

Cardio-Renal Syndrome in N'Djamena-Chad

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Abstract

Introduction: The Cardio-Renal Syndrome (CRS) is a pathological entity affecting the heart and kidneys during which, the acute or chronic dysfunction of one of these organs induces an acute or chronic dysfunction of the other. Its incidence in Africa, and especially in Chad, is not well known. The aim of this study was to contribute to the improvement of the management of CRS.

Methods: We conducted a cross-sectional study including all patients aged over 18 years, hospitalized for cardiac and renal diseases between December 2018 and August 2019 in the cardiology department of the University Hospital Center la Reference National and the nephrology department of the University Hospital Center la Renaissance.

Results: Sixty-Three patients were selected for the study, representing a frequency of 25%. The average age was 58.5 ± 14.9 years. There was a male predominance with a sex ratio of 1.5. The main reasons for consultation were dyspnea (71.4%) and chest pain (38.1%). Chronic renal failure was found in 52.3% and the mean Glomerular Filtration Rate was 19.6 ml/min/m² + -18.1 ml/min/m². Electrical abnormalities were represented by repolarization disorders (60.33%), and cardiac Doppler ultrasound found left atrial dilatation in 68.3% and left ventricular dilatation in 58.7% of cases. The most predominant type of CRS was type 1 (29%) followed by type 5 (29%). The main etiologies were hypertensive cardiomyopathy (15.9%) and ischemic heart disease (12.7%). Mortality was 22.2%.

Conclusion: CRS is a real pathological entity constituting a turning point in the evolution of any heart disease and nephropathy. Its frequency and mortality in hospital is high.

Keywords: Cardio-renal syndrome • Frequency • CHU-RN • Ndjamaena • Chad

Introduction

The maintenance of blood volume, vascular tone and hemodynamic stability depends on a set of pruning interactions between the heart and kidneys [1,2]. In recent times, a new syndrome of interaction between these two organs called cardio-renal has been defined and classified into five types like the Pneumo-Renal and hepatorenal syndrome, based on a pathophysiological and chronological rationale [1,3]. It is a complex pathophysiological entity affecting the heart and kidneys in which acute or chronic dysfunction of one of the organs can induce acute or chronic dysfunction of the other organ [1,4-7].

Numerous epidemiological studies have shown that patients with acute or chronic Heart Failure (HF) develop secondary Renal Failure (RF) and vice

versa [1,8]. However, in Africa and in Chad in particular, the incidence of cardio-renal syndrome is not well known. The aim of this study was to describe the epidemiological and clinical characteristics of cardio-renal syndrome in order to improve its management in Ndjamaena-Chad.

Methods

We conducted a descriptive cross-sectional study, spread over a period of 09 months (December 2018 and August 2019), including all patients aged over 18 years, with associated CI and IR, hospitalized during the study period at the CHURN Cardiology and CHUR Nephrology departments. Not included in our study were all patients on chronic hemodialysis. Renal failure was defined by the alteration of renal function, expressed by a decrease in diuresis and/or Glomerular Filtration Rate. And Cardiac Failure was defined as impaired cardiac function expressed as right, left, or congestive heart failure syndrome. Data were entered into Excel 2013 and analyzed by SPSS (Statistical Package for Social Sciences 18.0) software. The Student's t-test version 18.0 was used to compare two means. The threshold of statistical significance was p<0.05.

Results

Our study had included 63 patients. The hospital incidence of CRS was 25% with a male predominance (sex ratio 1:5). The mean age was 58.5 years ± 14.9 years and the most represented age group was 61 years and over with 49.2% of cases.

The average consultation time was 26.5 days ± 48.3 days and the main reasons for consultation were dyspnea and chest pain in 71,4% and 38.1% of cases respectively. The most representative cardiovascular risk factors were hypertension and age, respectively in 82.53% and 34.9%.

The antecedents were represented by polyblood transfusion with 4.8% of cases and herbal medicine in 3.2% of cases.

Clinical signs on admission were marked by congestive heart failure, diastolic hypertension, and systolic hypertension in 71.4%, 68.3%, and 60.3% of cases, respectively. The most common Electrocardiographic abnormalities found were repolarization disorders, Left Ventricular Hypertrophy (LVH), and Advisory Group on Hepatitis (AGH) in 60.33%, 58.7%, and 30.2% of cases, respectively (Table 1). Echocardiographic abnormalities were represented by left atrial dilatation, left ventricular dilatation, and global Hypokinesia in 68.3%, 58.7%, and 58.7%, respectively. LV relaxation disorders were found in 16 patients (25.4%).

Table 1. Distribution of patients by electrocardiographic abnormalities.

Electrical abnormalities	n	%
Hypertrophy		
LVH	37	58,7
Left Atrial Hypertrophy	19	30,2
Right Atrial hypertrophy	5,0	7,9
Repolarization disorder	38	60,3
Rhythm disorder	9,0	14,3
ACFA	4,0	6,3
Atrial extrasystoles	1,0	1,6
Ventricular extrasystole	4,0	6,3
Conduction disorder	13	20,6
Complete atrioventricular block	2,0	3,2
Complete left bundle branch block	7,0	11,1
Left anterior hemiblock	4,0	6,3

Renal ultrasound had shown decreased renal size in 25 patients or 39.7 % of cases and the Cortico-Medullary appearance was dedifferentiated in 50.8% of cases.

Biologically, the mean creatinine level was 53.3 mg/l \pm 58.7 mg/l with a mean GFR of 28.35 ml/min/m² \pm 20.00 ml/min/m², hypocalcemia was observed in 71 % of cases, hyperphosphatemia in 56 % of cases and, hyperuricemia in 84 % of cases. The mean hemoglobin level was 11.052 g/dl \pm 2.66 g/dl and anemia was observed in 52,2% of cases.

Of the 63 patients, 47.6% had acute renal injury and 52.4% had chronic renal injury. Chronic heart failure was found in 52.4% of the study population versus 47.6 % of acute CI. The most predominant types of CRS were type 1 followed by type 5 in 29% and 25% of cases, respectively. The etiologies of CRS (Table 2), overall were represented by hypertensive heart disease, severe hypertension, and ischemic heart disease in 15.9%, 14.3%, and 12.7% of cases, respectively.

Table 2. Distribution of patients according to CRS etiologies.

Etiologies	Types of CRS				
	1	2	3	4	5
Ischemic heart disease	44,4 %	-	-	-	-
Hypertensive heart disease	22,2 %	5%0	-	-	-
Valvulopathy	16,6 %	33,3 %	-	-	-
Dilated Cardio Myopathy	16,6 %	8,3 %	-	-	-
Hypertensive nephropathy	-	-	-	28,54 %	-
Cirrhosis	-	-	-	-	6,2 %
Chronic Glomerulonephritis	-	-	-	7,14 %	-
Nephrotic Syndrome	-	-	33,3 %	-	-
Acute Tubular Necrosis	-	-	33,3 %	-	-
Polycystic Kidney Disease	-	-	-	7,14 %	-
Decoction intake	-	-	33,3 %	-	-
Severe hypertension	-	-	-	-	56,2 %
Diabetes	-	-	-	-	18,7 %
Human Immunodeficiency Virus	-	-	-	-	6,2 %
Sepsis	-	-	-	-	6,2 %
Systemic Lupus Erythematosus	-	-	-	-	6,25 %
Indeterminate	-	8,33 %	-	57,1 %	-

The most used therapeutic classes were diuretics and Angiotensin-Converting Enzyme (ACE) inhibitors with 87.3% and 65.1%, respectively. The use of hemodialysis and blood transfusion were observed equally in 11.1% of cases.

Evolution was favorable in 74.6 % of cases, two (02) patients were discharged against medical advice and 14 died or 22.2% of cases whose death were dominated by PAO, metabolic disorders followed by shock states in 42.85%; 21.42% and 14.28% of cases respectively (Table 3).

Table 3. Distribution of patients by causes of death.

Causes of Death	n	%
Hemodynamics		
Acute Pulmonary Edema	6	42,8
Shock	2	14,2
Metabolic	3	21,4
Conduction disorder	1	7,1
Major Hemorrhage	1	7,1
Rhythm Disorder		
Atrial Fibrillation	1	7,1

Discussion

The prevalence of CRS is around 25% in our series. This prevalence is high compared to that obtained by Malick Bodian et al in 2017 in Dakar (Senegal) who found a frequency of 3.7% [9]. This difference can be explained by the size of our sample, the diversity of the services in which our study was carried out and also by the character of collection in consecutive series of our study. In addition, this high prevalence of cardiorenal syndrome in our country could also be explained by the poor access to specialized care, particularly cardiological and nephrological. The limited access to cardiological and nephrological consultations would favor the delay of the management of cardiac and renal pathologies and could also accelerate the occurrence of complications followed by a conjugal, renal and cardiac damage. On the other hand, our frequency is very low compared to that reported by the American ADHERE registry and the OFICA registry, which respectively reported a frequency of 65% and 67% [10,11].

This difference can be explained by the meta-analytical character of these studies and the level of technical facilities in terms of diagnostic means.

The mean age of the patients was 58.5 years \pm 14.9 years with extremes of 22 years and 85 years and the most represented age group was 61 years and over (49.2%). These results are similar to most of the results obtained in African studies conducted on renal failure and heart failure [12,13]. On the other hand, our result is different from that of Fabbian et al in 2011 in Ferrara (Italy) who found a mean age of 80 years \pm 8 years, this difference would be explained on the one hand by the high levels of the Italian health system compared to that of Sub-Saharan Africa, and on the other hand by the Italian demography which is predominantly aging [14].

The sex ratio in our series was 1.5. This result is similar to that of Malick Bodian et al in 2017 in Dakar (Senegal) and Kuwahara et al in Saitama (Japan) in 2016 who reported respectively 1.7 and 1.96 sex ratio in favor of men [9,15]. These results reinforce the description observed in the literature explaining that male sex is part of the non-modifiable cardiovascular risk factors thus predisposing to cardiovascular diseases [16].

In our series, dyspnea was the most frequent reason for consultation with a frequency of 71.4%, a result similar to that of Yao. K et al in Abidjan (Ivory Coast) in 2013 who had also found dyspnea as the most predominant reason for consultation with a frequency of 74,3% [17]. This could be explained by the fact that most patients consult at a very late stage of their disease, during the onset of respiratory discomfort.

The main cardiovascular risk factor identified was hypertension with 82.53% (n= 52) of cases, of which 21.15% were incidental findings. This result is significantly higher than that of Noubaisse A.S in N'Djamena (Chad) in 2017 and that of Somnoma J. B Tougouma et al in 2018 in Ouagadougou (Burkina Faso) who had found respectively 63% and 67.9% [12,17]. This difference between the results would be explained by the galloping emergence of HTA worldwide. These results reinforce the description observed in the literature [16].

The clinical signs were dominated by the picture of congestive heart failure in 71% of cases, this is a similar result with that of Yao. K et al in Abidjan (Ivory Coast) in 2013 [17]. These clinical pictures reflect an advanced evolution of the disease in testimony of the long consultation time. The use of traditional treatment, geographical and financial inaccessibility of our health structures could also partly explain this finding.

The most common echocardiographic abnormalities were left cavitory dilations and parietal hypertrophies. This finding can be explained by the impact of hypertension on the heart. Hypertension is a major risk factor for atheroma and therefore for heart disease responsible for an increase in afterload leading to left ventricular hypertrophy, which initially leads to abnormalities in diastolic function and subsequently to an increase in afterload leading eventually to congestive dilated hypertensive heart disease with LV systolic dysfunction, resulting in fluid retention [16].

The mean Glomerular Filtration Rate (GFR) was 28.35 ml/min/m². This could be partly explained by the fact that most of our patients were admitted after acute decompensation with advanced stage of their diseases.

The most predominant type of CRS in our study series was type 1 CRS (29%), this result is similar with that of Muhammad Nazir et al in 2014 in Kano, Nigeria. However, it differs from that found by Malick Bodian et al in 2017 in Dakar (Senegal) who described type 2 as the most predominant with a prevalence of 97.22% [18]. However we did not find an explanation for this difference.

The etiologies were dominated by hypertensive heart disease. This finding was made by Malick Bodian et al in 2017 in Dakar (Senegal). This main etiology found by our study justifies the high prevalence and the real cardiac repercussion of hypertension in our country and also confirms the main death table.

Therapeutically, the most used therapeutic classes were diuretics with a frequency of 87.3%. The same observation was made by Malick Bodian et al. This high use of diuretics during the treatment of cardio-renal syndrome is in agreement with the recommendations of learned societies on the management of cardio-renal syndrome in a global manner [7].

The mortality was 22.2% (n=14). This high mortality of the cardio-renal syndrome in our context could be explained by the admission of patients at an advanced stage of their disease, the lack of access to specialized care and the inadequacy of the technical platform. This mortality occurred in a very significant way in the course of the cardio-renal syndrome of type 4 compared to the other types (p=0,001).

This result is consistent with the literature showing that a patient with chronic renal failure has a higher risk of dying from cardiovascular disease, as cardiovascular events are twice as frequent if the eGFR is between 45 ml/min and 30 ml/min, and 2.8 times more frequent if the eGFR is between 30 ml/min and 15 ml/min [7].

Conclusion

The cardio-renal syndrome is a real pathological entity, deriving from two major public health problems; renal failure and heart failure. It affects a relatively young and male population in our environment with a prevalence of 25%. It is clinically characterized by a predominance of dyspnea followed by chest pain then by hypertension followed by diabetes in terms of comorbidity. Our study also allowed us to highlight that the most predominant CRS in our environment is type 1, hypertensive cardiopathy as the most predominant etiology and diuretics are the most used therapeutic class in its management. Its mortality is 22.2%, occurring mainly in the setting of PAO and quite significant during type 4 cardio-renal syndrome. Multicenter studies are needed.

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