### 2.2. Specific Objectives

To determine the role of patients in the unplanned initiation of emergency hemodialysis.

To identify the role of regular clinical follow-up in the unplanned initiation of emergency hemodialysis.

## 3. Materials and Methods

### 3.1. Study Design and Settings

#### 3.1.1. Study Design

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

#### 3.1.2. Study Period

The study was conducted from September 2021 to November 2021.

#### 3.1.3. Study Area

The study was conducted at Bahri Dialysis Center. It is one of 36 public and private hemodialysis centers located in Khartoum State (capital of Sudan). It is one of the major centers that offers emergency hemodialysis service in Khartoum State.

Khartoum state comprises three major cities: Khartoum, Omdurman, and Bhari, with a population of over 8 million. These 36 centers serve 3,996 patients and account for 60% of hemodialysis services in Sudan (according to data from the National Center for Kidney Diseases and Surgery).

The dialysis services provided for patients in the public centers are free of charge, and the cost of investigations and medicines is usually covered by the National Health Insurance.

### 3.2. Study Population

Adult Sudanese patients who had chronic kidney disease received emergency hemodialysis within the study period.

#### 3.2.1. Inclusion Criteria

Adult patients (>18 years old) who had chronic kidney disease.

Acceptance to participate in the study.

#### 3.2.2. Exclusion Criteria

Participants with incomplete data and records.

Refusal to participate in the study.

Those outside the study period or setting.

Patients who had acute kidney injury on hemodialysis.

### 3.3. Data Collection

#### 3.3.1. Data Collection Tools

The questionnaire was designed and completed, containing data regarding demographic information, including age group, gender, residence, and clinical data, using a close-ended structured, self-administered questionnaire.

All data were collected by the principal investigator.

#### 3.3.2. Sampling

**1. Sample size and sampling technique**

A total of 188 patients reported to the center during the study period.

Since this cross-sectional study used a simplified formula to calculate sample size, the following formula was used to calculate the sample size:

$$n = \frac{zz\dfrac{p(1-p)}{E}E}{1+zz\dfrac{p(1-p)}{E}E*N} \quad (1)$$

$n$: desired population.

$Z$: 1.96.

$p$: 0.5.

$E$: 0.05.

N = total population as reported in the center during the study period = 188.

N = 1.96*1.96*0.5 (1 - 0.5)/0.05*0.05.

1 + 1.96*1.96*0.5 (1 - 0.5)/ 0.05*0.05*188.

N = 129 participants.

### 3.4. Study Variables

#### 3.4.1. Independent Variables

**1. Demographical characteristics**

Age.

Gender.

Residence.

**2. Clinical characteristics**

Chronic kidney disease (CKD) duration.

Regular Follow-up.

Indication for hemodialysis.

Hepatitis B vaccination status.

Blood transfusion.

#### 3.4.2. Dependent Variables

Factors affecting emergency hemodialysis among chronic kidney disease patients.

### 3.5. Data Management and Analysis

#### 3.5.1. Data Management

**1. Data entry and quality control**

Data were entered into an Excel sheet, then exported to SPSS version 25.0 for data analysis.

#### 3.5.2. Data Analysis

Descriptive statistics are presented in terms of frequency tables with percentages and graphs. Descriptive analysis was performed for all study variables, with mean and standard deviation for quantitative data, and frequencies with proportions for qualitative data. Bi-variable analysis was conducted to determine the associations between the main outcome variable and other relevant risk factors using the Chi square test (for categorical variables). A P value of 0.05 or less is considered significant.

#### 3.5.3. Data Presentation

Data were represented after analysis in the form of univariable tables, cross-tabulation (bi-variable tables), multi-variable tables, figures, and narrative illustration.

### 3.6. Ethical Considerations

The ethical clearance is obtained from the Ethics Review Committee of the Sudan Medical Specialization Board.

The ethical clearance was obtained from hospital administrative authorities. Written consent was obtained from participants after explaining the nature and purpose of the study.

Confidentiality of participants' data was ensured by coding the questionnaire.

## 4. Results

A descriptive cross-sectional hospital-based study, with 129 study participants enrolled in this study, fulfilled all inclusion criteria. SPSS version 25 was used for analysis, obtaining the following results.

### 4.1. Descriptive Characteristics of Participants

#### 4.1.1. Socio-Demographic Characteristics

24.8% (n = 32) of the study participants were 41 - 50 years old, followed by 20.9% (n = 27) aged 18-30 years and 20.9% (n = 27) older than 60 years (**Figure 1**).

67.4% (n = 87) were males, while 32.6% (n = 42) were females, with a male-to-female ratio of 2:1 (**Figure 2**).

59.7% (n = 77) of the study participants were from Khartoum state (**Figure 3**).

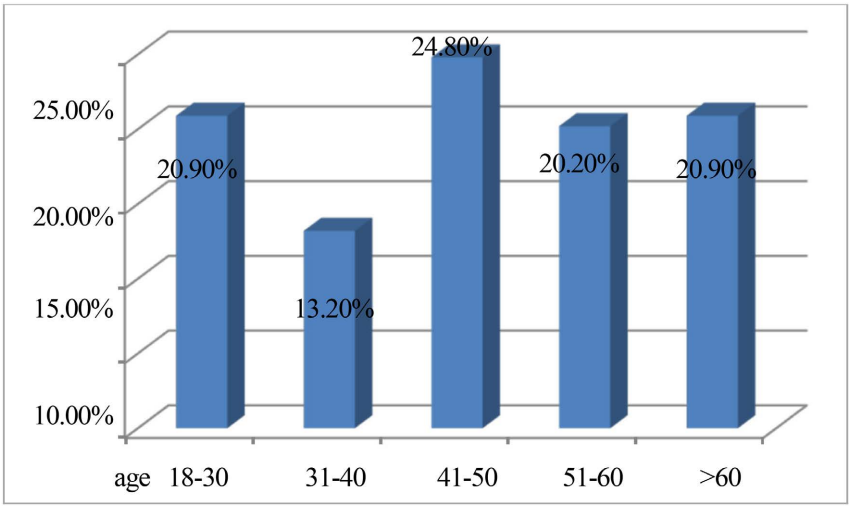


**Figure 1.** Distribution of study participants according to their age group in years (n = 129).

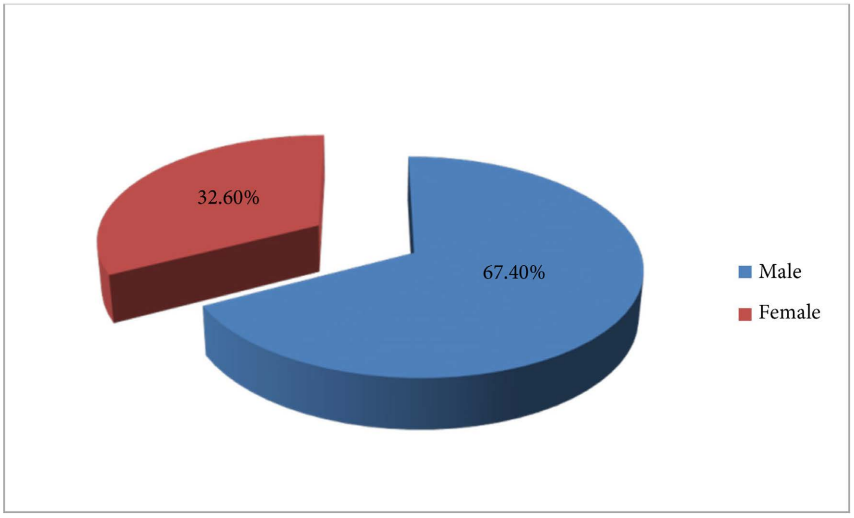


**Figure 2.** Distribution of study participants according to their gender (n = 129).

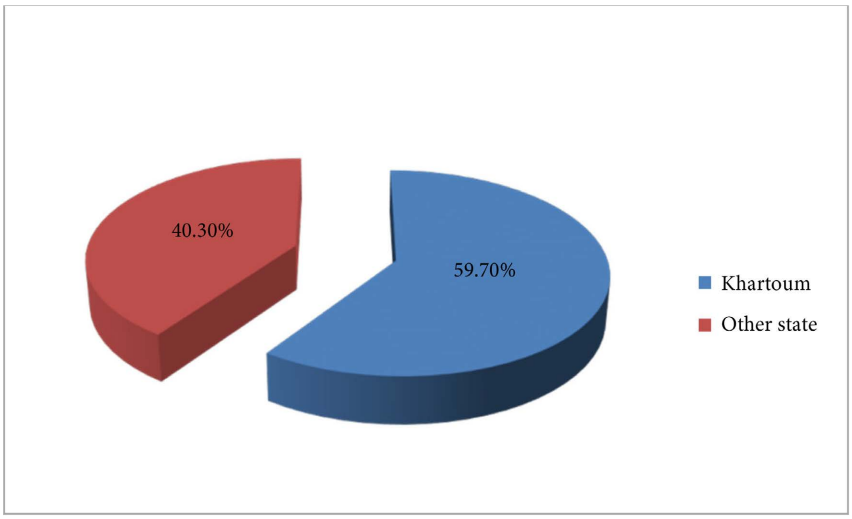


**Figure 3.** Distribution of study participants according to their residence (n = 129).

### 4.1.2. Clinical Characteristics

55.8% (n = 72) of the study participants were diagnosed with chronic kidney disease one year or more before the start of dialysis, as shown in Figure 4.

Hypertension, diabetes mellitus, and obstructive uropathy were the main causes of chronic kidney diseases among the study participants, accounting for 41.8% (n = 54), 15.5% (n = 20), and 13.9% (n = 18) respectively of study participants (Table 1).

69% (n = 89) were on regular follow-up, 58.1% (n = 75) with a nephrologist (Table 2).

12.4% (n = 16) had an arteriovenous (AV) fistula before initiation of hemodialysis; the main reason for not having an AV fistula was that their doctors didn't tell them to do so in 37.9% (n = 49) of patients, while 57.3% (n = 74) were using a temporary internal jugular catheter as vascular access (Table 3).

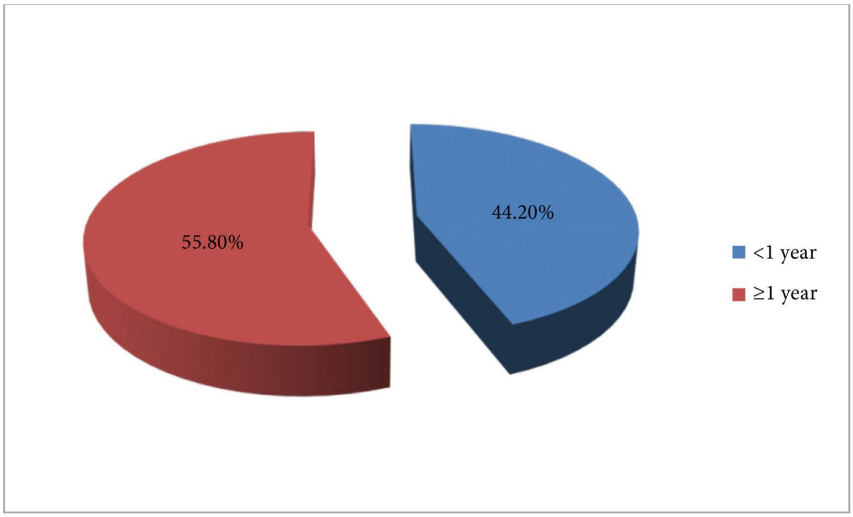


Figure 4. Distribution of study participants according to their duration of chronic kidney disease before start of hemodialysis (n = 129).

Table 1. Distribution of study participants according to causes of chronic kidney disease (n = 129).

| Causes of chronic kidney disease | Frequency | Percentage % |
|---|---|---|
| Hypertension | 54 | 41.8 |
| Diabetes mellitus | 20 | 15.5 |
| Obstructive uropathy | 18 | 13.9 |
| Glomerulonephritis | 9 | 6.9 |
| ADPKD | 7 | 5.4 |
| Acute kidney injury | 6 | 4.6 |
| Systemic vasculitis | 1 | 0.8 |
| Systemic lupus erythematosus | 0 | 0.00 |
| Uncertain | 23 | 17.8 |

*Note: some participants had more than one underlying cause. ADPKD: Autosomal Dominant Polycystic Kidney Disease.

Table 2. Distribution of study participants according to follow- up characteristics (n = 129).

| Follow-up | Frequency | Percentage % |
|---|---|---|
| **Regular follow-up** | | |
| Yes | 89 | 69.0 |
| No | 40 | 31.0 |
| **If yes, doctor specialty** | | |
| Nephrologist | 75 | 58.1 |
| General physician | 14 | 10.9 |
| **Total** | **129** | **100.0** |

Table 3. Distribution of study participants according to arteriovenous (AV) fistula characteristics (n = 129).

| AV fistula | Frequency | Percentage % |
|---|---|---|
| **AV fistula before hemodialysis hemodialysis** | | |
| Yes | 16 | 12.4 |
| No | 113 | 87.6 |
| **Reason of not having AV fistula before.** | | |
| Doctor didn't tell to do it | 49 | 43.4 |
| Not on follow up | 31 | 27.4 |
| Long waiting list | 14 | 12.4 |
| Not convinced | 13 | 11.5 |
| Financial issues | 5 | 4.4 |
| Waiting for kidney transplant | 1 | 0.88 |
| **Type of vascular access** | | |
| VA Fistula | 16 | 12.4 |
| Temporary jugular catheter | 74 | 57.3 |
| Temporary femoral catheter catheter | 34 | 26.4 |
| Long term catheter | 5 | 3.9 |
| **Total** | **129** | **100.0** |

## 4.2. Clinical Management and Preventive Indicators

### 4.2.1. Indication for Emergency Hemodialysis

The main indications for urgent dialysis were uremic symptoms, metabolic causes, and fluid overload in 48% (n = 62), 28.7% (n = 37), and 23.3% (n = 30), respectively (Figure 5).

### 4.2.2. Hepatitis B Vaccination Status

Regarding hepatitis B vaccination status; 41.9% (n = 54) of the study participants received the vaccine, while 58.1% (n = 75) were not vaccinated. 53.7% (n = 29) of the vaccinated group received the vaccine after initiation of emergency hemodial-

ysis. 89.4% (n = 67) of those not vaccinated reported that no one told them to have the vaccine (Table 4).

### 4.2.3. Compliance Characteristics

52.7% (n = 68) of the study participants were compliant with their medications for chronic kidney disease, while non-compliant ones constituted 47.3% (n = 61). The main reasons for non-compliance were negligence and financial issues in 62.4% (n = 38) and 19.6% (n = 12) of the non-compliant participants, respectively (Table 5).

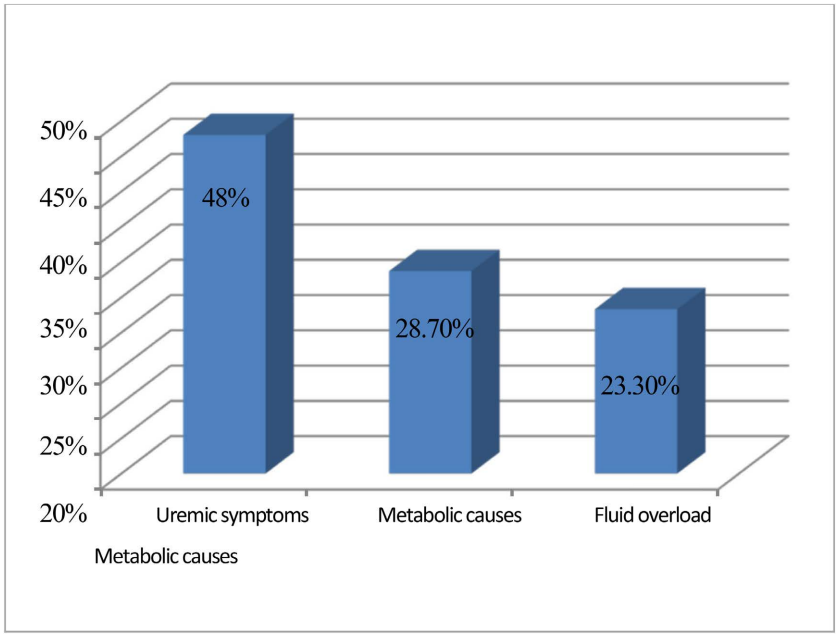


Figure 5. Distribution of study participants according to their indication of urgent dialysis (n = 129).

Table 4. Distribution of study participants according to hepatitis B vaccination status (n = 129).

| Hepatitis B vaccine | Frequency | Percentage % |
|---|---|---|
| **Received hepatitis B vaccine** | | |
| **Yes** | **54** | **41.9** |
| Before initiation of hemodialysis | 25 | 46.3 |
| After initiation of hemodialysis | 29 | 53.7 |
| **No** | **75** | **58.1** |
| **Reason of not having hepatitis B vaccine** | | |
| No one tell me | 67 | 89.4 |
| I am not convinced | 3 | 4 |
| Financial issues | 1 | 1.3 |
| Known hepatitis B virus positive | 4 | 5.3 |
| **Total** | **75** | **100.0** |

Table 5. Distribution of study participants according to compliance characteristics (n = 129).

| Compliance to medication | Frequency | Percentage % |
|---|---|---|
| **Compliance to chronic kidney disease medication** | | |
| Yes | 68 | 52.7 |
| No | 61 | 47.3 |
| **Reason to none compliance** | | |
| Negligence | 38 | 62.4 |
| Financial issues | 12 | 19.6 |
| Not prescribed | 1 | 1.6 |
| No reason | 10 | 16.4 |
| **Total** | 61 | **100.0** |

#### 4.2.4. Blood Transfusion

51.9% (n = 67) of the study participants received blood transfusion during hemodialysis, as shown in Figure 6.

### 4.3. Study Correlations

In this study, cross tabulations were done to assess the possible association between characteristics of the participants and arterio-venous (AV) fistula, and indication for urgent hemodialysis using chi-square and t statistical tests. The results showed that patients with AV fistula access were associated with the age group 51-60 years old, male gender from Khartoum state, but the associations were not statistically significant (p values > 0.05 in all) (Tables 6-8). Moreover, the results reported that patients having arteriovenous (AV) fistula access before initiation of hemodialysis in association with a duration of diagnosis of one year or more, plus regular follow-up, were statistically significant (p values < 0.05) (Tables 9-10).

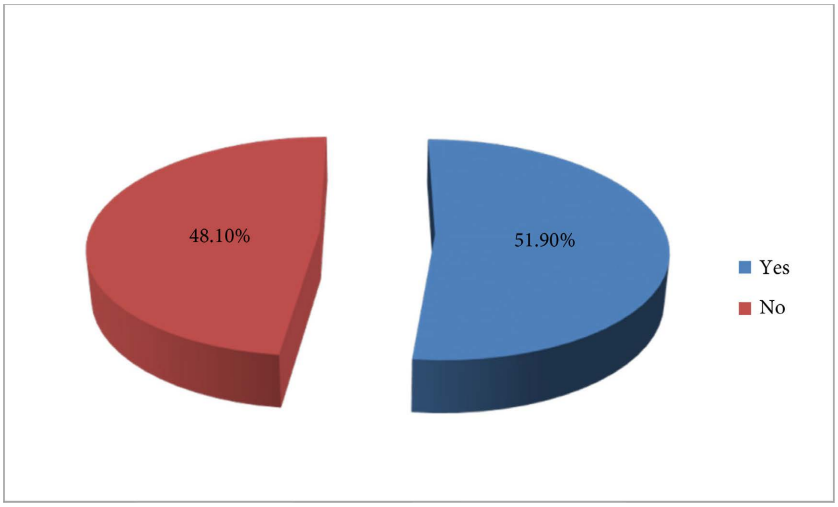


Figure 6. Distribution of study participants according to blood transfusion during hemodialysis (n = 129).

Table 6. Correlation between age and having arterio-venous fistula before initiation of hemodialysis (n = 129).

| AV fistula before initiation of hemodialysis | | | |
|---|---|---|---|
| Age group in years | Yes | No | Total |
| 18 - 30 | 1 (6.3%) | 26 (23%) | 27 (20.9%) |
| 31 - 40 | 1 (6.3%) | 16 (14.2%) | 17 (13.2%) |
| 41 - 50 | 4 (25%) | 28 (24.8%) | 32 (24.8%) |
| 51 - 60 | 7 (43.7%) | 19 (16.8%) | 26 (20.2%) |
| >60 | 3 (18.7%) | 24 (21.2%) | 27 (20.9%) |
| Total | 16 (100%) | 113 (100%) | 129 (100%) |
| P value = 0.327 | | | |

Table 7. Correlation between gender and having arteriovenous (AV) fistula before initiation of hemodialysis (n = 129).

| AV fistula before initiation of hemodialysis | | | |
|---|---|---|---|
| Gender | Yes | No | Total |
| Male | 9 (56.3%) | 78 (69%) | 87 (67.4%) |
| Female | 7 (43.7%) | 35 (31%) | 42 (32.6%) |
| Total | 16 (100%) | 113 (100%) | 129 (100%) |
| P value = 0.418 | | | |

Table 8. Correlation between patient residence and having arteriovenous (AV) fistula before initiation of hemodialysis (n = 129).

| AV fistula before initiation of hemodialysis | | | |
|---|---|---|---|
| Patient residance | Yes | No | Total |
| Khartoum | 10 (62.5%) | 67 (59.3%) | 77 (59.7%) |
| Other state | 6 (37.5%) | 46 (40.7%) | 52 (40.3%) |
| Total | 16 (100%) | 113 (100%) | 129 (100%) |
| P value = 0.725 | | | |

Table 9. Correlation between duration of diagnosis as a case of chronic kidney disease before initiation of hemodialysis and having arteriovenous (AV) fistula (n = 129).

| AV fistula before initiation of hemodialysis | | | |
|---|---|---|---|
| Duration of diagnosis as a case of chronic kidney disease before initiation of hemodialysis | Yes | No | Total |
| <1 year | 3 (18.7%) | 54 (47.8%) | 57 (44.2%) |
| ≥1 year | 13 (81.3%) | 59 (52.2%) | 72 (55.8%) |
| Total | 16 (100%) | 113 (100%) | 129 (100%) |
| P value = 0.050 | | | |

Table 10. Correlation between regular follow-up before initiation of hemodialysis and having arteriovenous (AV) fistula (n = 129).

| AV fistula before initiation of hemodialysis | | | |
|---|---|---|---|
| Follow—up before initiation of hemodialysis | Yes | No | Total |
| Yes | 16 (100%) | 73 (64.6%) | 89 (69%) |
| No | 0 (0.00%) | 40 (35.4%) | 40 (31%) |
| Total | 16 (100%) | 113 (100%) | 129 (100%) |
| P value = 0.001 | | | |

Table 11. Correlation between age and indication of emergency hemodialysis (n = 129).

| Indication of emergency hemodialysis | | | | |
|---|---|---|---|---|
| Age group in years | Uremic symptoms | Metabolic causes | Fluid overload | Total |
| 18 - 30 | 13 (20.9%) | 8 (21.6%) | 7 (23.3%) | 27 (20.9%) |
| 31 - 40 | 8 (12.9%) | 6 (16.2%) | 3 (10%) | 17 (13.2%) |
| 41 - 50 | 17 (27.4%) | 9 (24.4%) | 5 (16.7%) | 32 (24.8%) |
| 51 - 60 | 10 (16.2%) | 6 (16.2%) | 10 (33.3%) | 26 (20.2%) |
| >60 | 14 (22.6%) | 8 (21.6%) | 5 (16.7%) | 27 (20.9%) |
| Total | 62 (100%) | 37 (100%) | 30 (100%) | 129 (100%) |
| P value = 0.791 | | | | |

Table 12. Correlation between gender and indication of emergency hemodialysis (n = 129).

| Indication of emergency hemodialysis | | | | |
|---|---|---|---|---|
| Gender | Uremic symptoms | Metabolic causes | Fluid overload | Total |
| Male | 47 (75.8%) | 20 (54.1%) | 20 (66.7%) | 87 (67.4%) |
| Female | 15 (24.2%) | 17 (45.9%) | 10 (33.3%) | 42 (32.6%) |
| Total | 62 (100%) | 37 (100%) | 30 (100%) | 129 (100%) |
| P value = 0.153 | | | | |

Table 13. Correlation between duration of diagnosis as a case of chronic kidney disease before initiation of hemodialysis and indication of emergency hemodialysis (n = 129).

| Indication of urgent hemodialysis | | | | |
|---|---|---|---|---|
| Duration of diagnosis as a case chronic kidney disease before initiation of hemodialysis. | Uremic symptoms | Metabolic causes | Fluid overload | Total |
| <1 year | 31 (50%) | 12 (32.4%) | 14 (46.7%) | 57 (44.2%) |
| ≥1 year | 31 (50%) | 25 (67.6%) | 16 (53.3%) | 72 (55.8%) |
| Total | 62 (100%) | 37 (100%) | 30 (100%) | 129 (100%) |
| P value = 0.390 | | | | |

Furthermore, the results reported that uremic symptoms as the main indication

of emergency hemodialysis were associated with the age group 41 - 50 years old, male gender, and duration of diagnosis of one year or more, but the associations were not statistically significant (p values > 0.05 in all), as detailed in **Tables 11-13**.

## 5. Discussion

This study aimed to determine factors associated with emergency unpreparedness initiation of hemodialysis among known chronic kidney disease patients in Bahri dialysis center (September 2021–November 2021), covering 129 study participants. Unplanned hemodialysis is a common occurrence among chronic kidney disease (CKD) patients. In the primary care population, late referral to a nephrologist has been identified as a robust predictor of unplanned dialysis. However, factors associated with the unplanned start of dialysis in patients who are already followed by nephrologists in a multi-disciplinary clinic are not clearly defined.

In this current study, 24.8% (n = 32) of the study participants were 41 - 50 years old, in agreement with Pierre et al., where the mean age was 66.2 ± 15 years [10]. Moreover, Debajyoti et al. reported 81.7 ± 4.9 years [11], while Konstadina et al. reported that the mean age of their participants was 59.3 ± 12.2 years [12].

We reported that 67.4% (n = 87) were males, while 32.6% (n = 42) were females, with a male-to-female ratio of 2:1. Conversely, Pierre et al. documented that 58.7% of their participants were females, with a male-to-female ratio of 0.7:1 [10]. Furthermore, Debajyoti et al. documented that 65% of their participants were females, with a male-to-female ratio of 0.5:1 [11], whereas Konstadina et al. reported that 54.2% (n = 52) of their study group were males, with a male-to-female ratio of 1.2:1 [12].

In this study, 55.8% (n = 72) of the study participants had been diagnosed as a case of chronic kidney disease for one year or more before the start of dialysis, following Antonio et al., where 63.1% of their patients reported a disease duration of one year or more [13]. We revealed that hypertension, diabetes mellitus, and obstructive uropathy were the main causes of chronic kidney disease in 41.8% (n = 54), 15.5% (n = 20), and 13.9% (n = 18), respectively. In a similar context, Pierre et al. found that diabetes mellitus was the main underlying cause among 45.3% (n = 294) of their participants [10]. Debajyoti et al. revealed that ischemic heart disease and diabetes mellitus were the main underlying causes in 90% and 75%, respectively [11], while Konstadina et al. documented that 63.3% (n = 19) of their underlying causes was diabetes mellitus [12].

In our study, 69% (n = 89) were on regular follow-up, mainly 58.1% (n = 75) with a nephrologist, in relative agreement with Antonio et al., who reported that 73.9% of their study group members were on regular follow-up with their nephrologists [13]. The study revealed that only 12.4% (n = 16) had an arteriovenous (AV) fistula before initiation of hemodialysis, in agreement with Pierre et al., where 9.2% (n = 7) of people who underwent unplanned dialysis had an AV fistula [10].

In our study, the main indications for urgent dialysis were uremic symptoms, metabolic causes, and fluid overload in 48% (n = 62), 28.7% (n = 37), and 23.3% (n = 30), respectively. However, Pierre et al. found that the reasons for initiating dialysis differed between groups, and hyperkalemia was more likely to have contributed to unplanned dialysis [10].

Regarding hepatitis B vaccination status, 41.9% (n = 54) of the study participants were vaccinated, while 22.5% (n = 29) of them received the vaccine after initiation of hemodialysis. This was higher than the report by Amna et al., where only 19.9% of patients were vaccinated against the hepatitis B virus. This low frequency of vaccination was justified due to low educational level and low socioeconomic status [14]. Moreover, Muhammed et al. documented that only 45.6% (n = 68) of patients were vaccinated, and 54.4% (n = 81) were not vaccinated against HBV. Vaccination status was significantly associated with education (p = 0.004) and socioeconomic status (p = 0.008) [15].

## 6. Conclusion and Recommendations

Lack of patient preparedness and an emergency start to hemodialysis are associated with lower survival and higher morbidity.

The circumstances of dialysis initiation and the choices regarding initial modality and access can significantly affect patient experiences and outcomes.

Awareness raising campaigns should be adopted at the community level to increase the level of knowledge of chronic kidney disease patients about the need for regular follow-up and compliance with medications.

Hepatitis B vaccination sessions should be mandatory for every chronic kidney disease patient. Research is urgently needed to inform policy to guide clinical decision-making and preventative strategies for preparation for hemodialysis among chronic kidney disease patients.

## 7. Strengths and Limitations of This Study

- The limitations of this study stem from its cross-sectional nature and the limited complementary information that could be obtained from the records in Bahri hemodialysis center. Also, the lack of a planned-dialysis comparator, single-center design, possible recall bias from questionnaire responses, and limited adjustment for confounding.
- Incomplete records and missing data.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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