

Epidemiologic Transition and Heart Failure in Black African Adults

Djinguin Ben Justin Koffi^{1,2,3*}, Loa Ambroise Gnaba^{3,4}, Iklo Coulibaly^{1,3}, Bamba Kamagaté^{1,3}, Jean Baptiste Anzouan-Kacou^{1,3}

¹Félix Houphouët Boigny University, Abidjan, Côte d'Ivoire

²National Police Hospital, Abidjan, Côte d'Ivoire

³Institute of Cardiology, Abidjan, Côte d'Ivoire

⁴Alassane Ouattara University, Bouake, Côte d'Ivoire

Email: *koffidjinguin@yahoo.fr

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Abstract

The objective of this study is to report clinical, electrocardiographic, and echocardiographic data on heart failure for the evaluation of its cardiovascular risk factors and causes at the Institute of Cardiology of Abidjan and the National Police Hospital. **Patients and Methods:** The 12-month prospective study included 989 patients who were diagnosed with heart failure at the Institute of Cardiology of Abidjan and the Heart Department of the National Police Hospital in Côte d'Ivoire. **Results:** The mean age of the patients was 55 ± 12 years. Patients ≤ 50 years, aged 50 and 70 years, and ≥ 70 years were 42%, 60%, and 18%, respectively. The major cardiovascular risk factors were high blood pressure (60%), smoking (19%), type 2 diabetes (11%), and hypercholesterolemia (8%). The status of 11% of HIV positive patients were ignored upon admission to the Heart Hospitals. Severe kidney failure (25%) was found in all hypertensive patients. Atrial fibrillation patients and sinus rhythm subjects were 20% and 80%, respectively. The average duration of QRS was 102 ± 24 ms. 20% of patients had a complete left bundle branch block. The mean of the left ventricular ejection fraction (LVEF) was $35.8\% \pm 13\%$. The LVEF was $\leq 45\%$ in 57% of cases and $\leq 30\%$ in 30% of cases. The identified causes of heart failure were ischemic heart disease (60%), hypertensive heart disease (20%), and rheumatic valvulopathy (12%). Among the patients with ischemic heart disease, 80% were infarction. The coronarography and the myocardial revascularization were performed in 50% of cases. The primitive cardiomyopathy was diagnosed in 15% of cases. The average follow-up was 12.6 ± 8 months. 18% of patients died, 14% of whom deceased within 1 year after the initial diagnosis and 5% of death occurred in 19 months following the first symptoms of heart failure. The end stage of heart failure (13%) was the most

frequent cause of death followed by the sudden death (5%) and the terminal kidney failure (2%). The patients were rehospitalized for heart failure (28 cases) and for ischemic stroke during the follow-up. The functional New York Heart Association score of patients was II in 39%, III in 43%, and IV in 18% at 1 month after admission. **Conclusion:** The heart failure is a major public health issue in Côte d'Ivoire as in many other African countries. The prevalence of ischemic heart disease as the leading cause of heart failure is certainly the reflection of the epidemiologic transition and the advent of the coronarography in the technical platform of the Abidjan Institute of Cardiology. The rapid evolution of the epidemiologic pattern of the heart failure in association with the increasing frequency of cardiovascular risk factors should contribute to implement study and prevention strategies against cardiovascular diseases in Côte d'Ivoire and in Africa.

Keywords

Epidemiologic Transition, Heart Failure, Institute of Cardiology of Abidjan, National Police Hospital, Black African

1. Introduction

The epidemiological transition is a process by which the change in the management of infants, children, and adults due to the immunization leads to the reduction of the infant mortality and the increase of people reaching adulthood and old age. It is responsible for the decline of transmissible diseases due to better access to primary health care and lower overall mortality [1] [2]. The passage of the rural population to the urbanization will cause changes in the environment and in the behaviour because of excessive consumption of fats, physical inactivity, smoking, high-calorie and high-sodium foods, sympathetic hyperactivity, psycho-social stress, and weak prevention [3]. These urban populations are exposed to high blood pressure, greater weight gain, increase in heart rate, stronger urinary excretion of sodium, hyperglycemia, and hypercholesterolemia [4] [5]. The long-term effect of all these modifiable cardiovascular risk factors associated with unmodifiable risk factors (age and heredity) results in heart failure (HF) [6].

The heart failure is a frequent disease in the adult population in Africa. Diagnostic and management of this disease require specific heart investigations and treatments that are often inaccessible in the developing countries [7] [8].

The non ischemic heart diseases, including hypertensive, valvular, rheumatic heart disease are the leading cause of HF in Africa [9]. Other HF causes, such as endomyocardial fibroses, are unique to some African regions [10].

The purpose of this study was to determine the cardiovascular risk factors and the causes of HF and to evaluate the prognosis of the patients with HF at the Institute of Cardiology of Abidjan (ICA) and the National Police Hospital (NPH).

2. Patients and Methods

That was a prospective study conducted from January 2016 to December 2016 at the Institute of Cardiology of Abidjan and the Cardiology Department of the National Police Hospital in Côte d'Ivoire. This study included 989 patients who presented HF.

➤ Diagnostic and study parameters

The diagnostic of HF was established according to the Framingham criteria and to usual paraclinical signs, including the analysis of the electrocardiogram (ECG), chest x-ray, and echocardiography [11] [12] [13]. The dosage of the brain natriuretic peptide was tested for diagnosis and follow-up. Sex, age, clinical tolerance of the New York Heart Association (NYHA) score or grading were collected. Cardiovascular risk factors, such as smoking, type 2 diabetes, high blood pressure, and hypercholesterolemia were studied. Severe kidney impairment was retained when creatinine clearance was less than 30 ml/min. The virus of human immunodeficiency (HIV) testing (miniVidas 2 ELISA test) was carried out in all patients. The population of study underwent a resting ECG and a follow-up test (an exercise ECG). Echocardiography was done in all patients according to the recommendations for HF care [12] [14]. Left ventricular ejection fraction (LVEF) was evaluated by ultrasound at least once during the hospitalization and at least once per year over the follow-up.

➤ Etiologic research

The diagnosis of ischemic heart disease was made when the patient had either a medical background of typical angina or of myocardial infarction. Data from resting or exercise ECG and echocardiography with respect to the medical history of myocardial infarction or evolution of myocardial ischemia were considered for diagnosis of ischemic heart disease. The coronarography was performed in some patients. The diagnosis of hypertensive heart disease was made on the basis of a long-lasting medical history of high blood pressure with or without the use of long-term anti-hypertensive drugs associated with left ventricular hypertrophy [12]. Valvular heart disease was diagnosed with respect to echocardiography data regardless to rheumatic or degenerative causes. Echocardiography findings consisted of left ventricular dilatation (telediastolic diameter > 55 mm) or biventricular dilatation and systolic dysfunction without previously mentioned causes confirmed the diagnosis of primitive cardiomyopathy [9] [12].

➤ Follow-up of patients

The patients were treated according to the current recommendations [12]. The evolution data were collected either by a consultation within 3 months after the first hospitalization and then regularly in cases where it was possible or by new hospitalizations. The patients or their family were contacted at the end of the data collection. The causes of death were reported.

3. Statistical Analysis

Data were collected in an Excel database from Windows 8 (Microsoft Corpora-

tion, Redmond, WA, USA). Data were expressed as means with standard deviation. Discrete variables were expressed in percentages. The t-test and Chi-Square Test were used to compare quantitative variables and qualitative variables, respectively. A p-value ≥ 0.05 was not considered statistically significant (NS). Patients were compared according to NYHA score or grading, duration of QRS interval ($>$ or $<$ 120 ms), LVEF (LVEF thresholds: $>$ or $<$ 30% and $>$ or $<$ 45%), and the follow-up (death or survival).

4. Results

During the 12-month study, 989 patients were hospitalized at the Department of Medicine of the ICA and the NPH. The mean age was 55 ± 12 years (extremes: 25 - 73 years). Patients under 50 years, between 50 and 70 years, and ≥ 70 years were 42%, 60%, and 18%, respectively. Cardiovascular risk factors were high blood pressure (60%), tobacco (19%), type 2 diabetes (11%), and hypercholesterolemia (8%). HIV positive patients, ignored upon admission, were 11% of cases. Severe kidney failure with 25% was observed in all hypertensive patients. Patients with atrial fibrillation were 20% compared to 80% of sinus rhythm patients. The average duration of QRS was 102 ± 24 ms. Patients with complete left branch block were 20%. The mean of LVEF was $35.8\% \pm 13\%$. **The LVEF was $\leq 45\%$ in 57% of cases while 30% of patients had LVEF $\leq 30\%$.** Ischemic heart disease (60%) is the most frequent cause of HF followed by hypertensive heart disease (20%) and rheumatic valvulopathy (12%). Among the ischemic heart disease patients, 80% had a myocardial infarction. 50% of patients with ischemic heart disease underwent a coronarography and a myocardial revascularization. Primitive cardiomyopathy patients were 15% with normal coronarography.

Over the follow-up (average: 12.6 ± 8 months), 18% of patients died, 14% of whom died within 1 year after the initial diagnosis and 5% occurred in 19 months after the first symptoms of HF (**Table 1**). Sudden death (5%), end stage HF (13%), and end stage kidney failure (2%) were the major causes of death of the study population. 28% of the patients were rehospitalized for HF while 5% of subjects presented an ischemic stroke over their follow-up. Regarding to the NYHA grading, 39% of patients were Class II; 43% were Class III; and 18% were Class IV at 1 month later after their admission to ICA.

No significant differences were observed between the deceased patients and the surviving individuals regarding to gender, age, risk factors or HF causes except the frequency of primitive dilated cardiomyopathy ($p < 0.02$). The change in LVEF was independent risk factor of mortality over the 12-month study. The NYHA score was strongly linked to the mortality with higher proportion of Classes II, III, and IV in deceased patients ($p = 0.03$).

60% of patients with LVEF $> 30\%$ suffered commonly from hypertensive heart disease ($p < 0.05$). Ischemic heart disease patients were younger (48 versus 56 years, $p = 0.01$) and were frequently diagnosed with diabetes ($p < 0.021$). They had a low average of LVEF which was not significantly different from that of

Table 1. Comparison of deceased patients with surviving patients in a cohort of 135 symptomatic HF patients at ICA and NPH.

	Surviving patients (n = 111)	Deceased patients (n = 24)	p
Men	93 (83%)	21 (87%)	NS
Mean age	56 ± 10 years	55 ± 9 years	NS
Mean of LVEF	39.2 ± 13%	39.1 ± 12%	NS
NYHA grading			
II	57	3	0.03
III	42	12	
IV	12	9	
	Risk factors		
Smoking	60	12	NS
Type 2 diabetes	51	12	
High blood pression	78	15	
Dyslipidemia	57	12	
	Identified causes		
Coronary disease	75	9	NS
Valvular heart disease	15	3	NS
Hypertensive heart disease	18	6	NS
Dilated cardiomyopathy	3	6	0.02

NS: Non significant.

other patients ($p = 0.065$). Diabetic patients were older than non diabetic subjects (average: 60 versus 50 years, $p = 0.001$). Ischemic heart disease ($p < 0.002$) and hypertensive heart disease ($p < 0.0002$) are predominant in individuals with diabetes.

5. Discussion

➤ Study population

This manuscript describes the first study done at the ICA and PNH regarding to medical care of HF in the era of the epidemiologic change. The lifestyle changes related to the development of Côte d'Ivoire, particularly of Abidjan give rise to the evolution or the transition of the epidemiological profile. In this bicentric study, HF accounted for 60% - 65% of patients. In Western countries, HF represents 1% - 2% of the overall population; however, it is of 10% in people over 70 years. The patients of our study were 10 years younger than those of Western countries, where the average age varies 65 - 70 years. The average age of 55 years corroborates with that of other African studies. In sub-Saharan Africa, the mean age of HF patients reported by Thesus-HF was 52 years [6]. An average age of 55 years was found in the cohort study of 844 subjects with HF in Soweto [15]. A Saoudian series recorded 60 years as means age in patients from the Arabian peninsula [16]. The findings on HF individuals' mean age are consistent in

the African region. In this study, the male predominance was observed and is similar to that of Saudian study [17]. However, our result is different from that of Thesus-HF [18] and of Damasceno A *et al.* [15] who revealed a sex-ratio of 1 and a female predominance, respectively. This remarkable difference of sex-ratio could be due to ischemic cardiomyopathy which is more prevalent in men in this age group, while this disease of HF is uncommon in sub-Saharan Africa.

➤ Effect of cardiovascular risk factors

The prevalence of cardiovascular risk factors was relevant for caring HF patients as described by several African authors [15] [18] [19]. High blood pressure was the most frequent risk factor of HF followed by diabetes. These factors represent 15% - 20% in HF patients in Africa whereas they are 30% in Western Europe [20] [21] [22]. In sub-Saharan Africa, it has been known for many decades that less than 30% of hospitalized patients at the cardiac intensive care unit have diabetes [21]. Lifestyle changes, urbanization, physical inactivity, and obesity explain the increasing number of diabetes in Africa [23] [24]. In contrast, some types of malnutrition might cause diabetes [16]. Regarding to the high blood pressure, literature data have shown that high blood pressure is a major cause of atherosclerosis. The association of high blood pressure with diabetes considerably rise the frequency of the coronarographic lesions observed in our series.

High blood pressure affected two-thirds of our study population. This high proportion is in agreement with data of all African studies. The presence of high blood pressure was independent of other risk factors.

➤ Causes of heart failure

In this present study, the elevated rate of ischemic heart disease (60%) is comparable with that of Western countries research [25]. The low frequency of rheumatic and valvular cardiomyopathies (13%) corroborate with results of African series: 8% in Soweto and 14% The seus-HF study [7] [15] [18]. Interestingly, peripartum cardiomyopathy and alcoholic cardiomyopathy were not diagnosed during the study. The alcohol consumption was not quantified in this study.

Pronostic Factors

The severity of echocardiographic findings was identical to that of large series. The mean of LVEF was 40% at the ICA, 39.5% in the study of sub-Saharan The-seus-HF, and 45% in the cohort study in Soweto [12] [13]. This echocardiographic severity reflects the defavorable prognosis observed in two-thirds of patients presenting NYHA Class III and Class IV at 1 month after the initial hospitalization. The strong correlations of high NYHA classes with increased mortality rate was found in our study. However, the marked changes in ejection fraction was not associated with high mortality in this series.

The low [17] [20] proportion of atrial fibrillation subjects was found in large study population in Africa: 7.7% in Theseus and 6.3% in Soweto [21] [22]. These

data were lower than those of Western Europe investigations, where the combination of atrial fibrillation and HF accounted for 10% - 50% in elder patients [26]. The Prolongation of the QRS duration with left branch block, which occurs in about 20% - 30% of HF patients, is associated with a poor prognosis [27]. 15% of patients had a QRS duration > 120 ms at the ICA and the NPH. QRS duration appears to be a dependent mortality factor. The presence of severe kidney failure in 20% of cases was a little higher than that of literature data [25]. This was probably due to the high proportion of hypertensive and diabetic individuals in our study population. The death rate was 15% in 1 year and 18% on the total study duration. This rate is lower than that of other African studies, which indicated that mortality is more than 60% in acute HF patients with ischemic heart disease [28]. This observation suggests an urgent and an adequate care of HF patients benefiting from drugs and cardiovascular rehabilitation at the ICA. These results are similar to those of the European and North American investigations, where the mortality rate is 10% prior to the advent of the implantable cardioverter defibrillator [29].

6. Conclusion

The heart failure is a public health problem in Côte d'Ivoire as well as in many other African countries and developed countries. Non ischemic heart disease is the most frequent cause of HF in sub-Saharan Africa. In this study, the prevalence of ischemic heart disease should be carefully considered in the epidemiological transition and the advent of the coronarography in the technical platform of ICA. The rapid evolution of the epidemiological pattern of the heart failure with the increasing frequency of cardiovascular risk factors should contribute to implement study and prevention strategies against cardiovascular diseases in our country and in Africa.

Conflict of Interest

None.

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