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Research Article

# Atrioventricular Blocks: Epidemiological, Clinical and Therapeutic Aspects in the Cardiology Departments of the University Hospital of Conakry

**Balde Elhadj Yaya[1*], Beavogui M[1], Bah MB[1], Doumbouya AD[1], Barry IS[1], Kone A[2], Diakie S[1], Sylla IS[1], Balde AA[1], Diallo M[1], Balde TS[1], Balde MA[1], Balde MD[1], Conde M[1]**

[1]*Department of Carddiology, Kankan University, Kankan, Guinea*

[2]*Department of Cardiovascular Surgery, Donka Hospital, Conakry, Guinea*

## ABSTRACT

**Objective**: The objectives of this study were to determine the prevalence of Atrioventricular Blocks (AVB) at the Center Hospitalize ET Universities de Conakry but also to describe the clinical signs, the paraclinical signs and the management of AVB.

**Patients and methods**: We carried out a prospective multicenter descriptive type study lasting 6 months from April 20 to October 20, 2021. All patients received an electrocardiogram and/or a Holter ECG.

**Results**: We identified 64 cases of AVB including 56.3% complete atrioventricular block, 20.3% 2nd degree AVB Mobitz I, (17.2%) AVB Mobitz II, and 6.2% high degree AVB. AVBs were more common in men (56%) versus 44% in women. Symptoms were dominated by dyspnea (60.5%), syncope (46.1%) and physical asthenia (30.8%). The average heart rate was 48.3 bpm (range 26 and 98 bpm). The AVBs were mainly of degenerative (68.7%), idiopathic (18.7%) and ischemic (6.2%) origin. The indication of stimulation was asked in 43 patients. The locations were carried out in Dakar (9 squares), Tunisia (4 squares) and in Guinea (1 square) with respective average costs of €5,000, €7,700 and €5,000. The mode of stimulation, the most used was the double chamber (DDD, DDIR) which represents 78% of the cases against 21.4% for the monochamber (VVI, VVIR).

**Conclusion**: Pacing is a major challenge in Guinea. State support in staff training, the opening of a cardiac catheterization center and the acquisition of pacemakers could considerably improve patient care.

**Keywords**: Atrial ventricular block; Electrocardiogram; Cardiac pace

## INTRODUCTION

Atrioventricular Blocks (AVB) are delays or deficits in the conduction of nerve impulses between the atria and the ventricles [1]. They occur most often in the absence of significant heart disease and particularly affect the elderly [2]. It is a condition due in most cases to an idiopathic disease of the conduction tissue or to ischemic lesions of this tissue [3]. The atrioventricular node is the site most frequently involved in adults [4]. PR interval abnormalities are associated with an increased risk of Atrial Fibrillation (AF), which carries a substantial risk of morbidity and mortality [5]. Symptoms are based on the degree of the block [6]. It is often asymptomatic and is discovered during a clinical examination showing bradycardia or during a systematic ECG [7]. However, it can also be expressed by the occurrence of faintness with punch (Stokes-Adams syndrome) [7]. Diagnosis is made exclusively by electrocardiogram, rhythmic Holter and/or by endo-cavitary electrophysiological exploration (EEP); the latter is the most specific examination for locating the block.

The objectives of this study were to determine the prevalence of atrioventricular blocks at the University Hospital of Conakry, to describe the clinical signs, the preclinical signs and the management of AVB.

**Correspondence to:** Balde Elhadj Yaya, Department of Carddiology, Kankan University, Kankan, Guinea, Tel: 224 628 049 387; E-mail: yaya017balde@gmail.com

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# MATERIALS AND METHODS

## Study framework and type

The study took place in the cardiology departments of the Center Hospitalo-Universitaire (CHU) of Conakry. These are reference services in the management of cardiovascular diseases in Guinea. This was a prospective multicenter study of the descriptive type lasting 6 months from April 20 to October 20, 2021. We included in the study all patients admitted to the cardiology departments and having an atrio-2nd or 3rd degree ventricular after performing an electrocardiogram and/or a rhythmic Holter. Patients with first degree atrioventricular block or those who refused to participate in the study were excluded.

## Conduct of the study

The study was led by a team of cardiologists and interns from cardiology departments. It took place in two (2) stages:

**1st stage**: All the subjects surveyed benefited from an interrogation to identify their marital status, clinical signs (dizziness, dyspnea, palpitation and syncope) and personal medical history (arterial hypertension, type-2 diabetes, acute coronary syndrome, valvulopathy, heart failure). After the interrogation, we carried out their clinical examination, in particular a measurement of blood pressure and heart rate through an OMRON brand electronic sensitometer.

**2nd Step**: We performed a 12-lead resting surface electrocardiogram in all patients through a six (6) lead NORAV brand electrocardiograph. In cases where the electrocardiogram was not contributory to the diagnosis, we performed a 24-hour rhythmic Holter. We looked for 2nd or 3rd degree AVB in these patients with identification of its site and its association with arrhythmia. Some of our patients also benefited from a transthoracic echocardiography and biological examinations (blood monogram, creatinine, calcemia, magnesium).

## Statistical analysis

Our data were entered and analyzed by epi-info software in version 7.2 and Microsoft Excel 2010. The results were presented in frequencies and in means ± standard deviation.

# RESULTS

During our study period, we received 3625 patients for various conditions. After performing an electrocardiogram and/or a 24-hour rhythmic Holter, we counted 166 cases of AVB, representing a prevalence of 4.6%. Among these patients with AVB, 64 had 2nd or 3rd degree AVB.

Our study population was aged on average 69.2 years with extremes of one (1) month and 97 years (Table 1). The study involved 36 men (56%) and 28 women (44%) with an M/F sex ratio of 1.3 (Table 1).

52 patients were symptomatic, a frequency of 81.2%. We found dyspnea in 32 patients (60.5%), syncope in 24 patients (46.1%), physical asthenia in 16 patients (30.8%), palpitations in 14 (27%) patients and dizziness in 11 patients (21.1%) (Table 2). We noted hypertension in 41 patients (85.4%), diabetes in 12 patients (25%) and stroke in 2 patients (4.2%) as a history (Table 1). The average heart rate of our patients was 48.3 beats per minute (bpm) with extremes of 26 and 98 bpm. The majority of patients had bradycardia (85.9%). The underlying heart disease was found in 43 patients, including heart failure (74.4%) and valvulopathy (18 cases) (Table 1).

The main electrocardiographic abnormalities were: complete atrioventricular block in 36 cases (56.3%), 2nd degree AVB Mobitz I in 13 cases (20.3%), AVB Mobitz II in 11 cases (17.2%), and high AVB in 4 cases (6.2%) (Table 3). AVB were associated with atrial fibrillation in 4 cases (71%) and ventricular extra systoles in 10 cases (28.6%). AVB were presumed suprahissian in 27 patients (42.2%) and presumed hissian or infrahissian in 32 patients (57.8%) (Table 3). Forty six (46) patients underwent transthoracic echocardiography. The results were normal in 8 patients. The main echocardiographic abnormalities were dilated cardiomyopathy in 22 cases (47.8%), impaired left ventricular systolic ejection fraction in 20 cases (43.5%) and ischemic cardiomyopathy in 6 cases (13%) (Table 2).

Biologically, 32 patients had blood tests. Hyperkalemia was noted in 2 patients, renal failure in 1 patient.

The main causes of AVB were of degenerative origin in 48 patients (68.7%), idiopathic in 12 patients (18.7%) and ischemic in 4 patients (6.2%). We also noted 1 case (1.6%) of congenital AVB in a newborn with intertribal septal defect (ASD) (Table 2).

In the 64 cases of AVB listed, 43 (67.2%) had an indication of stimulation, however only 14 were stimulated. The implantations were carried out in Dakar (9 cases), Tunisia (4 cases) and in Guinea (1 case) with respective average costs of €5,000, €7,700 and €5,000. The mode of stimulation, the most used was the double chamber (DDD, DDIR) which represents 78% of the cases against 21.4% for the monochamber (VVI, VVIR) (Table 3).

**Table 1:** General characteristics of the population.

| Variables | Frequency | Percentage (%) |
|---|---|---|
| Middle age | 69.2 ± 16.7 | Extremes 1 month and 97 years |
| Sex | 28 | 44 |
| Male | 36 | 56 |

| | | |
|---|---|---|
| Medical background | | |
| hypertension | 41 | 85.4 |
| Type 2 diabetes | 12 | 25 |
| stroke | 2 | 4.2 |
| Underlying heart disease | | |
| Heart failure | 32 | 74.4 |
| Heart valve disease | 18 | 41.9 |
| Acute coronary syndrome | 6 | 14 |
| Inter-atrial communication | 1 | 2.3 |

**Table 2**: Clinical, echocardiographic and biological data of the patients.

| **Variables** | **Workforce** | **Percentage** (%) |
|---|---|---|
| Clinical signs | | |
| Dyspnea | 32 | 60.5 |
| Syncope | 24 | 46.1 |
| Physical asthenia | 16 | 30.8 |
| Palpitations | 14 | 27 |
| Dizziness | 11 | 21.1 |
| Chest pain | 8 | 15.4 |
| Lipothymia | 6 | 11.5 |
| Etiogies | | |
| Degenerative | 44 | 68.7 |
| Idiopathic | 12 | 18.7 |
| Ischemic heart disease | 4 | 6.2 |
| Hyperkalemia | 2 | 3.1 |
| Iatrogenic | 1 | 1.6 |
| congenital | 1 | 1.6 |
| Echocardiography | | |
| Hypertrophic cardiomyopathy | 22 | 47.8 |
| Alteration of LVEF | 20 | 43.5 |

| | | |
|---|---|---|
| Hypertrophic cardiomyopathy | 8 | 17.4 |
| Kinetic disorders | 12 | 28.7 |
| Inter-atrial communication | 1 | 2.2 |
| Left atrial dilation | 7 | 15.7 |
| Heart valve disease | 18 | 35.4 |
| Biology | | |
| Hyperkalemia | 2 | 5.3 |
| Hypokalemia | 5 | 13.1 |
| Hypomagnesemia | 6 | 15.8 |
| Hypercalcemia | 2 | 5.3 |
| Hypocalcemia | 14 | 36.8 |
| Hyper creatinemia | 3 | 7.9 |
| Hypocreatinaemia | 2 | 5.3 |
| LVEF: Left Ventricular Systolic Ejection Fraction | | |

**Table 3**: Distribution of patients according to type of AVB, mode and site of pacemaker implantation.

| **Variables** | **Frequency** | **Percentage** (%) |
|---|---|---|
| AV block type | | |
| 3rd degree AVB | 36 | 56.3 |
| AVB Type 2 Mobitz I | 11 | 17.2 |
| AVB type 2 Mobitz II | 13 | 20.3 |
| High degree AVB | 4 | 6.2 |
| Block location | | |
| Suprahissian ( nodal) | 27 | 42.2 |
| Hissian or Infra- Hissian | 37 | 57.8 |
| Associated arrhythmias | | |
| Ventricular extrasystoles | 10 | 71.4 |
| Atrial fibrillation | 4 | 28.6 |
| Pacemaker implantation | | |
| Implanted patients | 14 | 32.5 |

| | | |
|---|---|---|
| Non-implanted patients | 29 | 67.5 |
| Average waiting time | 35 Days | Extremes 14 and 60 days |
| Installation method | | |
| DDD* | 9 | 64.3 |
| DDR* | 2 | 14.3 |
| VVI* | 2 | 14.3 |
| LIVE* | 1 | 7.1 |
| Implant Center | | |
| Senegal | 9 | 64.3 |
| Tunisia | 4 | 28.6 |
| Guinea | 1 | 7.1 |

*The operating mode of the pacemaker is defined by three letters:

- The first letter indicates the stimulated cavity. V: ventricle, A: atrium (atrium), D: both
- The second letter indicates the detected cavity. V: ventricle, A: atrium (Auricle), D: both
- The third letter indicates the mode of operation. T: trigger, I: inhibited, D: both
- The addition of the letter R indicates that the pace maker can physiologically accelerate during exercise.

## DISCUSSION

Patients with high-grade or complete atrioventricular block are at increased risk of heart failure, syncope, and even sudden death [8]. Acute treatment of atrioventricular block depends on its severity and clinical tolerance. The strategy is based on the elimination of any risk factor and the correction of ionic disorders, sometimes the administration of atropine or isoprenaline, or even temporary cardiac stimulation in the event of severe bradycardia, possibly pending the placement of a permanent pacemaker when indicated [9].

We conducted a multicenter study at the University Hospital of Conakry whose objectives were to determine the prevalence of atrioventricular blocks at the University Hospital of Conakry, to describe the clinical and paraclinical signs and their management. The difficulties encountered were related to the inability of some patients to carry out biological and/or ultrasound examinations, the absence of endocavitary electrophysiological exploration which is the examination which makes it possible to locate the block with precision and the non-respect of appointments. You by certain patients after their return from treatment abroad (underestimation of the number of patients implanted).

During our study period, we received 3625 patients including 166 cases of AVB of any degree combined, representing a prevalence of 4.6%. This result is superior to that of Ritchy [10] in Madagascar who found a prevalence of 2.03%. Our study was metacentric and included all patients seen in consultation or hospitalized, whereas Ritchy's study was concentric and focused only on hospitalized patients.

The average age of our patients was 69.2 ± 16.7 years. Our result corroborates the data of Millogo [11] in Burkina-Faso who found an average age of 69 ± 18 years.

In several studies, AVB affects men more frequently. This data from the literature is in agreement with our study which showed a male predominance of 56% with a sex ratio M/F of 1.3. Fifty-two (52) patients were symptomatic, *i.e.* 81.2%. The most frequently found symptoms were dyspnea (50%), syncope (43.7%) and physical asthenia (25%). These different symptoms were found at the forefront in the results of several studies such as those by Kafata [12], Adoubi [13], and Mbaye [4] where the dominant symptoms were respectively physical asthenia (100%). , syncope (48%) and dyspnea (44.2%).

Arterial hypertension was the cardiovascular history most associated with AVB in our series (70.3% of cases). This result is close to that of Mbaye in Senegal who found a frequency of 67% for hypertension [14].

In Congo, KAFATA had reported during his study on cardiac stimulation, an average heart rate of 40 ± 4 beats per minute. In our series the average heart rate was higher at 48 bpm. This difference could be explained by the fact that we included 2$^{nd}$ degree AVB in our study whereas KAFATA only included 3$^{rd}$ degree AVB.

In Zhao's cohort in 2019, atrial fibrillation was a risk factor for the occurrence of all types of AVB with a statistically significant association. In our work, the occurrence of AVB on AF was found in 4 patients (28.6%). Our result is superior to that of

Ritchy who found 2 cases of AF associated with AVB. Apart from AF, we identified as arrhythmia, 10 cases of ventricular extrasystoles. These ventricular extrasystoles should require special attention, especially when they occur in the form of short bursts or long and fixed coupling bigeminy [15]. Under such conditions, they would often be premonitory attacks typical of torsade de pointes.

The importance of the topographic diagnosis of AVB in the decision of the device is known. This diagnosis is in some cases imprecise with the only surface ECG data. Endocavitary electrophysiology is the examination allowing a topographic diagnosis of AVB. Because of its absence in our clinical context, we resorted to the morphological analysis of QRS complexes. Thus we obtained 42.2% of presumed AVB of supra-hissian seat and 57.8% of hissian or infra-hissian seat. This result is comparable to data from Ikama, which identified 63.2% presumed infrahissian AVB versus 36.8% suprahissian AVB [16].

Conduction tissue degeneration was the main etiology of AVB (75%) in our series. Our result goes in the same direction of the data of the literature.

In biology, we found 2 cases of severe hyperkalaemia which could explain the conduction disorders encountered in these 2 patients. The other ionic disorders found were hypocalcemia in 14 patients (36.8%), hypomagnesemia in 6 patients (15.8%) and hypokalemia in 5 patients (13.1%). Ritchy had found a higher rate of hypokalaemia (17.5%), however hypocalcaemia was less frequent (5%). Renal failure was present in 1 patient (2.6%). A higher frequency was found in Ritchy's series, 14 patients (35%).

From a medical point of view, atropine was the main treatment used (68.4%) whereas isoprenaline was the first-line treatment in the study by Millogo. We used atropine for the treatment of AVB by unavailability of isoprenaline in our clinical setting.

Regarding cardiac pacing, 43 patients (67.2%) had an indication for implantation of a pacemaker, however only 14 were implanted (21.9%). This low rate of stimulation would be multifactorial. At the start of the study, Guinea had neither a rhythmologist nor a technical platform. At present, we have a private cardiac catheterization room and two (2) personnel trained in cardiac pacing. These advances are still insufficient to cover the needs of the population. The other factors would be related to the high costs of setting up, the poverty of the population and the lack of health coverage.

Among the 14 stimulated patients, 78.4% were in dual-chamber mode (DDD, DDDR) and 21.4% in single-chamber mode (VVI,VVIR). This result shows a predominance of stimulation in dual-chamber mode compared to single-chamber mode. This observation has been made since 2009 by Tuppin who noted 75.4% stimulation in dual chamber mode against 21.4% in single chamber [17]. However, the first African series were characterized by the predominance of the right ventricular single-chamber pacing mode due to its lower cost and the simplicity of its technique [18].

In our study, the average waiting time before the implantation of a pacemaker was 34.6 days ± 16.9. This waiting period was longer in our series compared to that of Millogo which was 8.2 days. This would be justified by the fact that almost all of our patients were implanted abroad.

## CONCLUSION

In conclusion, the frequency of AVB is high in Guinea; however accessibility to cardiac pacing remains a problem in our context due to the limited resources of our patients and the lack of health coverage. State support in staff training and the opening of cardiac catheterization rooms could considerably improve care.

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