

## EPIDEMIOLOGICAL INVESTIGATION OF RHEUMATIC HEART DISEASE IN THE EMERGENCY

### DEPARTMENT IN DAKAR: A DESCRIPTIVE ANALYSIS

#### ABSTRACT

**Background :** Rheumatic Heart Disease (RHD), also known as "Bouillaud's disease", is a post-streptococcal non-suppurative inflammatory disease complicating an upper airway infection with group A  $\beta$ -hemolytic *streptococcus*. Although RHD has almost disappeared in developed countries, it is still a major public health problem in low- and middle-income countries, as it remains the most frequent cause of cardiovascular mortality and morbidity in children. The objective was to describe the epidemiological and evolutionary aspects of rheumatic heart disease admitted to the emergency room of the Albert Royer National Children's Hospital in Dakar. **Methods :** we conducted a retrospective, descriptive study over a 12-month period (January 1 to December 31, 2021) of children aged 3 to 18 years hospitalized for rheumatic heart disease in the emergency department during the study period. **Results :** The prevalence was 3.73% (37/993) with a mean age of 11.35 +/- 3 years and a majority between 10 and 15 years. Males predominated - sex ratio 1.3. The majority came from disadvantaged areas (91.9%) with low incomes for the most part (83.8%). The reasons for consultation were dominated by dyspnea (86.5%), fever (75.7%) and polyarthralgia (35.1%). General and physical signs were tachycardia (86.5%), orthopnea (24.3%), hypoxia (40.5%), congestive heart failure (83.7%). Cardiac involvement was dominated by mitral and aortic polyvalvular disease in more than half (57%). Management included

diuretics (97.3%), oxygen therapy (90%), corticosteroids (31%) and antibiotics (81%). Three cases of death were noted. **Conclusion :** RHD is still frequent in our countries with an often poor prognosis due to delayed management. Prevention policies are necessary to eradicate this scourge.

**Keywords:** Rheumatic heart disease, polyvalvular disease, children, death

## 1. INTRODUCTION :

Rheumatic heart disease (RHD), also known as Bouillaud's disease, is a post-streptococcal non-suppurative inflammatory disease complicating an upper airway infection with group A  $\beta$ -hemolytic streptococcus. Although RHD has virtually disappeared in developed countries, it remains a major public health problem in low- and middle-income countries, where it is still the most frequent cause of cardiovascular mortality and morbidity in children [1,2,3]. Rheumatic heart disease is the leading cause of acquired heart disease in children and adolescents in the Third World [4,5]. In Africa, the high prevalence of rheumatic heart disease in schoolchildren is a worrying public health problem. RHD is a complication of post-streptococcal angina, favored by poor hygiene and a lack of effective management of streptococcal infections [6-9]. Diagnosis is based on the presence of the modified Jones criteria, combined with proof of streptococcal infection, notably anti-streptolysin O antibody (ASLO) positivity. Management depends on the clinical form of the disease, with prevention based on a clear improvement in people's living conditions, as well as effective diagnosis and treatment of strep throat. There is a lack of recent data on the prevalence of RHD in Senegal. With this in mind, we conducted this retrospective study over a 12-month period (January to December 2021) in the emergency department of the Centre Hospitalier National D'Enfant Albert Royer, with the overall aim of describing the epidemiological and evolutionary aspects of RHD in hospitalized children.

## 2. MATERIAL AND METHODS

## **2.1. Study site**

The study took place in the emergency department (ED) of the Albert Royer National Children's Hospital in Dakar. All children aged 0 - 18 years are admitted to this department for consultation for any reason. It includes a triage unit, an emergency room where vital emergencies are treated, a short-term hospitalization room and ambulatory follow-up boxes.

## **2.2. Type and duration of study**

We conducted a retrospective, descriptive study over a 12-month period from January 1 to December 31, 2021, in the emergency department of the Albert Royer Children's Hospital in Dakar.

## **2.3. STUDY POPULATION**

### **2.3.1 Inclusion criteria**

All children aged 3 to 18 years hospitalized in the emergency department for rheumatic heart disease confirmed by cardiac Doppler ultrasound with evidence of streptococcal infection (ASLO positive) were included.

### **2.3.2 Non-inclusion criteria**

- Patients with incomplete or unusable records.
- Outpatient care

## **2.4. DATA COLLECTION AND ANALYSIS**

### **○ Diagnosis confirmation**

The diagnosis of RHD was based on the Jones criteria and on ASLO positivity (levels greater than or equal to 200 IU).

### **○ Collection tools**

- A pre-established data collection form;

- Collection of information from medical files
- o **Parameters studied**

The following parameters were studied for all included cases:

- Epidemiological : children's age, gender, socio-demographic data
- Clinical and paraclinical : history, reasons for admission, general signs, signs of clinical examination, Doppler echocardiography, biology and ASLO.
- Therapeutic and outcome data

## **2.5. Statistical analysis**

Data were entered into Excel 2010 after designing a data entry mask. Analysis was carried out using Excel 2010 and Epi info 7.2. During analysis, qualitative variables were described by frequency tables, histograms, camembert and bar charts. Quantitative variables were described by their positional parameters ((mean, median and mode).

The bivariate analysis concerned risk factors for death. The difference was statistically significant when the p-value was strictly less than 0.05.

## **3. RESULTS AND DISCUSSION**

### **3.1 RESULTS**

Over the study period, a total of 37 patients with RHD were included out of 993 children hospitalized in emergency departments, representing a frequency of 3.73% (37/993). The mean age of the patients was 11.35 +/- 3.0 years. The extremes were 3.00 and 17.00 years (Table 1). The sex ratio was 1.31. Among the children, 54.05% had regular follow-up by a cardiopediatrician, 30.56% had recurrent tonsillitis and 18.92% (n=7) had a comorbidity. Antibiotic prophylaxis was prescribed for 35.14% of patients. School absence concerned 13.51% of children. The majority of patients came from the periphery of the city center (91.89%). Of these, 87.78% had a low socio-economic status. The most frequent reasons for consultation were dyspnea, fever and asthenia in 86.49%, 75.68% and 54.05% of cases respectively (figure 1). Physical signs were mainly heart murmur (94.59%),

congestive heart failure syndrome (83.78%) and respiratory distress (75.68%) (figure 2). A biological inflammatory syndrome was noted in most patients, with hyperleukocytosis (50%), inflammatory anemia (83.33%) and positive C-reactive protein (>6mg/l) in 91.67%. The ion disorders noted were hyponatremia (32.43%) and hypokalemia (27.03%) (table 2). Cardiomegaly was noted in 22 patients (59.46%), pleural effusion in 4 (16.66%) and pulmonary superinfection in 32.43%. Cardiac Doppler ultrasonography revealed valvular damage in over half (57%), and endocarditis in 16.22% of cases (figure 3). Mitral insufficiency was the most frequent valvular involvement (30.10%). Management was mainly medical, with diuretics (100%), oxygen therapy (78.38%), conversion enzyme inhibitors (Captopril) (83.78%) and antibiotics (81.08%). No patient had a surgical cure. The majority had a favorable outcome. We had recorded three cases of death in the context of cardiorespiratory arrest.

### **3.2. DISCUSSION**

The prevalence of rheumatic heart disease in Dakar emergency departments remains high (3.73%). A higher prevalence was found in Dakar in a school survey: 4.96% (95% CI 2.4 - 9.1) [9]. This difference can be explained by the fact that the study population consisted exclusively of patients hospitalized in emergency departments. Despite preventive measures and early management of strep angina, rheumatic heart disease (RHD) remains high in Senegal. Policy to eradicate RHD must focus on the availability of rapid tests for streptococcal tonsillitis in healthcare facilities in general, and emergency departments in particular, as well as on training healthcare staff to diagnose and treat all bacterial tonsillitis in children effectively. Educating parents and making them aware of the need to seek care in the event of fever is also an important pillar of this policy. RHD is a disease of young children, and is rare in infants under 3 years of age. In this study, the average age of the children was 11.35 +/- 3.0 years (3.00-17.00 years). A slightly lower age was found in Senegal and Congo, at 9.7 +/- 3.3 and 9.6 years respectively [9, 10]. The population was predominantly male, with a sex ratio of 1.31. A female predominance was found in other studies [9,10].

RHD has virtually disappeared in industrialized countries, where the socio-economic level is relatively higher, although other factors explain this rarity of RHD. Low socio-economic status has been described as a factor favoring the onset of ARA. This is due, among other things, to late recourse to treatment for lack of financial means. More than half (56.49%, n=87) of patients had a low socio-economic level. These results are in line with data from studies carried out in Africa [11]. It's an established fact that poverty, promiscuity and poor hygiene promote the outbreak of RHD. The decline in these rates is due to a slight improvement in people's standard of living. Recurrent tonsillitis increases the risk of RHD, affecting 30.56% of patients. Similar data have been noted in Togo [4]. Indeed, it has been shown that there is a cross-antigenicity with a similarity between microbial Ag and human Ag, leading to the production of antibodies, affecting some organs such as the heart, joints and skin. Preventing rheumatic heart disease requires improving the socio-economic conditions of populations and combating precariousness in underprivileged environments. The severity of ARA lies in the cardiac damage, particularly valvular damage, which determines the vital and functional prognosis of the disease. In our study, just over half the patients (56.76%, n=21) were affected by valvular disease. The mitral valve was most affected, in the form of mitral insufficiency (38.10%). The same finding was found in the school survey conducted in Senegal, with a proportion of 80% [9]. Polyvalvular damage affected 30.10% of patients. Aortic valvulopathy was less frequent than mitral damage, as noted in other studies [9]. All these results show that damage to various cardiac tissues is very common in rheumatic fever. The frequency of mitral damage can be explained by the fact that left-sided pressures are higher than right-sided intracardiac pressures, although this hypothesis is not fixed in the literature [11, 12, 13]. Management was mainly medical in our series, the study being carried out in the medical emergency department. Management included prevention of rheumatic progression with long-term penicillin therapy, and prevention of cardiac failure with digitalis-diuretics. None of our patients received surgical treatment in our case series, in contrast to other studies [14]. This can be explained by the fact that surgery is out of the

patient's reach in low and middle income countries [15]. The outcome was favorable after medical treatment, with stabilization following hospitalization. We recorded three cases of death in congestive heart failure with hypotension and hypoxia refractory to medical treatment. The factors associated with these deaths were the child's age over 14, low socio-economic status and female gender ( $p < 0.003$ ).

## CONCLUSION :

Rheumatic heart disease is common in low-income countries. Prevention involves effective management of angina and improving people's standard of living. Setting up a national RHD registry will enable us to monitor trends in the prevalence of the disease.

## CONSENT

As per international standard, parental written consent has been collected and preserved by the author(s).

## ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

Table1 : Distribution of patients by age group

age group (years)	Effectif	Percentage %
3 – 10	8	21.62%
10 – 15	25	67.57%
15 – 18	4	10.81%

Table 2 : Distribution of patients by biological signs

Biological signs	Number	Percentage %
Hyperleukocytosis	18	50,00
Inflammatory anemia	30	83,33
Positive CRP	33	91,67
Positive ASLO (> 200)	25	67,57
Hyponatremia	12	32,43
Hypokalemia	10	27,03

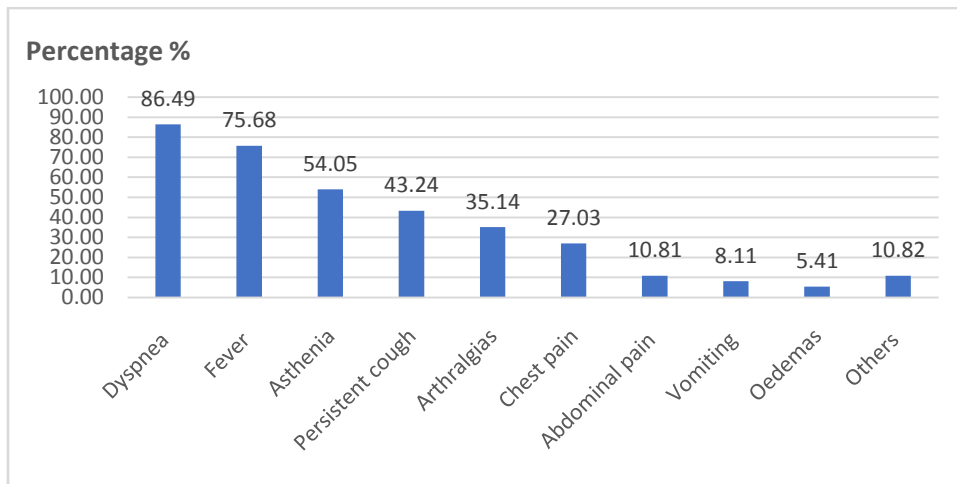


Figure 1 : Distribution of patients by reasons for hospital admission

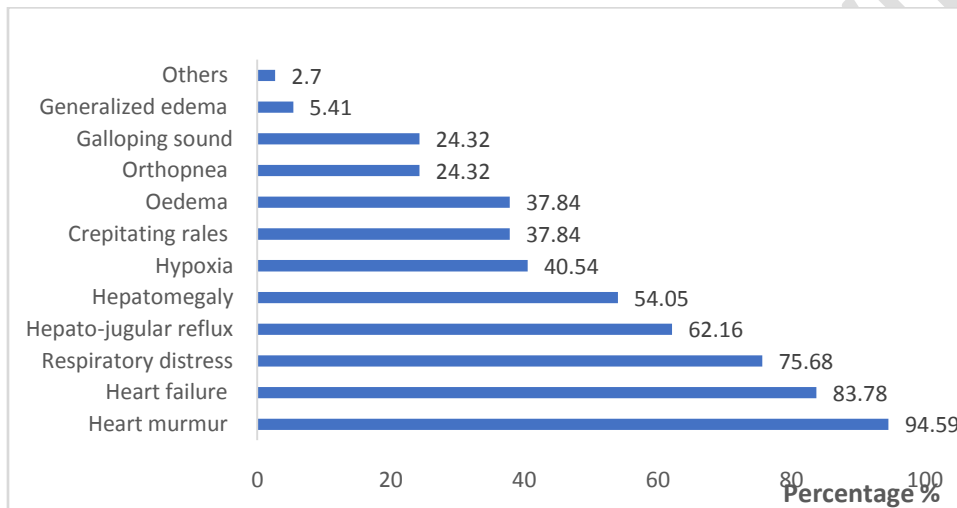


Figure 2 : Distribution of patients by physical signs

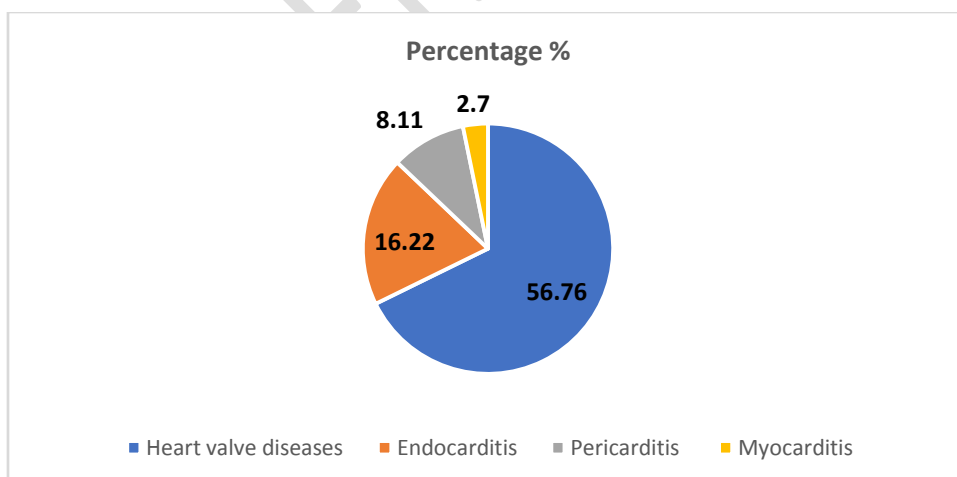


Figure 3 : Distribution of patients by cardiac damage

## REFERENCES

- 1- Ba-Saddik IA, Munibari AA, AL-Nageeb MS et al. Prevalence of rheumatic heart disease among school children in Aden-Yemen. *Ann Trop Paediatr* 2011; 31:37–46.
- 2- World Heart Federation. *Diagnosis and Management of RAA and MCR*.2007. Update October 2008: 1-29
- 3- Guidelines for the diagnosis of rheumatic fever Jones Criteria 1992 update. Special Writing Group of the Committee on Rheumatic Fever, Endocarditis, and Kawasaki Disease of the Council on Cardiovascular Disease in the Young of the American Heart Association. *JAMA*, 1992;268
- 4- Goeh akuee, Gbeasor F.D., Baragou S. al, Rheumatic heart disease at the Tokoin University Hospital Center in Lomé. *Science and Medicine, Rev. CAMES 2008- Series A, Vol.06: 1-6*
- 5- S Sidibé, N Diallo, AK Sacko, et al. Rheumatic heart disease in Bamako: About 52 cases. *Research en* 2018;5:2591.
- 6- BA HO, Sangaré I, Camara Y, et al. Adult Rheumatic Valvulopathy at Gabriel Touré University Hospital: About 314 Cases. *Health sciences and disease* 2022; 23(4).
- 7- Medium G; Okoko A, Mbika AC et al. acute rheumatic fever and rheumatic heart disease in children in brazzaville. *Méd Afr Noire: 1999, 46 (5), 2.7.22, (259-263)*
- 8- WHO. World Health Organization, Rheumatic heart disease. Report of the Secretariat, Executive Board One Hundred and Forty-first Session Item 6.2 of the provisional agenda, EB141/4, May 1, 2017
- 9- Ngaide AA, Mbaye A, Kane A et al. Prevalence of rheumatic heart disease in Senegalese school children: a clinical and echocardiographic screening. *Heart Asia* 2015, 7:40-45
- 10- Watkins DA, Johnson CO, Colquhoun SM. Global, regional, and national burden of rheumatic heart disease, 1990–2015. *N Engl J Med* 2017, 377:713–722,.
- 11- The newsletter of the diploma and capacity in tropical medicine from the countries of the Indian Ocean. No. 16. June 2009
- 12- Touré M.D, Baldé A. Condé, B.M. Touré, M. Fofana: Epidemiological, clinical and progressive aspects of 89 cases of rheumatic mitral disease. *Méd Afr Noire: 1998, 45 (5).*
- 13- Panduleni Penipawa Shimanda, Stefan Söderberg, Scholastika Ndatinda Ipinge, Ebba Mwalundouta Neliwa, Fenny Fiindje Shidhika and Fredrik Norström. Rheumatic heart disease prevalence in Namibia : a retrospective review of surveillance registers. *BMC Cardiovascular Disorders : 2022, 22, 266, P 1-10*

14. World Health Organization ; Executive Council , 141. ( 2017). Rheumatic heart disease: draft resolution proposed by Australia, Brazil, Canada, Ecuador, Fiji, Cook Islands, Japan, Namibia, New Zealand, Pakistan, Samoa, Tonga and Tuvalu (view 11/22).

15. Belay W and Aliyu MH. Rheumatic Heart Disease is Missing from the Global Health Agenda. *Annals of Global Health*. 2021; 87(1): 110, 1–6.

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