

Research Article

Prevalence of Hyponatremia Amongst Patients with Heart Failure in Two Sub-Saharan Hospitals: Cross-sectional Study

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Abstract

Background: Hyponatremia is a very frequent abnormality amongst patients with Heart failure (HF) and significantly increases the morbidity and length of hospital stays amongst these patients. There is limited data on the epidemiology of this condition in sub-Saharan countries like Cameroon. This study therefore seeks to estimate the prevalence of hyponatremia amongst patients admitted for HF in 2 university hospitals in Cameroon. **Methods:** A hospital-based retrospective cross-sectional study was conducted in two University Hospital in Yaounde; Cameroon on patient files of patients admitted for HF from January 2021 to January 2022. A total of 107 participants were included using exhaustive sampling. Data were obtained from the patients' medical records and analyzed using SPSS version 23.0. Frequencies were expressed as percentage (%) and continuous variables were presented as mean $\pm$ standard deviation. Comparison of categorical variables was done using the Chi-square tests. **Results:** A total of 184 patients were admitted for HF decompensations in the study period. Of these, 132 files were available but only 107 patient files met inclusion criteria. The female sex predominated in this study (55.1%) with a sex ratio (M/F) of 0.77. The majority of patients in this study were elderly patients with a mean age of 61.3 ± 17.1 years and the age range of 70 years and above being the most frequent (31.8%). The prevalence of hyponatremia in this study was 32.7% dominated by mild hyponatremia (22.4%) followed by moderate (5.6%) and severe (2.8%) hyponatremia. The mean serum sodium level was 36.98 ± 5.24 mEq/l with extreme values of 122.0mEq/l and 148mEq/l. More than half of the participants in this study had a previous diagnosis of hypertension (53.3%) while 16.3% had diabetes mellitus. The most common etiologies for HF in our study were hypertensive cardiopathy (43.9%) and dilated cardiopathies (32.7%). Ischemic cardiopathies made up only 9.3% of etiologies in this study. 64.5% of participants were classified as NYHA class IV on admission. The predominant clinical manifestations at admission were dyspnea (92.5%) followed by pedal edema (76.6%) and pulmonary congestion (54.2%). One tenth of patients presented in a state of cardiogenic shock (10.3%). 45.8% of participants presented an anemia on complete blood count (Hb<12g/dl) while 38.3% had renal dysfunction (eGFR<60ml/min/1.73m²). **Conclusion:** Hyponatremia is very frequent amongst patients admitted for HF affecting about a third of patients. Despite this high prevalence, the vast

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majority of cases are mild with very few patients presenting with severe hyponatremia.

Keywords

Hyponatremia, Heart Failure, Subsaharan

1. Background

Hyponatremia is the most common electrolyte disorder in clinical practice [1]. In Europe, a multicentric study in France reported a prevalence of 12.1% in internal medicine units [2] while an African study from Ghana found prevalences of 27.6% [3]. The most frequent mechanism leading to this ion derangement is by dilution from excessive free water retention in conditions like HF and SIADH release [4].

Patients with HF have a higher frequency of hyponatremia compared to the general population due to factors like diuretic use, ineffective blood volume with increased ADH release and renal dysfunction [5]. This condition significantly increases mortality, duration of admissions and readmission rates amongst patients with HF [6].

Hyponatremia in HF has been significantly studied but there are limited studies from Cameroon like other similar African countries. In this cross-sectional study, we therefore aimed to determine the prevalence of hyponatremia amongst patients admitted for HF decompensation in two university hospitals in Cameroon.

2. Methodology

This retrospective cross-sectional study was carried out in two University hospitals; the Yaoundé General Hospital (YGH) and the Yaoundé Central Hospital (YCH) on patients 18 years and above admitted for HF decompensations in the period from January 2021 to January 2022. We included all consecutive patients admitted to these services who did a serum electrolyte level at admission or during admission. We excluded patients with a diagnosis of chronic kidney disease and chronic liver disease with fluid retention.

Following ethical clearance from the ethical committee of the Faculty of Medicines and Biomedical Sciences of the University of Yaoundé 1 and administrative authorizations from the administration of the YGH and YCH, we proceeded to collect data with the use of a questionnaire. We collected socio demographic, clinical and paraclinical data from patient files as well as information about treatments and evolution of patients. Hyponatremia was defined as serum sodium concentration $< 135\text{mEq/l}$ while mild, moderate and severe hyponatremia were defined as serum sodium levels from $130 - 134.9\text{mEq/l}$, $125 - 129.9\text{mEq/l}$ and $< 125\text{mEq/l}$ respectively.

Statistical Package for Social Sciences (SPSS) version 23.0

was used for data analysis. Frequencies were expressed as percentage (%) and continuous variables were presented as mean $\pm$ standard deviation. Comparison of categorical variables was done using the Chi-square test.

3. Results

3.1. Sociodemographic Characteristics

A total of 184 patients were admitted for HF decompensations in the study period. Of these, 132 files were available but only 107 patient files met inclusion criteria.

The female sex predominated in this study (55.1%) with a sex ratio (M/F) of 0.77. The majority of patients in this study were elderly patients with a mean age of 61.3 ± 17.1 years and the age range of 70 years and above being the most frequent (31.8%). (See Table 1).

Table 1. Sociodemographic Characteristics of study population; ($N = 107$).

Variables	Total	%
Age Ranges (Years)		
[20-30]	6	5,6
[30-40]	7	6,5
[40-50]	13	12,1
[50-60]	18	16,8
[60-70]	29	27,1
≥ 70	34	31,8
Sex		
Male	48	44,9
Female	59	55,1

3.2. Prevalence of Hyponatremia

The prevalence of hyponatremia in this study was 32.7% dominated by mild hyponatremia (22.4%) followed by moderate (5.6%) and severe (2.8%) hyponatremia. The mean

serum sodium level was 36.98 ± 5.24 mEq/l with extreme values of 122.0mEq/l and 148mEq/l.

The majority of participants had a previous diagnosis of HF (55.1%). The most common treatment before admission were loop diuretics (29,9%); angiotensin receptor blockers (28,0%) and beta blockers (20,6%).

3.3. Comorbidities

More than half of the participants in this study had a previous diagnosis of hypertension (53.3%) while 16.3% had diabetes mellitus. Up to 43.9% of participants had no previously recognized comorbidity. (See Table 2).

Table 2. Distribution of Comorbidities in the study Population (N=107).

Comorbidities	Total	%
No comorbidity	47	43,9
Hypertension	57	53,3
Diabetes	18	16,3
HIV	1	0,9

HIV: Human Immunodeficiency virus.

3.4. Etiologies of HF

The most common etiologies for HF in our study were hypertensive cardiopathy (43.9%) and dilated cardiopathies (32.7%). Ischemic cardiopathies made up only 9.3% of etiologies in this study. (Table 3).

Table 3. Distribution of Etiologies of HF in the Study Population (N=107).

Etiologies of HF	Total	%
Hypertensive Cardiopathy	47	43,9
Dilated Cardiopathy	35	32,7
Arrhythmogenic Cardiopathy	26	24,3
Valvulopathies	15	14,0
Ischemic Cardiopathy	10	9,3
Idiopathic Cardiopathy	3	2,8
Rheumatic Heart Disease	2	1,9
Cor pulmonale	2	1,9

HF: Heart Failure

3.5. Clinical and Paraclinical Presentation of Participants

64.5% of participants were classified as NYHA class IV on admission. The predominant clinical manifestations at admission were dyspnea (92.5%) followed by pedal edema (76.6%) and pulmonary congestion (54.2%). One tenth of patients presented in a state of cardiogenic shock (10.3%).

45.8% of participants presented an anemia on complete blood count (Hb<12g/dl) while 38.3% had renal dysfunction (eGFR<60ml/min/1.73m²). ECG abnormalities were seen in 89.7% of participants including AF (21.5%) and LVH (35.5%). Chest x rays showed abnormalities in more than half of participants; cardiomegaly in 61.7% of participants and pulmonary congestion in 54.2%. 57,9% of participants had heart failure with a reduced left ventricular ejection fraction (<40%), 16.8% had a moderately reduced ejection fraction (40-50) while 25.2% has a conserved function. (Table 4).

Table 4. Clinical and paraclinical Characteristics of patients admitted for HF in two hospitals in Yaounde.

Variables	Total	%
BP Values		
Normal	64	59,8
HTN grade I	19	17,8
HTN grade II	15	14,0
HTN grade III	9	8,4
Signs of HF		
Signs of RHF	105	98,1
Signs of LHF	101	94,4
NYHA Classification of HF		
Stage II	3	2,8
Stage III	35	32,7
Stage IV	69	64,5
LVEF (%)		
Conserved (≥ 50)	27	25,2
Moderately Reduced [40-50]	18	16,8
Reduced (< 40)	62	57,9

4. Discussion

In this our study from Cameroon, we found a prevalence of 32.7% for hyponatremia amongst patients admitted for HF. This prevalence is comparable to the prevalence reported by a prospective cohort study from Ethiopia which reported a 28.9% prevalence [7]. Similarly, our results were close to those re-

ported by the Outcome of a Prospective Trial of Intravenous Milrinone for Exacerbation of Chronic HF-OPTIME-CHF study (27%) [8] and the Evaluation Study of Congestive Heart Failure and Pulmonary Catheter Effectiveness-ESCAPE study (23.8%) [9].

On the other hand, a Spanish prospective cohort which recruited 973 patients registered a prevalence of 15.11% which was much lower than the prevalence from our current study [10]. A meta-analysis on the subject by Zhao et al including 25 articles and a total of 43316 patients showed a highly variable prevalence of hyponatremia across the study populations (5-50%) [11]. Another large study; the JCARE-CARD registry which studied 1677 patients hospitalized for worsening heart failure recorded a prevalence of hyponatremia in their population of 10.6% [12] which was considerably lower than in this current study. The diverse demographics, disparities in access to health care and varying compliance to treatment measures could explain the variable prevalence of hyponatremia in this population.

The most common comorbidities in our study were hypertension and diabetes mellitus which is consistent with other studies and with the idea that these are the major cardiovascular risk factors. Hypertensive cardiopathy was the most frequent Etiology of HF in our study followed by dilated cardiopathy and is consistent with reports from meta-analysis of other sub-Saharan African studies [13]. This is however different from European and American studies which report ischemic heart disease as the most common etiologies [14].

Limitations

As a retrospective study, the quality of our clinical and paraclinical data is dependent on the quality of data recorded in the files which varies between clinicians. A prospective study would be necessary to validate these results. Secondly, the serum sodium levels were measured by two different laboratories with different machines and calibrations which could potentially introduce variabilities. Finally, the absence of up to 52 files reducing our sample from 184 to 132 may have affected the robustness of our conclusion.

5. Conclusion

Hyponatremia is very frequent amongst patients admitted for HF affecting about a third of patients. Despite this high prevalence, the vast majority of cases are mild with very few patients presenting with severe hyponatremia. Our study highlighted the fact that hyponatremia in heart failure remained underestimated. Indeed, if the serum electrolytes were systematically checked, no further assessments nor any specific management were displayed.

Abbreviations

CHF Chronic Heart Failure

eGFR	Estimated Golomerular Filtration Rate
F	Female
HF	Heart Failure
Hb	Haemoglobin
LVH	Left Ventricle Hypertrophy
M	Male
mEq/l	Milliequivalent/Liter
NYHA	New York Heart Association
SIADH	Syndrome of Inappropriate Antidiuretic Secretion Hormone
SPSS	Statistical Package for Social Sciences
YCH	Yaound éCentral Hospital
YGH	Yaound éGeneral Hospital

Conflicts of Interest

The authors declare no conflicts of interest.

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