

Cardio-Renal Syndrome at the Cardiology Department of the Hopital De La Paix of Ziguinchor (Senegal)

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How to cite this paper: Manga, S.J., Yenou, G.P.A., Bodian, M., Kane, Y., Sy, S.L. and Indafa, Q.T. (2021) Cardio-Renal Syndrome at the Cardiology Department of the Hopital De La Paix of Ziguinchor (Senegal). *Open Journal of Internal Medicine*, 11, 238-245.

<https://doi.org/10.4236/ojim.2021.114020>

Received: November 10, 2021

Accepted: December 18, 2021

Published: December 21, 2021

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Abstract

Context and Objectives: Cardio-renal syndrome is a pathophysiological disorder of the heart and kidneys frequent in hospitalization for cardiology. The objective of this work is to study the frequency, clinical characteristics and treatment of cardio-renal syndrome (CRS) at the Hôpital de la Paix in Ziguinchor. **Methodology:** This is a retrospective study, from January 16, 2017 to September 16, 2020, including patients hospitalized in the cardiology department for heart failure associated with impaired renal function. **Results:** 92 patients were included, *i.e.* a hospital frequency of 9.15% with a predominance of men (sex ratio of 1.19). The average age was 60.05 years. High blood pressure (75%) was the main risk factor. The clinical symptomatology was dominated by dyspnea (69.6%). The average creatinine clearance was 24.40 ml/minute/1.73 m² and stage 5 renal failure was noted in 39 patients (42.4%). Echocardiography detected systolic dysfunction of the left ventricle in 53 patients (64.6%). The kidney ultrasound was normal in half of the cases. The most observed CRS in our study was type I (60.9%). Therapeutically, the most widely used drugs were diuretics (85.9%) and ACE inhibitors (71.7%). The death rate was 28.3%. The average cost of inpatient care was 149,466 CFA francs. The poor prognosis elements were stage IV dyspnea ($p = 0.006$), cardiomegaly ($p = 0.047$) and the presence of pericardial effusion ($p = 0.021$). **Conclusion:** Cardio-renal syndrome is a condition to be systematically looked for in cases of heart failure because it is associated with severe mortality.

Keywords

Cardio-Renal Syndrome, Prevalence, Clinic, Ziguinchor

1. Introduction

Cardio-renal syndrome (RSC) is a pathophysiological disorder of the heart and kidneys in which chronic or acute dysfunction of one can lead to chronic or acute dysfunction of the other [1].

Five subtypes have been described. A distinction is made between acute or chronic cardio-renal syndromes (CRS type 1 and 2 respectively) and acute and chronic reno-cardiac syndromes (CRS type 3 and 4 respectively); type 5 SCR is characterized by the association of a renal failure and heart failure secondary to acute or chronic systemic pathology.

The association of cardiac and renal dysfunction impacts the prognosis of patients leading to an increase in morbidity-mortality.

Mortality is higher in heart failure (HF) with associated renal failure (RI). The mortality rate is 24% in heart failure patients with normal renal function and 38% to 51% of patients with renal impairment [2].

The prevalence of the association of cardiac dysfunction and renal dysfunction, whether acute or chronic, is currently difficult to estimate, but nevertheless represents a large proportion of hospitalized patients.

Heart and kidney disease are common in patients admitted to hospital and they coexist in a significant number of cases.

The prevalence of cardio-renal syndrome in Europe is estimated at 17.5% [3].

In Africa, statistical data are scarce and the incidence of cardio-renal syndrome is poorly understood, as it is the subject of few studies.

In Senegal, Bodian found a prevalence of 3.7% in a study carried out in Dakar [4].

Currently, no data concerning cardio-renal syndrome in the region of Senegal is available.

The objective of this work was to study the frequency, clinical characteristics and management of cardio-renal syndrome at the Peace Hospital of Ziguinchor in southern Senegal.

2. Method

We carried out a retrospective cohort study in the cardiology department of the Ziguinchor de la Paix Hospital from January 16, 2017 to September 16, 2020.

The patients that have been included in the study were at least 18 years old and were hospitalized in the Cardiology Department of the Hospital de la Paix for heart failure associated with impaired renal function.

The definition of heart failure was that of the European Society of Cardiology

(ESC) namely the presence of typical signs of heart failure associated with objective signs of heart failure (Biology, ECG, Cardiac ultrasound, Radiography ...).

Renal failure was defined as an increase in serum creatinine and blood urea with a glomerular filtration rate of less than 90 ml/minute.

The data collection base consisted hospitalized patients' records. The studied parameters concerned socio-demographic data, personal and family history, hemodynamic constants, functional signs as well as clinical examination data. The results of additional examinations, treatment and hospital progress were also studied.

Data entry and analysis was performed using Statistical Package for Social Sciences (SPSS) version 18 software.

We made sure that the confidentiality of study participants was ensured by using personal identification numbers on data collection forms instead of names. Personal identifiers will not be included in study reports. All study files will be kept confidential.

3. Results

During the study period, 1005 patients had been hospitalized in cardiology, including 92 for cardio-renal syndrome, *i.e.* a prevalence of 9.15%. There were 50 men (54.3%) and 42 women (45.7%) for a sex ratio of 1.19. The average age of the patients was 60.05 years (± 18.25) with extremes of 18 and 97 years. **Table 1** presents the risk factors for the patients: high blood pressure (75%) was the main medical past history followed by diabetes (28.3%) and cardiomyopathies (21.7%).

Clinically, dyspnea was the main functional sign (93.4%), average systolic blood pressure was 130.86 mmHg (± 30.59), average diastolic blood pressure was 80.68 mmHg (± 20.32) and the lower limbs edema (77.2%), the main sign found on physical examination.

Biologically, the average serum creatinine was 65.72 mg/l (± 73.35).

Moderate renal failure was found in 33 patients (35.9%) and end stage renal failure in 39 patients (42.4%).

The main signs found on the EKG were those of necrosis (25.6%), atrial fibrillation (22.2%) and left ventricular hypertrophy (12.2%).

Table 1. Distribution of patients according to history and risk factors.

| Antecedents | Workforce | Percentage (%) |
|-----------------------|-----------|----------------|
| HBP | 69 | 75 |
| Diabetes | 26 | 28.3 |
| Dialtedcardiomyopathy | 20 | 21.7 |
| Tobacco | 8 | 8.7 |
| Obesity | 4 | 4.3 |

HBP: High Blood Pressure.

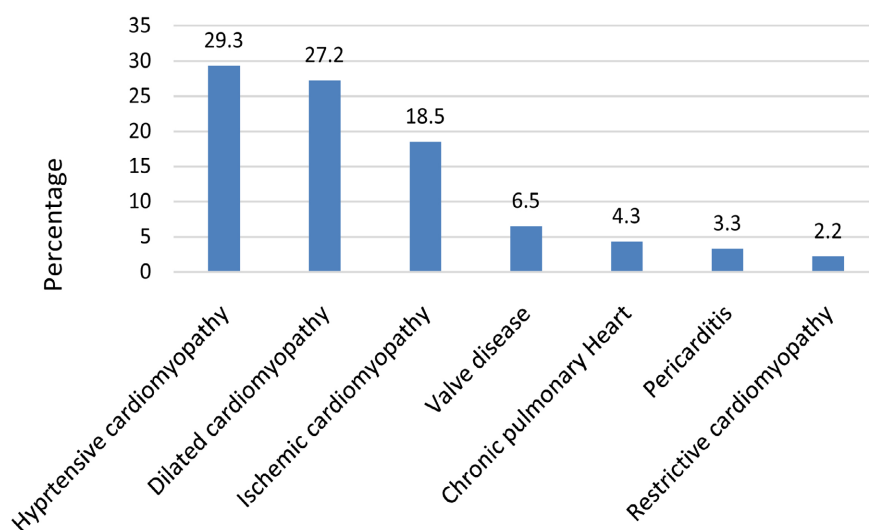


Figure 1. Distribution by etiology found on cardiac ultrasound.

Table 2. Predictive factors for the occurrence of CRS.

| | | Type of cardio-renal syndrome | | | | Total | P |
|----------------|-----------|-------------------------------|-------|-------|-------|--------|-------|
| | | I | II | III | IV | | |
| HBP | workforce | 36 | 24 | 3 | 6 | 69 | 0.022 |
| | % | 52.2% | 34.8% | 4.3% | 8.7% | 100.0% | |
| Diabetes | workforce | 10 | 12 | 2 | 2 | 26 | 0.044 |
| | % | 38.5% | 46.2% | 7.7% | 7.7% | 100.0% | |
| Cardiomyopathy | workforce | 15 | 4 | 1 | 0 | 20 | 0.37 |
| | % | 75.0% | 20.0% | 5.0% | 0% | 100.0% | |
| Renal failure | workforce | 3 | 7 | 1 | 1 | 12 | 0.048 |
| | % | 25.0% | 58.3% | 8.3% | 8.3% | 100.0% | |
| Tobacco | workforce | 6 | 2 | 0 | 0 | 8 | 0.736 |
| | % | 75.0% | 25.0% | 0% | 0% | 100.0% | |
| Alcohol | workforce | 4 | 1 | 1 | 0 | 6 | 0.392 |
| | % | 66.7% | 16.7% | 16.7% | 0% | 100.0% | |
| Obesity | workforce | 2 | 1 | 0 | 1 | 4 | 0.481 |
| | % | 50.0% | 25.0% | 0% | 25.0% | 100.0% | |
| Heart failure | workforce | 2 | 1 | 0 | 0 | 3 | 0.944 |
| | % | 66.7% | 33.3% | 0% | 0% | 100.0% | |
| Arrhythmia | workforce | 1 | 1 | 0 | 0 | 2 | 0.896 |
| | % | 50.0% | 50.0% | 0% | 0% | 100.0% | |
| Stroke | workforce | 4 | 1 | 0 | 0 | 5 | 0.796 |
| | % | 80.0% | 20.0% | 0% | 0% | 100.0% | |

Stage IV dyspnea ($p = 0.006$), the presence of cardiomegaly ($p = 0.047$) and pericarditis ($p = 0.021$) were factors of poor prognosis. The average cost of care was 149.466.77 CFA Francs.

On cardiac ultrasound, the average left ventricular ejection fraction was 45.79% (± 16.39), systolic left ventricular dysfunction was found in 53 cases (64.6%) and this was the most often from an average alteration of the left ventricle global systolic function (45.3%). Renal ultrasound found poor corticosteroid-medullary differentiation in half of the cases. The main etiologies found after cardiac ultrasound were hypertensive cardiomyopathies (29.3%), dilated cardiomyopathies (27.2%) and ischemic heart disease in 17 patients (18.5%). **Figure 1** shows the different etiologies found.

The majority of patients had type I CRS (60.9%) followed by type II one (28.3%) then type IV (6.5%).

The treatment was mainly based on diuretics (85.9%), ACE inhibitors (71.7%) and calcium channel blockers (33.7%). Peritoneal dialysis was performed in 11 patients (11.97%).

The outcome was favorable in most cases (50%) and the mortality rate was 28.3%.

High blood pressure, diabetes and kidney failure were significantly associated with the risk of developing CRS while the presence of cardiomyopathy or heart failure was not associated with the risk of an SCR's occurrence (**Table 2**).

4. Discussion

Little is known about the prevalence of CRS in Africa. In our study, it was 9.15%. Bodian [4], in Dakar, reports a lower prevalence of 3.7% while Millogo [5] found a prevalence of 10.93% close to ours. This prevalence is very probably underestimated because the study of Smith [2] reported, on a cohort of more than 80,000 patients with heart failure, proportions of 60% of patients with glomerular filtration rate (DFG) less than 90 ml/min. The actual prevalence should be accessed through multicenter and prospective multidisciplinary studies.

The American ADHERE registry reports a higher incidence in the elderly [6]. The average age of heart failure occurrence is 73.5 years in the West [7]. The average age in our study was 60.05 years (± 18.25) relatively younger than that reported in the Western series. This age difference is believed to be due to early and appropriate cardiovascular diseases treatment in economically advanced countries, while limited access to care reduces the capacity for early management of the cardiovascular risk factors in our regions. Hypertension is a real public health problem and is the leading cause of heart failure in adults in Africa [8].

High blood pressure affects the heart by promoting:

- Left ventricular hypertrophy (LVH) following increased LV work, an adaptive phenomenon, but deleterious by its consequences on systolic and diastolic function.
- Coronary atherosclerosis with reduced coronary reserve.
- Rhythm disturbances such as AF and ventricular arrhythmias favored by ventricular and atrial hypertrophy.

In fact, 75% of our patients were previously hypertensive and this tendency is

reported by all the authors [4] [5] [9]. Hypertension is a factor favoring the onset of CRS. Hypertension ($p = 0.022$), diabetes ($p = 0.044$) and renal failure ($p = 0.048$) were the risk factors favoring the occurrence of CRS in our patients with a statistically significant difference. This is in accordance with the results of Krzesinski [10] who often found very early in the history of these patients, three factors namely high blood pressure, diabetes mellitus and aging.

We find that global heart failure was the most frequent clinical presentation in our study. This is a usual form, as most authors have noted in sub-Saharan Africa [8] [11] [12]. The delay in consultation and the insufficiency or even the absence of means of support, could explain this development towards particularly severe forms.

Our study reports a high number of patients with end-stage renal disease with a glomerular filtration rate of less than 15 ml/min in 42.4% of our patients and this trend is probably reported by several authors [4] [5] [9] in connection with a delay in diagnosis and treatment. According to Volpe M [13], the cardiovascular risk is increased as soon as the renal function is slightly impaired, only less than 65 ml/minute.

Type I CRS was the most frequent in our study because half of our patients arrived in consultation with acute lung edema, probably related to the high proportion of cardiomyopathies in our study. In general, type I cardio-renal syndrome is the most common [14].

Type I CRS is characterized by acute impairment of cardiac function leading to acute renal dysfunction. The aetiologies classically accepted as being able to induce an acute deterioration of cardiac function in the context of type 1 CRS are as follows: decompensation in the context of underlying heart failure, acute coronary syndrome, cardiogenic shock and cardiac surgery.

The coexistence of impaired renal function and heart failure in adults is associated with a poor prognosis. Indeed, the aggravation or worsening of renal failure on admission to hospitalized patients for cardiac decompensation is correlated with a poor prognosis, an increase in the length of stay and an increase in mortality. The mortality rate was 28.3% in our study and it varied between 16.7% and 45.83% according to several studies [5] [15]. Geisberg C. [16] had shown that the association of heart failure and renal dysfunction was linked to a substantial increase in mortality in these patients.

The average cost of hospitalization was 149,466.77 CFA francs in our study and could constitute an obstacle to optimal care in our patients, most often from disadvantaged social backgrounds.

Rosamond's study [17] reported that currently heart failure affects 2.3% of the population, especially the elderly, with an annual cost of more than \$33 billion. The majority of costs arise during hospitalization.

The limitations of this work lie in the retrospective nature of the study with a certain amount of data that was unusable. However, carrying out prospective studies could give an idea of the real prevalence of CRS in our regions.

5. Conclusions

The combination of heart failure and kidney failure is frequent and often associated with significant mortality. Hypertension is the main risk factor for its occurrence.

Optimal care comes up against many difficulties in our regions. The prevention of the factors favoring its occurrence could make it possible to reduce its incidence.

Authors' Contribution

All the authors contributed to the conduct of this work. All authors have read and approved the latest version of this manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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