

The Contribution of the 24-Hour EKG Holter in Heart Failure in the Cardiology Department of the Pr Bocar Sidy Sall Hospital of Kati

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How to cite this paper: Boubacar, S., Coumba, T., Youssouf, C., Nouhoum, O., Salimata, S., Konimba, D., Hasseye, T., Sanogo, A., Diarra, B., Camara, H., Asmaou, K., Mariam, S., Anna, T., Massama, K., Souleymane, C. and Menta, I. (2025) The Contribution of the 24-Hour EKG Holter in Heart Failure in the Cardiology Department of the Pr Bocar Sidy Sall Hospital of Kati. *World Journal of Cardiovascular Diseases*, 15, 443-454. <https://doi.org/10.4236/wjcd.2025.159039>

Received: July 30, 2025

Accepted: September 14, 2025

Published: September 17, 2025

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Abstract

Heart failure (HF) is defined as the inability of the heart to provide sufficient blood flow to meet the body's metabolic needs and/or at the cost of increased filling pressures. It is complicated by rhythm disorder, thromboembolic accidents, and sudden death in 50% of cases [1] with a lethality of 10% [2]. The existence of rapid or slow cardiac rhythm disorders may be responsible for heart failure with or without underlying cardiopathy. One of the methods to detect these rhythm disorders is the long-term recording of the rhythm by the Holter EKG [3]. In Mali, very few studies have addressed the contribution of the Holter EKG in the management of heart failure and also the lack of data at the University Hospital of Kati motivated this work. **Methods:** This is a cross-sectional, descriptive, prospective study, conducted from January 01, 2023 to December 31, 2023, in patients hospitalized for heart failure in the cardiology department of CHU BSS in Kati. All these patients benefited from a 12-lead surface electrocardiogram (EKG), a cardiac ultrasound and a 24-hour EKG Holter. **Results:** We included 34 patients with an average age of 56.15 years with a sex ratio (M/F) of 1.63. Left ventricular stroke fraction was reduced in 70.6%. We found at the Holter ECG 94% of ventricular extrasystole (ESV), 97% of supraventricular extrasystole (ESSV), 15% of unsupported ventricular tachycardia (VT) and 12% of conduction disorder. In our study, 55.9%

of patients were classified as Lown class IV. The present study did not allow us to highlight a correlation between the presence of unsupported VT and the risk of sudden death (P: 0.9). The most frequent complications were thromboembolic events with 60% and the mortality rate was 11%. **Conclusion:** the Holter EKG allows us to better highlight cardiac arrhythmias, especially ventricular at risk of sudden death in patients with heart failure.

Keywords

Heart Failure, 24 Hour EKG Holter, Cardiac Arrhythmia, Kati

1. Introduction

Heart failure (HF) is defined as the inability of the heart to provide sufficient blood flow to meet the body's metabolic needs and/or at the cost of increased filling pressures [4]. It is a complex syndrome, very frequently observed nowadays with the increasing aging of the population, it is the culmination of most cardiac pathologies [5]. It is indeed a very serious pathology with a significant morbidity and mortality, costly management [6] and with an incapacitating nature. The prevalence of heart failure is very high worldwide, it is 2% to 4% of the general population, with an estimated incidence of 2 million new cases [7]. It affects more than 10% of the population over 80 years, between 1% and 2% of the general population [8]. It is the cause of more than 550,000 new cases of hospitalization per year in the United States [9]. Thus, there were nearly 800,000 patients with heart failure in France in 2011 [8]. In 2006, a study involving seven countries in French-speaking Africa reported a proportion of 27.5% of patients hospitalized in emergency for a heart failure attack at stage 4 of the NYHA [10]. A study conducted at the Libreville university hospital center on heart failure in 2018 found a prevalence of 49.7% [2]. In 2018, the prevalence of heart failure according to a study conducted at the DIABCARMET center in Senegal was 14.28% [11]. In Mali, heart failure represented the first reason for admission to cardiology services according to Diallo, with a rate of 41.3% of all observed cardiac disorders [12]. It is the cause of 27% of admissions to the cardiology department and 12% of general medical consultations at Gabriel Touré Hospital [13]. It is complicated by rhythm disorder, thromboembolic accidents and sudden death in 50% of cases [1] with a lethality of 10% [2]. These complications are most often secondary to a rhythm disorder, thus a study conducted by Diabaté in 2022 at the CHU Gabriel Touré found a prevalence of 22.5% of rhythm disorders in heart failure patients. The existence of rapid or slow cardiac rhythm disorders may be responsible for heart failure with or without underlying cardiopathy [3]. One of the methods to detect these rhythm disorders is the long-term recording of the rhythm by the Holter EKG [3]. The Holter EKG is a non-invasive scan commonly used in cardiological practice. It is a diagnostic method of choice to establish the correlation between episodic symp-

toms and an excitability, automatism or conduction disorder [14]. In Mali, very few studies have addressed the contribution of the Holter EKG in the management of heart failure and also the lack of data at the University Hospital of Kati motivated this work.

2. Materials and Methods

This is a cross-sectional, descriptive, prospective study conducted from January 01, 2023 to December 31, 2023, in patients hospitalized for heart failure in the cardiology department of the CHU BSS in Kati. Sampling: any patient hospitalized for heart failure and regardless of the etiology. Were included all patients hospitalized in the cardiology department of CHU Bocar Sidy SALL of Kati for heart failure in whom the 24 Hour EKG holter was performed during the collection period and who had given their consent to participate in the study. Patients who had no signs of heart failure and/or were unable to perform the Holter EKG or those who did not give their consent were not included. The variables studied were sociodemographic data, clinical, electrocardiogram results, EKG Holter, transthoracic ultrasound data and biology. The data were collected on a standardized individual sheet. The collection was done on IBM SPSS statistics 20 and the analysis of data from the software Excel 2016 and Epi info. The qualitative variables were expressed in proportions and the quantitative ones on average with their standard deviation and extreme. The statistical test used was the khi2 test with a risk p equal to 5% for the following variables: extrasystoles and left ventricular ejection fraction alteration; rhythm disorders and heart diseases.

Classification of extrasystoles (ESV) according to Lown

- Class 0: No ESV
- Class I: Presence of ESV (<30 ESV/h)
- Class II: Presence of ESV (>30 ESV/h)
- Class III: Presence of polymorphic ESV; IIIa (isolated); IIIb (ventricular bigeminy)
- Class IV: class IVa (ESV: doublets, triplets); class IVb (ESV: salvo)
- Class V: Phenomena R/T

Ethical consideration: Patients' informed consent was obtained and confidentiality on the data was strict.

3. Results

A total of 68 patients were hospitalized for cardiac insufficiency, only 34 patients could do the EKG holter, which is a prevalence of 50% (Figure 1).

The age group (54 - 71) was the most represented, at 56%. The average age was 56.15 years (Figure 2).

The male sex was the majority with 62%, representing a sex ratio (M/F) of 1.63 (Figure 3).

Housewives were the majority with 38.2%, followed by farmers with 20.6% (Table 1).

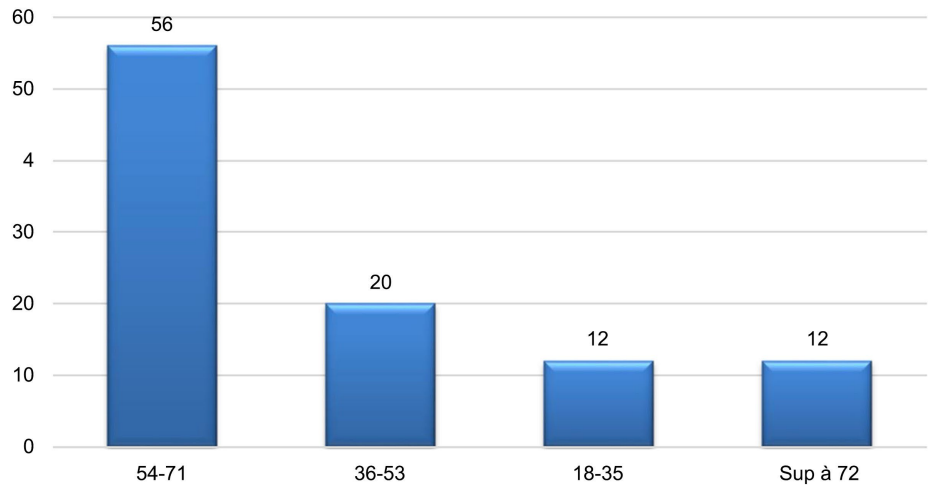


Figure 1. Distribution according to age groups.

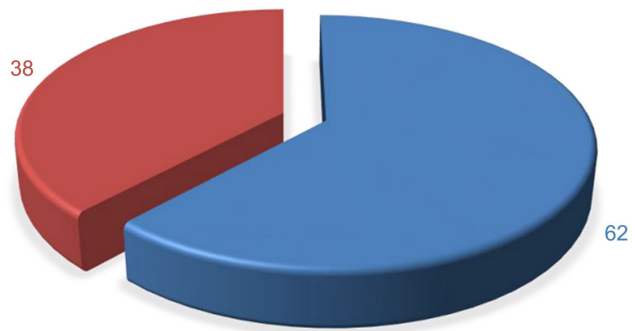
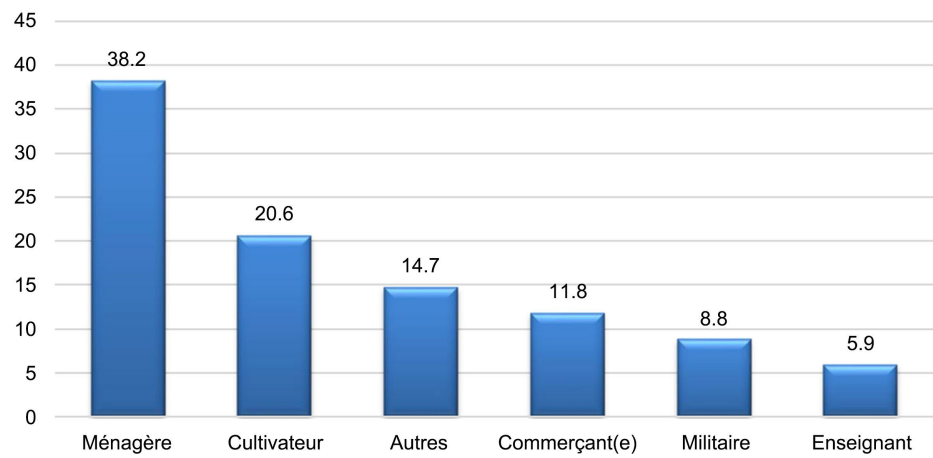


Figure 2. Gender distribution.



Others: banker, marabout, engineer, shepherd, student.

Figure 3. Distribution by occupation.

Table 1. Distribution by cardiovascular risk factors.

Risk factors	Number	Percentage
Age \geq 60 ans	19	56
HTA	17	50
Smoking	14	41
Alcohol	12	35
Menopause	6	18
Obesity	2	6

The most observed risk factors were: Age 60 years with 56%, followed by hypertension (50%) and smoking (41%) (**Table 2**).

Table 2. Distribution of patients according to functional signs.

Functional signs	Number = 34	Percentage
Dyspnea	Stage 2	4
	Stage 3	4
	Stage 4	26
	Total	34
Cough	27	79
Palpitations	27	79
Chest pain	15	44
Dizziness	8	23
Hepatalgia	8	23

Dyspnea was present in all patients, 76% of whom were in class 4, followed by palpitations and cough with 79% each. Global heart failure was the most represented with 79% (**Table 3**).

Table 3. Distribution by type of heart failure.

Type of heart failure	Number	Percentage
Congestive heart failure	27	79
Left heart failure	7	21

Global heart failure accounted for 79% of cases (**Table 4**).

Table 4. Distribution according to the biological test.

Biological check-up	Number (N = 34)	Percentage
Creatinine N = 16	High	15
	Low	1
Ionic disorders	8	23
Lipid disorders	8	23
Anemia	8	23
Glycemia N = 4	High	2
	Low	2

Creatinine was elevated in 47% of patients (**Table 5**).

Table 5. Distribution according to the electrocardiographic result.

EKG de base		Number N = 34	Percentage
Myocardial injuries		32	94
Tachycardia		20	59
Hypertrophy Cavitary N = 16	Left ventricle	10	32
	Left atrial	1	
Rhythm disorder N = 11	Ventricular Extrasystole	9	32
	Supra ventricular Extrasystole	1	
	Atrial fibrillation	1	
Conduction disorder N = 7	Left bundle branch block	5	21
	First-degree Atrio ventricular block	2	
Non sinusal rhythm		1	3

Myocardial lesions were the most frequent with 94%. The heart rhythm disorder was present in 32% with a predominance of ESV (26%). Twenty-one percent of patients had a conduction disorder dominated by BBG. LV hypertrophy was present in 29% of patients. Tachycardia was observed in 59% of patients. The rhythm was non-sinusal in 3% of our patients (**Table 6**).

Table 6. Distribution by echocardiographic abnormalities.

Echocardiographic Abnormalities		Number N = 34	Percentage
Disorder of the Kinetic	Akinesia	13	100
	Hypokinesia	10	
	Dyskinesia	5	
	Akinesia + Hypokinesia	6	
Fraction of ejection from the left ventricle	Reduced	24	100
	Moderately reduced	8	
	Preserved	2	
Cavity dilation	4 cavities	20	91
	Left cavities	10	
	Left ventricle	1	
Mitral insufficiency		2	6
Intra cavitary thrombus		2	6
Septal hypertrophy		1	3

The disorder of kinetics was observed in all our patients with a predominance of akinesia, or 38.23%. The ejection fraction of the VG was reduced in 70.6% of our patients, moderately reduced in 23.5% of cases. Cavity dilation was present in

91% of our patients with a predominance of the four cavities, or 58.82%. Mitral insufficiency and intra cavitory thrombus were present in 6% of cases (**Table 7**).

Table 7. Distribution according to the supraventricular rhythm disorder.

Type of the supraventricular rhythm disorder	Number N = 34	Percentage
Supra ventricular Extrasystole (ESSV)	33	97
Atrial fibrillation	2	6
Atrial tachycardia	1	3
Sinus tachycardia	1	3

Supraventricular rhythm disorders were dominated by ESSV with 97% followed by atrial fibrillation (6%). ESSV were monomorphic in 64% of patients and polymorphic in 36%. Sporadic ESSV was predominant in 64% of patients followed by the combination of bigenism and trigemics with 27%. Fifty-four percent of the cases presented doublets of ESSV and 42% had burst. 32.4% of ESSV were frequent (**Table 8**).

Table 8. Distribution by type of ventricular rhythm disorder.

Type of ventricular rhythm disorder	Number N = 34	Percentage
Ventricular Extrasystole (ESV)	32	94
Unsustained ventricular tachycardia	5	15

Among ventricular rhythm disorders, ESV were leading with 94% followed by unsustained ventricular tachycardia (VT) in 15%. The ESV were monomorphic and polymorphic in 50% each. ESV was sporadic in 50% of our patients and 34.4% of the patients had bigenism associated with a trigemesis. Sixty-nine percent of the cases presented with doublets of ventricular extrasystole and 53% presented with bursts. The ESV was numerous in 41%, followed by very numerous 31%. In our study, ESV were more frequent in the event of an alteration of the ejection fraction, but there was no statistically significant relationship with a p : 0.9 (**Table 9**).

Table 9. Distribution by intersection between rhythm disorder and heart disease.

Abnormalities	Hypertensive heart disease	Coronary artery disease	Valvulopathy	Cardiomyopathy
Supra ventricular extrasystole (ESSV)	24.2% (0.6)	69.7% (0.4)	6.1% (0.06)	15.2% (0.1)
Ventricular extrasystole (ESV)	25% (0.6)	68% (0.8)	6.2% (0.1)	15.6% (0.3)
Supra ventricular tachycardia (TSV)	50% (1.2)	100% (1.8)	-	-
Ventricular tachycardia (TV)	25% (0.02)	75% (0.08)	-	-

ESSV and ESV were predominant in coronary artery disease with 69.7% and 68%, respectively. The cross between arrhythmia and heart disease was not statistically significant. Conduction disorders were represented by bradycardia 50%, BAV3 25% and pause in 25% (**Table 10**).

Table 10. Distribution according to the etiological diagnosis.

Etiological diagnosis	Number N = 34	Percentage
Coronary artery disease	25	73
Hypertensive heart disease	9	26
Cardiomyopathy	5	15
Valvulopathy (mitral insufficiency)	2	6
Hyperthyroidism	1	3

Etiologically, coronary artery disease was dominant with 73% followed by hypertensive heart diseases (26%) and cardiomyopathies (15%). Holter ECG: the baseline rhythm was non-sinusal in 5.9% of cases. Among the anomalies encountered, all our patients presented with rhythm disorders and 12% with conduction disorders.

The evolution was favorable in 57%. However, we observed complications in 33% and reported 11% of deaths (**Figure 4**).

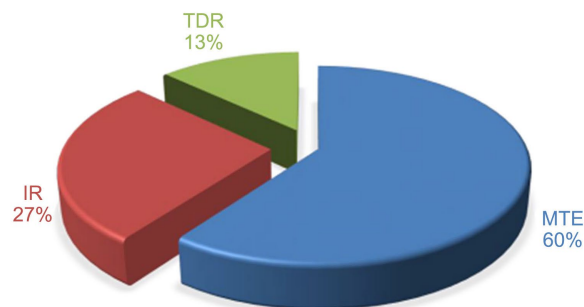


Figure 4. Distribution according to complications.

Thromboembolic diseases (TEM) were the most common with 60%, followed by renal disease (27%) and rhythm disorders (13%).

4. Discussion

Limitations of the study:

Lack of financial means in half of the patients for carrying out complementary tests (ECG holter and other tests). This limitation has a significant impact on the outcome of the study.

Our study focused on 34 heart failure patients who performed the Holter ECG in the cardiology department of the Bocar Sidy SALL hospital in Kati. Our study suffers from certain shortcomings, notably: financial means failures of some patients thus preventing the completion of certain assessments. Men accounted for 62% (**Figure 2**) of our sample, representing a sex ratio of 1.63. This male predominance was highlighted by other authors with 59.9% for Coulibaly [15] and 54.3% for Menta in Mali [16]. This observation was in disagreement with Radouane in Morocco [17] who had found a female predominance with 52.3%. This difference could be due to the size of his sample. The average age was 56.15 years with extremes of 18 years and 80 years, which was higher than the 50.64 years of Sadio [18] and 51.42 years of Hamadou [19], but lower than the average age of 59.82 years found by Faye [20]. The age group 54 - 71 was the most represented with 56% (**Figure 1**). In the study of Radouane [17], the age group 40 - 79 years was the most represented with 75%. This slight difference could be explained by the design of our studies. Housewives were the majority with 38.2%, followed by farmers with 20.6% (**Figure 3**), the same observation made by Sissoko [21] with 37.3% and 29.2% respectively. The main risk factors in our patients were dominated by age 60 years and older, hypertension and smoking with respectively: 56%, 50% and 41% (**Table 1**). Hamadou [19], had found as predominant risk factors HT (27.5%) and obesity (22.5%). At Diabaté [22], hypertension was ranked first with 46.9% followed by diabetes 20.5%. These findings show that hypertension poses a real public health problem, especially in our regions. Dyspnea was present in all our patients and was at stage 4 in 76% (**Table 2**). Which was overlay to the 87.87% of Faye [20]. As for Diabaté S [22] and Hamadou [19] they found 48.4% and 57.5% respectively. The explanation for this advanced stage of dyspnea would be the late management of our patients. Unlike other series, Sadio [18] found a predominance of class II with 51.30% against 5.5% for class IV. This difference is explained by the fact that the patients of SADIO [18] were recruited at their discharge or as outpatients. Palpitations and cough were in the background with 79% each (**Table 2**), which was similar to the data from Faye [20] with 75.75% for cough. Global heart failure accounted for 79% of cases (**Table 3**). Biologically, kidney failure was present in 44% of our patients. Ionic and lipid disorders as well as anemia had been observed in 23% of the patients each (**Table 4**). In the study of Faye [20] an ionic disorder was present in 30.3% of patients, renal failure in 27.27% and anemia in 21.21% of patients. In our study, ionic disorders were secondary to the depletion of patients and renal insufficiency due to renal hypo perfusion. At the ECG, the signs of myocardial lesions were the most frequent with 94%. The heart rhythm disorder was present in 32% with a predominance of ESV (26%). Twenty-one percent of patients had a conduction disorder dominated by BBG. LV hypertrophy was present in 29% of patients. Tachycardia was observed in 59% of patients. The rhythm was non-sinusal in 3% of our patients (**Table 5**). In accordance with the other series but with different proportions, Hamadou [19] had found tachycardia in 37.5% of cases, atrial fibrillation (AF) in 7.5% of patients,

ventricular extrasystoles in 22.5%. Faye [20] had found left ventricular hypertrophy (LVH) in 30.3% of patients, AF in 9.09% of cases, tachycardia in 36.36%, and ESSV in 6.06%. In the study by Sadio [18] 43.2% of patients had tachycardia, 18.9% had ESV, the FA 16.2%. The echocardiographic abnormalities remained essentially marked by the segmental kinetic disorder with akinesia in majority (38%) and systolic dysfunction of the VG which were observed in all patients (**Table 6**), which was in agreement with Hamadou [19] and Sadio [18]. Cavity dilation was observed in 91% of cases, the 4 cavities accounted for 59%, the left cavities 29% and the isolated left ventricle 3%. Faye [20] had recovered a dilation: of the 4 cavities in 24.24%, the left cavities represented 45.45% and the left ventricle 24.24%. The dilation of the cavities was explained by the late management of our patients. In our study, the baseline rhythm was sinus in 32 patients (94.1%) and non-sinus in 2 cases (5.9%). These proportions are superimposable to the 92.5% and 7.5% of Hamadou [19] and to the 83.7% and 16.3% of Sadio [18]. Ninety-seven percent of patients had ESSV (**Table 7**). Our result is similar to that of Hamadou [19] and Faye [20], who found 82.5% and 78.78% respectively. ESSV were monomorphic in 64% of patients and polymorphic in 36%. In the study by Faye [20] the monomorphic ESVEs accounted for 76.92% and 83.7% in Sadio [18]. The doublets and salvo were present in 54% and 42%, respectively. The doublets were present in 69.69% at Faye [20]. Polymorphism, the presence of doublet and/or bursts as well as precocity (R/T phenomenon) are criteria for poor prognosis. Among ventricular rhythm disorders, ESV were leading with 94% followed by unsustained ventricular tachycardia (VT) in 15% (**Table 8**). The ESV were monomorphic and polymorphic in 50% each. ESV was sporadic in 50% of our patients and 34.4% of the patients had bigeminy associated with a trigeminy. Sixty-nine percent of the cases presented with doublets of ventricular extrasystole and 53% presented with bursts. The ESV was numerous in 41%, followed by very numerous 31%. In our study, ESV were more frequent in the event of an alteration of the ejection fraction, but there was no statistically significant relationship with a p : 0.9. In the studies of Sadio [18], Faye [20], and Hamadou [19], ventricular extrasystoles accounted for: 62%; 44.45% and 30%, respectively. These results are consistent with the literature, the frequency of ventricular extrasystoles increases in cases of dilated cardiomyopathy [23]. ESSV and ESV were predominant in coronary artery disease with 69.7% and 68%, respectively (**Table 9**). The cross between arrhythmia and heart disease was not statistically significant. Conduction disorders were represented by bradycardia 50%, BAV3 25% and pause in 25%. The management of rhythm disorders constitutes a challenge in our context, in the absence of appropriate management, they are the cause of thromboembolic events, in some cases the indicated medications are not available in our environment or often the cost is not affordable for the patient. Some patients are candidates for treatment by device, which is not accessible due to the lack of technical facilities or often the very high cost. The etiologies were dominated by ischemic heart disease with 73% and hypertensive heart disease 26% (**Table 10**), the same

etiologies were found by Faye [20] with 27, respectively 27% and 30.30%. The predominance of these pathologies could be explained not only by the increased frequency of hypertension in our regions but also by the lifestyle of our patients. As complications we found: thromboembolic diseases (MTE) were the most common with 60%, followed by renal involvement (27%) and rhythm disorders (TDR) (13%) (Figure 4).

5. Conclusion

Half of the patients hospitalized for heart failure were able to perform an EKG holter. The supraventricular and ventricular extrasystoles were the most observed rhythm disorders. The Holter EKG allows us to better highlight cardiac arrhythmias, especially ventricular at risk of sudden death in patients with heart failure.

Conflicts of Interest

We do not have conflicts of interest.

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