



Factors Associated with Hospital Outcomes of Heart Failure in Patients with Chronic Kidney Disease

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Abstract

Introduction: The objectives of this study were to determine the prevalence of heart failure among patients with chronic kidney disease, to describe their sociodemographic, clinical, and echocardiographic characteristics, and to identify prognostic factors associated with heart failure in the context of chronic kidney disease. **Methodology:** We conducted a prospective, descriptive cross-sectional study from May 1 to October 31, 2024. We included all patients aged 18 years or older with chronic kidney disease, whether or not they were on dialysis, who had developed heart failure, who consented to participate in the study, and who had a transthoracic echocardiogram performed within the past six months. **Results:** Out of a total of 263 hospitalized patients, we identified 183 cases of chronic kidney disease, representing a hospital prevalence of chronic kidney disease of 70% (183). Of the 183 patients with chronic kidney disease, 70 (45 men, 25 women) had heart failure, representing 38% of the group, with a mean age of 44 years. Hypertension (91%) was the most common cardiovascular risk factor. We observed cardiomegaly on chest X-ray in 89%, left ventricular hypertrophy on electrocardiogram in 49%, and dilated cardiomyopathy in 31%, with 37% of patients having New York Heart Association (NYHA) Class III or IV heart failure. We reported a 62% clinical improvement rate compared to a 23% mortality rate, with the leading cause being acute pulmonary edema, accounting for 44% of deaths. **Conclusion:** The prevalence of heart failure is significant in chronic kidney disease (38%). Emphasis should be placed on early screening.

Subject Areas

Nephrology

Keywords

Chronic Kidney Disease, Heart Failure, Donka

1. Introduction

Chronic kidney disease is a major public health problem due to its increasing prevalence and high rates of cardiovascular morbidity and mortality [1].

Its incidence is rising sharply and it is now recognized as a major cardiovascular risk factor [2].

Cardiovascular disease is the leading cause of death among patients with chronic kidney disease [3].

One study showed that, after adjusting for baseline clinical characteristics, advanced stages of chronic kidney disease in patients with heart failure were associated with a significant increase in hospitalizations, readmissions, and mortality [4].

In the United States, a 2016 study on cardiovascular complications in chronic kidney disease (CKD) showed that atherosclerotic heart disease and congestive heart failure were the most common, with a prevalence of 68.8% [5].

In France, in 2012, cardiovascular complications accounted for 26% of deaths among patients with chronic kidney disease, with heart failure and coronary artery disease at the top of the list [6].

In Senegal, a 2016 study assessing cardiovascular complications in chronic kidney disease found that they were dominated by left ventricular hypertrophy (71.05%), coronary artery disease (34.21%), and congestive heart failure (18.42%) [3].

According to a study conducted in Conakry in 2008, the prevalence of hypertension was 56.5%, and the incidence of kidney disease among hypertensive patients was 94 out of 170 cases; 16 deaths were recorded, with the main causes being heart failure and kidney failure [7].

The objectives of this study were to determine the prevalence of heart failure among patients with chronic kidney disease, to describe their sociodemographic, clinical, laboratory, and echocardiographic characteristics, and to identify prognostic factors associated with heart failure in the context of chronic kidney disease.

2. Materials and Methods

2.1. Study Setting

The Department of Nephrology, Hypertension, and Systemic Diseases at Donka National Hospital served as the setting for this study.

2.2. Methods

1) Study Design and Duration: This was a prospective, descriptive, cross-sectional study lasting six (06) months, from May 1 to October 31, 2024.

2) Target population: We included all patients hospitalized for chronic kidney

disease in the Nephrology Department during the study period.

3) Study population: Our study included all patients admitted to the Nephrology Department for chronic kidney disease, whether on dialysis or not, who developed heart failure during the study period.

4) Inclusion criteria: All patients aged 18 years or older with chronic kidney disease, whether on dialysis or not, who presented with heart failure, consented to participate in the study, and had a transthoracic echocardiogram performed within the past six months.

5) Exclusion criteria: Patients with chronic kidney disease without heart failure and cases of acute kidney injury were excluded.

6) Recruitment: We conducted an exhaustive recruitment process.

7) Variables studied: The parameters studied included prevalence, age, sex, place of origin, occupation, marital status, educational level, reasons for consultation, medical history, cardiovascular risk factors, physical signs, laboratory and imaging findings, as well as prognostic and clinical course factors.

Chronic kidney disease was defined according to the Kidney Disease Improving Global Outcomes (KDIGO) guidelines, which define it as the presence of a persistent renal abnormality lasting more than three months—whether morphological, histological, or biological—associated with a decrease in glomerular filtration rate.

Glomerular filtration rate was calculated using the Modification of Diet in Renal Disease (MDRD) formula and staged according to the KDIGO classification.

The diagnosis of heart failure was considered in the presence of clinical signs dominated by dyspnea, lower extremity edema, jugular vein distension, and hepatomegaly.

We classified heart failure into three types.

-Functional classification of dyspnea, which comprises four classes according to the New York Heart Association.

Depending on the location of the cardiac damage, heart failure can be left-sided, right-sided, or global. Left-sided heart failure is dominated by signs of pulmonary congestion (dyspnea, orthopnea, acute pulmonary edema), whereas right-sided heart failure is characterized by systemic venous congestion (lower extremity edema, jugular vein distension, hepatomegaly). Global heart failure combines the manifestations of both left-sided and right-sided heart failure.

-Classification of heart failure based on left ventricular ejection fraction (LVEF)

According to the recommendations of the European Society of Cardiology, heart failure is classified based on the left ventricular ejection fraction (LVEF) as reduced ejection fraction heart failure when the LVEF is less than 40%, as moderately reduced ejection fraction heart failure when the LVEF is between 41% and 49%, and as heart failure with preserved ejection fraction when the LVEF is 50% or higher, associated with signs and/or symptoms of heart failure as well as documented structural or functional cardiac abnormalities.

High blood pressure was defined according to the WHO as a systolic blood pressure of ≥ 140 mmHg and/or a diastolic blood pressure of ≥ 90 mmHg.

Transthoracic echocardiography was performed in all patients and was used to confirm and classify heart failure.

Chest X-ray: was used to determine the presence of cardiomegaly, defined as a cardiothoracic index > 0.5.

Prognostic Outcome:

Improvement: These were patients who showed clinical improvement following drug therapy and/or replacement therapy by the end of their hospitalization; that is, control of aggravating factors, regression of clinical signs, and absence of complications

Mortality: This refers to the number of deaths that occurred during hospitalization.

Discharge against medical advice: A patient's voluntary departure from the healthcare facility before a medical decision to discharge has been made.

Data collection and analysis:

Data entry, data collection, and the creation of **Tables 1-3** were performed using Word 2010 and Excel 2013.

Table 1. Sociodemographic characteristics of the patients.

Sociodemographic characteristics	Workforce (70)	Percentage (%)
Age	Average age: 44 ± 15.93 years	Range: 18 to 81 years
≤20	8	11
21 - 40	24	35
41 - 60	29	41
61 - 80	8	11
>81	1	2
Gender	Sex-ratio: 1.8	
Male	45	64
Female	25	36
Marital status		
Married	55	79
Single	10	14
Widowed	5	7
Occupation		
Self-employed	23	33
Housewives	17	24
Civil servants	11	16
Retailers	10	14
Pupils/Students	6	9
Unemployed	3	4

Table 2. Cardiovascular risk factors.

Cardiovascular risk factors	Workforce (70)	Percentage (%)
High blood pressure	64	91
Gender	45	64
Tobacco use	15	21
Diabetes	14	20
Alcohol	9	13
Dyslipidemia	6	9
Obesity	2	3

Table 3. Correlation between stages of chronic kidney disease, heart failure, and prognosis.

Stage	Good Vital Prognosis	Poor Vital Prognosis	P-Value
Stage of chronic kidney disease			
Stage I	-----	-----	-----
Stage II	-----	-----	-----
Stage III	4	0	001255
Stage IV	4	0	0.01155
Stage V	41	21	0.0238
Stage of heart failure			
Stage I	-----	-----	-----
Stage II	18	0	0.0002
Stage III	22	4	0.0215
Stage IV	9	17	0.0000

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 20. For quantitative variables, we calculated the mean and standard deviation; for qualitative variables, we assessed the association between a variable and other parameters. The association was considered significant when the p-value was <5%.

Ethical considerations:

Verbal, informed consent was obtained from each patient, and the data were used for purely scientific purposes.

Limitations and challenges:

Because patients were seen only once, it was not possible to assess improvements in renal and cardiac function.

3. Results

Out of a total of 263 hospitalized patients, we identified 183 cases of chronic kid-

ney disease, representing a hospital prevalence of chronic kidney disease of 70% (183/263). Of the 183 patients with chronic kidney disease, 70 had heart failure, representing (70/183) 38%.

The patients' ages ranged from 18 to 81 years; the most affected age group was 41 to 60 years (41%), with a mean age of 44 ± 16 years, a predominance of males (64%), married individuals (79%), and those in the liberal professions (33%).

The main reasons for consultation were dominated by dyspnea (97%), followed by physical weakness (75.71%), epigastric pain (58.57%), vomiting (44%), oliguria (39%), and hiccups (23%).

Hypertension ranked first (91%) among cardiovascular risk factors, followed by smoking (21%), diabetes (20%), dyslipidemia (13%), and obesity (3%).

Physical signs included lower limb edema (79%), pallor of the skin and conjunctiva (74%), jugular vein distension (73%), crackles (61%), hepatomegaly (33%), and hepatojugular reflux (31%).

The mean hemoglobin level was 9 g/dl, with a range of 8 g/dl to 11 g/dl. The mean creatinine level was 500 $\mu\text{mol/l}$, with a range of 300 $\mu\text{mol/l}$ to 1240 $\mu\text{mol/l}$.

On imaging studies, 62 patients (89%) had cardiomegaly on chest X-ray, 34 patients (49%) had left ventricular hypertrophy on electrocardiogram, 22 patients (31%) had dilated cardiomyopathy, and 13 cases (19%) had left ventricular hypertrophy on echocardiography.

Stage V chronic kidney disease accounted for 88% of cases, compared with 6% each for stages IV and III.

In our series, hypertension (35%), chronic glomerulonephritis (33%), and diabetes (19%) were the main causes of chronic kidney disease.

In terms of cardiac status, NYHA Class III and IV heart failure each occurred at an identical rate of 37%, with 26% in Class II.

A statistically significant association was found between Stage V chronic kidney disease and poor prognosis ($p = 0.0238$).

Cardiac prognosis was significantly associated with overall prognosis. Patients classified as stage IV had significantly worse overall prognoses ($p < 0.001$), whereas stage II was associated with a favorable outcome.

We reported a 62% clinical improvement rate compared with a 23% mortality rate, the leading cause of which was acute pulmonary edema, representing a frequency of 44%.

4. Discussion

In this study, out of 263 hospitalized patients, we identified 183 cases of chronic kidney disease (CKD), representing a hospital prevalence of 70%.

Toukara A.A. reported a prevalence of 21% for chronic kidney disease in Mali in 2016 [8].

Among the 183 cases of chronic kidney disease, 70 patients presented with heart failure, representing 38%.

Saki KA *et al.* reported a 46% incidence of cardiac involvement in patients with

chronic kidney disease in Lomé in 2011 [9].

The mean age was 43 ± 15.93 years, ranging from 18 to 81 years.

Our mean age is lower than that reported by Jerbi B *et al.* in Tunisia, who noted a mean age of 53 years among patients with chronic kidney disease and cardiovascular events [2].

BAH A. O. *et al.* reported a female predominance of 52%, in contrast to our results, where men were in the majority, accounting for 64% of cases, with a sex ratio of 1.8 [10].

The main reasons for consultation were dominated by dyspnea (97%), followed by physical weakness (75.71%), epigastric pain (58.57%), vomiting (44%), oliguria (39%), and hiccups (23%).

Millogo in Burkina Faso, in a study on cardiorenal syndrome, noted dyspnea as the primary functional sign with a frequency of 84.9% [11].

Hypertension ranked first (91%) among cardiovascular risk factors, followed by smoking (21%), diabetes (20%), dyslipidemia (13%), and obesity (3%).

Eyeni *et al.* in Congo-Brazzaville identified the following cardiovascular risk factors in patients with chronic kidney disease: hypertension (68%), diabetes (25%), physical inactivity (20%), age (14%), and smoking (11%) [12].

The physical signs were dominated by lower extremity edema (78.57%), followed by pallor of the skin and conjunctiva (74.29%), jugular vein distension (72.86%), and pulmonary crackles (61.43%).

The etiologies of chronic kidney disease vary from one study to another.

In our series, hypertension (35%), chronic glomerulonephritis (33%), and diabetes (19%) were the leading causes of chronic kidney disease.

In the Tia study in Côte d'Ivoire, the main causes of chronic kidney disease were hypertension (34%), chronic glomerular nephropathies (29%), and human immunodeficiency virus infection (11%) [13].

Maiga D in Mali identified the following causes of chronic kidney disease: vascular nephropathies (54%), interstitial nephropathies (22%), and glomerular nephropathies (17%) [14].

Stage 5 chronic kidney disease accounted for 88% of cases, compared with 6% each for stages 4 and 3.

Regarding cardiac conditions, NYHA stage III and IV heart failure each occurred at identical rates of 37%, with 26% in stage II.

We reported 42 cases of clinical improvement compared with 16 cases (22%) of death, the leading cause of which was acute pulmonary edema, representing a frequency of 44%.

Millogo in Burkina Faso had noted a 20% mortality rate among patients with cardiorenal syndrome [11].

The ECG and Doppler echocardiogram findings were consistent with an underlying cardiac condition: hypertensive heart disease. The mean length of hospital stay was 17.7 ± 17.5 days.

A statistically significant association was found between stage V renal prognosis

and poor overall prognosis ($p = 0.0238$).

Prognosis was significantly associated with cardiac prognosis. Patients classified as stage IV had significantly worse prognoses ($p < 0.001$), whereas stage II was associated with a favorable outcome.

5. Conclusions

The prevalence of heart failure is significant in patients with chronic kidney disease (38%), with a higher incidence among men; a statistically significant association was found between stage V chronic kidney disease and poor prognosis ($p = 0.0238$).

Emphasis should be placed on the early detection of heart failure in patients with chronic kidney disease.

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Authors' Contributions

All authors contributed to this study.

Conflicts of Interest

The authors declare no conflicts of interest.

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