

Rheumatic Heart Disease In Chad: Clinical, Paraclinical, Therapeutic And Progressive Aspects

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Abstract

Introduction: Rheumatic heart disease is mostly common in low-income or developing parts of the world, such as Sub-Saharan Africa, with a high morbidity and mortality rate. There are few data that are available in Chad on rheumatic heart disease. Our objective was to study the clinical, echocardiographic, therapeutic, and progressive aspects of rheumatic heart disease at the Renaissance University Hospital Center and the National Reference Teaching Hospital in N'Djamena, Chad.

Patient and methods: This was a prospective, multicenter and observational cohort study, covering a consecutive series of patients consulted and/or hospitalized for rheumatic heart disease, documented by an echocardiogram from January 2015 to January 2021.

Results: Among the 4456 patients consulted and/or hospitalized, 398 cases of rheumatic heart disease (8.9%) were collected, and 364 patients had met the inclusion criteria. The mean age was 31.2 ± 14.4 years, and 193 patients (53%) were female. On admission, heart failure was present in 214 patients (58.8%), ischemic stroke in 10 patients (2.7%) and supraventricular arrhythmias such as atrial fibrillation in 94 patients (25.8%) and atrial flutter in 6 patients (1.6%). Mitral regurgitation was observed in 49.7% (n=181), of cases, aortic regurgitation in 33.2% (n=121), mitral stenosis in 31.3% (n=114), and aortic stenosis in 7.7% (n=28). At least two valvular disorders were combined in 48.4% of cases. A surgical intervention such as a heart valve replacement and/or valvuloplasty was performed in 80 patients (22.2%). At least one rehospitalization was noted in 56.9% of patients. Forty-two of the 150 patients free of heart failure at inclusion (28%) had experienced the first episode of decompensated heart failure during follow-up. On the other hand, in 119 patients (55.6%), it was the second episode of decompensated heart failure. Other progressive complications included atrial fibrillation (13.8%), thromboem-

bolic complications (6.3%), infective endocarditis (6.0%) and prosthetic valve dysfunction (1.4%). Altogether, the mortality rate was 10.4%. It was 9.9% in non-operated patients compared to 12.5% in operated patients ($p=0.49$).

Conclusion: The present study shows that morbidity and mortality of rheumatic heart disease remain high in our context and often affect children, young adults and women. Treatment is essentially based on cardiac surgery which is not available in Chad.

Introduction

Rheumatic heart disease is mostly common in low-income or developing parts of the world, such as Sub-Saharan Africa, with a high morbidity and mortality, particularly in the population of those aged under 30 [1]. According to the WHO, the prevalence of rheumatic heart disease is estimated to be 15.6 million people worldwide, particularly predominant among disadvantaged populations in developing countries with approximately 233,000 deaths per year [2–5]. Despite the considerable progress made in recent years in the field of diagnosis and treatment, serious multiple complications such as heart failure, atrial fibrillation, infective endocarditis, and thromboembolic complications hamper the evolution of these conditions in our context [6]. A heart valve repair surgery is guaranteed to improve the quality of life of these patients, but is unfortunately not accessible in Chad. Prevention antibiotic prophylaxis which is an alternative choice, is not very well known and is not always applied by health professionals [7]. This highlights the importance of early diagnosis and appropriate management of patients with rheumatic heart disease. In Chad, few data on rheumatic heart disease are available, however, in a recent study about cardiovascular diseases, rheumatic heart disease was the fifth main cause of hospitalization in cardiology, with a prevalence of 12.3% [8]. The objective of this study was to specify the clinical, echocardiographic, therapeutic, and progressive aspects of rheumatic heart disease in Chad.

Patient and Methods

This was a prospective, multicenter and observational cohort study, carried out in the cardiology department of the National Reference Teaching Hospital Center, Renaissance University Hospital Center and the Good Samaritan University Hospital in N'Djamena, Chad. A consecutive series of patients were consulted and/or hospitalized for rheumatic heart disease and documented by an echocardiogram from January 2015 to January 2021.

Study population

Patients aged 15 years and above were given an informed consent to participate in the study. The diagnosis of rheumatic heart disease had been confirmed by a doppler echocardiography and the etiology of the rheumatic heart disease was also included. This etiological diagnosis was made considering a history of acute rheumatic fever and/or precordial abnormalities such as the presence of cardiac murmurs, but above all, it was based on the echocardiographic diagnostic criteria established by the World Heart Federation (WHF). This criteria considered the morphology of the valves, the subvalvular apparatus and

the doppler ultrasound [9]. Patients with rheumatic fever but without a leaky heart valve, whose echocardiographic data were incomplete or unavailable and those with a valvular heart disease of non-rheumatic etiology were all excluded from the study.

Study variables and data collection tool

The variables studied were sociodemographic characteristics, clinical data during patient admission, electrical and echocardiographic data. The various medical and surgical therapies were also recorded.

The evolving data concerned the various progressive complications (hemodynamic, rhythmic, thromboembolic, and infectious complications). The mortality study specified the different causes of death. These data relating to each patient were recorded on a previously established data collection sheet. These forms were completed by the doctors. Cardiac surgery, not available in Chad, was made possible for operated patients thanks to the regional program of the international non-governmental organization (NGO) “EMERGENCY” . The NGO runs from 2007 the free of charge Salam Centre for cardiac Surgery based in Khartoum, Sudan threatening patients coming from 24 African countries.

The evaluation of the severity of valvular lesions, systolic dysfunction of the left ventricle (LVEF \leq 50%) and dilatation of the left ventricle (DTDLV \geq 55 mm) was carried out by referring to the recommendations of the European Society of Cardiology (ESC), American Heart Association (AHA) and American College of Cardiology (ACC) on the management of patients with valvular heart disease [10, 11]. A second echocardiographic evaluation of each patient was carried out by an external cardiologist from the Salam Center for Surgery. In the event of discrepancy concerning the etiology or severity of the lesions, a direct exchange between the two sonographers was made to refine the results. The source of the data was from the Chad Rheumatic Valve Disease Registry, which was available in the cardiology department of the Renaissance University Hospital.

Ethical considerations

Patient consent was obtained. However, a patient’s refusal to participate in the study did not affect their subsequent care. The confidentiality of the data collected was guaranteed.

Data analysis

Data analysis was carried out using Epi Info Software version 7.1. Quantitative parameters were presented as a mean \pm standard deviation, while qualitative parameters was as percentages. Pearson’s Chi-square test was used for the comparison of proportions. When

application conditions were not observed, Fisher’s exact test was used. The Student’s T test was used to compare two means. The statistical significance threshold retained was $p < 0.05$.

Results

Epidemiological characteristics of study patients.

Among the 4456 patients consulted and/or hospitalized, 398 cases of rheumatic heart disease (8.9%) were collected, while 364 patients percentage met the inclusion criteria. The mean age was 31.2 ± 14.4 years, and 193 patients (53.1%) were females. The 112 patients (30.8%) resided in rural areas and 200 patients (54.9%) that are not educated. Table 1 summarizes the sociodemographic characteristics of the patients.

Table 1. Sociodemographic, clinical and electrocardiogram characteristics of the 364 Patients

Parameters	Mean \pm Standard Deviation	Effectives (%)
Age (years)	31.2 \pm 14.4	
15-24		161 (44.2)
25-34		84 (23.1)
35-44		57 (15.7)
45-54		42 (11.5)
\geq 55		20 (5.5)

Gender		
Male		171 (47)
Female		193 (53)
Rural residence		112 (30.8)
Educational level		
None		200 (54.9)
Primary school		17 (4.7)
Secondary school		81 (22.3)
University graduate		66 (18.1)
History of recurrent angina		66 (18.1)
Symptoms		
Dyspnea		284 (78)
Palpitations		254 (60.8)
Precordialgia		149 (40.9)
Cough		110 (30.2)
Heart failure		214 (58.8)
Focal neurologic deficit		10 (2.7)
Left atrial hypertrophy		155 (42.6)
Left ventricular hypertrophy		194 (53.3)
Atrial fibrillation		94 (25.8)
Atrial flutter		7 (1.9)
Focal atrial tachycardia		4 (1.1)

Clinical and paraclinical characteristics

The reasons for consultations were dyspnea on exertion (78%), palpitations (69.8%) and precordialgia (40.9%). On admission, heart failure was present in 214 patients (58.8%) and neurological deficit was present in 10 patients (2.7%). Impaired renal function (GFR <60 ml/min) was found in 93 patients (25.5%). On admission electrocardiogram, atrial hypertrophy and left ventricular hypertrophy were found in 42.6% (n=155) and 53.3% (n=194) of cases, respectively. The electrocardiogram also recorded a supraventricular tachycardia disorder such the atrial fibrillation in 25.8% of cases (n=94). Cardiac ultrasound revealed one valvular involvement in 152 patients (41.8%) and two valvular involvements in 58.2% of cases. Mitral valve regurgitation was observed in 49.7% of cases (n=181), aortic valve regurgitation in 33.2% of cases (n=121), mitral valve stenosis in 31.3% of cases (n=114) and aortic valve stenosis in 7.7% of cases (n=28). In 67 patients (18%) mitral valve regurgitation was associated with aortic valve insufficiency and 39 patients (11%) had mitral valve disease. The mean left ventricular end-diastolic diameter (LVEDD) was measured at 54.4 ±13.1 mm and dilatation of the LV (LVEDD >55mm) was noted in 50% of cases. The mean left ventricular ejection fraction (LVEF) was calculated at 59.1 ± 10.6% and a moderate alteration of the LVEF (≤ 45%) was noted in 49 patients (13%). The distribution of valvular diseases and other ultrasound parameters are presented in Table 2.

Table 2. Echocardiographic features of 364 patients with rheumatic heart disease predominantly valvular lesions

Echocardiographic Parameter	Valvular lesions				
	All cases	MVR	MVS	AVR	AVS
Total cases	364 (100%)	181(50%)	114(31%)	121(33%)	28(8%)
Systolic function and dimensionc					
Mean LVEDD (mm)	54 ± 13	58 ± 12	49 ± 13	59 ± 13	55 ± 13
LVEDD > 55 mm	183 (50%)	112 (62%)	32 (28%)	73 (60%)	13 (46%)
Mean LVESD (mm)	36 ± 12	39 ± 12	32 ± 12	40 ± 12	37 ± 11
LVESD > 45mm	65 (18%)	40 (22%)	10 (9%)	35 (29%)	6 (21%)
Mean LVEF (%)	59 ± 11	59 ± 11	59 ± 9	57 ± 12	54 ± 14
LVEF ≤ 45%	49 (13%)	27 (15%)	10 (9%)	27 (22%)	7 (25%)
Mean LATD (mm)	48±13	51 ± 12	49 ± 12	47 ± 13	40 ± 114
LATD > 50 mm	164 (45%)	89 (49%)	60 (53%)	52 (43%)	9 (32%)
Mean RVSP (mmHg)	52±23	55 ± 21	62 ± 27	48 ± 20	42 ± 20
RVSP > 35 mmHg	250 (69%)	149 (82%)	90 (79%)	85 (70%)	14 (50%)
Valvular regurgitation (mild, moderate, severe)					
Mitral valve (%)	181(49,7)	15: 35: 50%	7: 10: 4%	11: 14: 12%	3: 1: 2%
Aortic valve (%)	121(33,2)	25: 21: 10%	16: 12: 4%	38: 41: 21%	2: 7: 4%
Tricuspid valve (%)	90 (24,7)	24: 40: 9%	12: 22: 7%	13: 12: 4%	2: 5: 2%

MVR : Mitral valve regurgitation, MVS : Mitral valve stenosis, AVR : Aortic valve regurgitation, AVS : Aortic valve stenosis, LVEDD : Left Left ventriculaire end-diastolic diameter, LVESD: Left ventricular end-systolic diameter, LVEF: Left ventricular ejection fraction, LATD : Left atrial tranverse diameter, RVSP : Right ventricular systolic pressure.

Therapeutic characteristics

A high proportion of patients were under standard medical treatment for heart failure with 87.1% of patients on loop diuretics, beta blockers (65.7%), aldosterone inhibitors (38.5%) and angiotensin converting enzyme inhibitor or angiotensin II receptor antagonist (42.5%). Oral anticoagulant treatment mainly based on vitamin K antagonists was used in 187 patients (51.4%) and secondary prophylaxis based on penicillin was used in 146 patients (40.1%). Surgical intervention was performed in 80 patients (22%). (Table 3)

Outcomes

After a mean follow-up time of 25.4 ± 13.8 months, 56.9% of patients had been rehospitalized at least once for a cardiovascular cause. During follow-up, the rate of heart failure increased in 256 patients (70,3%) versus 214 patients (58,8%) on admission. On the other hand, in 119 patients (55.6%), there was a recurrence of a decompensated heart failure. Other progressive complications included atrial fibrillation (13.8%), cardiac thromboembolism (6.3%), infective endocarditis (6.0%) and prosthesis

Table 3. Types of medical treatment for 364 patients with rheumatic heart disease

Parameter	Effectives (%)
Oral anticoagulants (VKA)	187 (51.4)
Amiodaron	68 (18.7)
Aldosterone inhibitor	140 (38.5)
Beta blocker	239 (65.7)
Loop diuretics	317 (87.1)
Digoxin	17 (4.7)
Nitrate derivatives	9 (2.5)
Angiotensin converting enzyme inhibitor/ Angiotensin II receptor antagonist	155 (42.6)
Benzathin penicillin	146 (40.1)
Heart valve surgery	80 (22)
Mechanical prosthesis in valve replacement surgery	62 (17)
Valvular plasty	36 (9.9)

VKA : Vitamine K antagonist

Table 4. Different evolutionary modalities observed in 364 patients

Parameter	Means \pm Standard deviation	Effectives (%)
Mean follow-up times (months)	25.4 \pm 13.8	
Cardiology readmission		207 (56.9)
Progressive complications		
First episode of heart failure		42 (28)
Recurrence of heart failure		119 (55.6)
Atrial fibrillation		40 (13.8)
Thromboembolic complication		23 (6.3)
Infective endocarditis		22 (6.0)
Prosthesis dysfunction		5 (1.4)
Major bleeding		10 (2.7)
Death		38 (10.4)
Non-operated patients		28 (9.9)
Operated patients		10 (12.5)

dysfunction (1.4%). The mortality rate was 10.4% (n=38). It was 9.9% in non-operated patients (n=28) compared to 12.5% in operated patients (n=10) (p=0.49). Table 4 summarizes the different outcomes observed in our series. The main causes of death were cardiogenic shock (28.9%, n=11), acute lung edema (15.8%, n=6), end-stage renal failure (26.3%, n=10), stroke (13.1%, n=5), prosthesis dysfunction (10.5%, n=4), infective endocarditis (7.9%, n=3) and severe hemorrhage (10.5%, n=4).

Discussion

This prospective, multicenter and observational cohort study allowed us to clarify the epidemiology of rheumatic heart disease in our context. The context is marked by the predominance of poverty, malnutrition, promiscuity, and poor access to education and healthcare structures. These elements are major factors contributing to the occurrence of acute rheumatic fever (ARF) and hence rheumatic heart disease.

The prevalence of rheumatic heart disease was relatively high, which was 8.9% of the admissions in our series. This corroborates the work of Naibé et al. [8] about cardiovascular diseases in Chad, where it was reported that rheumatic heart disease was one of the most frequently found nosological groups (12.3%). This observation was also made by many other authors in African literature [5,12]. On the other hand, in developed countries, we are witnessing the disappearance of rheumatic heart disease, replaced by degenerative valve disease. Indeed, in western countries, a proper management of group A streptococcal infection and the reduction in acute rheumatic fever had led to a reduction in the incidence of rheumatic heart disease [13–15]. This situation calls mainly on african cardiologists to promote in their respective countries, primary prevention strategies for acute rheumatic fever and rheumatic heart disease because they are effective, inexpensive, and easy to implement.

This study also made it possible to describe the sociodemographic characteristics of our patients. These were young patients with an average age of 31.2 years, mainly female (53%) and not educated (54.9%). These results were consistent with many previous studies [2,5,12,16]. However, although our patients were young, the peak occurrence of rheumatic heart disease in our study was found to be in the age group between 15-24 years (44.2%). Rheumatic heart disease thus quickly becomes symptomatic at an early age reflecting the rapid progression of this condition in our context. Our data contrasts with those in the literature where this peak would be around the 4th decade [17] and in our context, reflect on an insufficiency in the secondary prevention of this condition.

The clinical profile reflected on the evolution of an advanced stage of the disease. Most patients had moderate to severe valvular damage with a LV dilatation in half of the patients and an increase in pulmonary pressures in 69% of the cases. These patients had a very high risk of developing a cardiovascular complication. Heart failure was thus present in 58.8% patients on admission, confirming the crucial role of rheumatic heart disease in the etiopathogenesis of heart failure in Chad and sub-Saharan Africa [18]. Certainly, the misuse of secondary antibiotic prophylaxis would partly explain this rapid progression of the disease. However, it is also necessary to underline the deleterious role of numerous other factors, namely the low socio-economic level of most patients, the absence of universal health insurance, the traditional mindset of health, the inaccessibility of healthcare structures and the poor healthcare systems. These various intertwined factors would not promote early treatment of these patients and would not guarantee continuity of proper management once it has been initiated.

The management of patients with rheumatic heart disease represents a real challenge for cardiologists in our context, marked by the inaccessibility of reconstructive surgery for valvular heart disease [2,6,16]. Chad does not have a cardiac surgery center and patients with rheumatic heart disease must be evacuated abroad to benefit from quality care. Very expensive care which is unachievable for the majority of patients and is a drag on the budget of their already exhausted states. Only 22% of patients had undergone surgical intervention to repair valvular lesions when we know that the majority of patients were at the surgical stage. This reflects the disparity in population access to quality care between the countries of the South and those of the North.

In our study, vitamin K antagonist (VKA) were instituted in 51.4% of patients. Which is lower than the 70% VKA rate reported by Zühlke et al [6] in the REMEDY study. Initiation of anticoagulation when indicated in our context is relatively low and maintenance of the International Normalized Ratio (INR) within the target range is poor. Many factors contribute to this, namely the geographical and financial inaccessibility for many patients for the INR biological test (all the laboratories concerned are only located in the capital, N'Djamena) and the low level of education of patients regarding the management of their VKA treatment. Strategies to popularize INR examinations as well as better patient education are necessary given the high prevalence of thromboembolic and hemorrhagic complications linked to the use of VKA.

In developing countries, rheumatic heart disease remains the major cause of cardiovascular death in children and young adults [1]. In our series, we recorded a high mortality rate of 10.4% of the patients. Similar mortality rates, varying between 10 to 15% have been reported in the African literature [2,5,16] and significant inadequacies had been demonstrated in the field of primary, secondary and tertiary prevention of rheumatic heart disease.

Conclusion

The present study shows that morbidity and mortality of rheumatic heart disease remain high in our context and often affect children, young adults and women. Treatment is essentially based on cardiac surgery which is not available in Chad.

Conflict of interest

The authors declare no conflict of interest.

Author contributions

All authors read and approved the final version of the manuscript.

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