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Rheumatic disease diagnosed at the stage of chronic rheumatic valvular heart disease

THESIS

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BY

Mr. IFKIREN Amine

Born on September 14th, 1998 in Ouarzazate

TO OBTAIN THE DEGREE OF DOCTOR OF MEDICINE

KEYWORDS

RHEUMATIC HEART DISEASE – ACUTE RHEUMATIC FEVER – SUBCLINICAL CARDITIS – DELAYED DIAGNOSIS

JURY

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{رَبِّ أَوْزِعْنِي أَنْ أَشْكُرَ نِعْمَتَكَ
الَّتِي أَنْعَمْتَ عَلَيَّ وَعَلَى وَالِدَيَّ
وَأَنْ أَعْمَلَ صَالِحًا تَرْضَاهُ وَأَصْلِحْ
لِي فِي ذُرِّيَّتِي إِنِّي تُبْتُ إِلَيْكَ
وَإِنِّي مِنَ الْمُسْلِمِينَ}

سورة الأحقاف

بِسْمِ ٱللَّهِ ٱلرَّحْمَٰنِ ٱلرَّحِيمِ

قَالُوا۟ سُبْحَٰنَكَ لَا عِلْمَ لَنَآ إِلَّا مَا عَلَّمْتَنَآ ۖ إِنَّكَ أَنتَ ٱلْعَلِيمُ ٱلْحَكِيمُ ﴿٣٢﴾

صَدَقَ ٱللَّهُ ٱلْعَظِيمُ

Hippocratic Oath

I swear to fulfill, to the best of my ability and judgment, this covenant :

I will respect the hard-won scientific gains of those physicians in whose steps I walk, and gladly share such knowledge as is mine with those who are to follow.

I will apply, for the benefit of the sick, all measures [that] are required, avoiding those twin traps of overtreatment and therapeutic nihilism.

I will remember that there is art to medicine as well as science, and that warmth, sympathy, and understanding may outweigh the surgeon's knife or the chemist's drug.

I will not be ashamed to say "I know not," nor will I fail to call in my colleagues when the skills of another are needed for a patient's recovery.

I will respect the privacy of my patients, for their problems are not disclosed to me that the world may know. Most especially must I tread with care in matters of life and death. If it is given me to save a life, all thanks. But it may also be within my power to take a life ; this awesome responsibility must be faced with great humbleness and awareness of my own frailty. Above all, I must not play at God.

I will remember that I do not treat a fever chart, a cancerous growth, but a sick human being, whose illness may affect the person's family and economic stability. My responsibility includes these related problems, if I am to care adequately for the sick.

I will prevent disease whenever I can, for prevention is preferable to cure.

I will remember that I remain a member of society, with special obligations to all my fellow human beings, those sound of mind and body as well as the infirm.

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DEDICATIONS

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To all my teachers and friends from ARIHA School

I dedicate this work to all those who are dear to me, including those whom I may have unintentionally failed to mention.

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We thank you for agreeing to be part of the thesis committee. Within these few lines, we cannot fully convey our admiration and deepest appreciation for the exemplary professor you are. We are profoundly grateful for the high-quality instruction you provided both in the lectures and within your hospital department. We are also immensely thankful for allowing us to incorporate your department into our study. Please be assured of our deepest respect.

To my Dear Master and thesis Judge, Professor ZOUIZRA Zahira, Professor of Cardiovascular Surgery at the Mohammed VI University Hospital of Marrakesh,

We are deeply moved by the enthusiasm with which you agreed to be part of our esteemed committee. Your professional journey, undeniable expertise, and personal qualities establish you as a distinguished professor and serve as an inspiration to us. Through this work, please allow me to present a testament to my profound respect and to express my sincere gratitude.

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It is with immense gratitude that I acknowledge your contribution to my thesis committee. My experience in your department was invaluable; beyond the medical insights gained during visits, I learned the essence of teamwork and the profound responsibility we as students hold towards patients. Your integrity, benevolence, and generosity have been a constant source of motivation, pushing me to strive for excellence. This work stands as a testament to your impactful guidance.

ABREVIATIONS

LISTE DES ABRÉVIATIONS

AHA	: American Heart Association
AMO	: Assurance Maladie Obligatoire
AR	: Aortic Regurgitaions
ARF	: Acute Rheumatic Fever
AS	: Aortic Stenosis
BPG	: Benzathine Penicillin G
CNOPS	: Caisse Nationale des Organismes de Prévoyance sociale
CNSS	: Caisse Nationale de Sécurité Sociale
CRP	: C-Reactive Protein
E.g.	: Exempli gratia
ESR	: Erythrocyte Sedimentation Rate
GAS	: Group A Streptococcus
IL-17A	: Interleukin-17A
LV	: Left Ventricle
MR	: Mitral Regurgitation
MS	: Mitral Stenosis
NSAIDs	: Nonsteroidal Anti-Inflammatory Drugs
RAMED	: Régime de l'Assistance Médicale
RF	: Rheumatic Fever
RHD	: Rheumatic Heart disease
ST	: Sore Throat
TH1	: T Helper 1 Cells
VCAM-1	: Vascular Cell Adhesion Molecule 1
WHO	: World Health Organization

FIGURES & TABLES

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OUTLINE

INTRODUCTION

Rheumatic heart disease (RHD) is a chronic valvular heart condition resulting after a single severe or multiple episodes of untreated acute rheumatic fever (ARF). It is considered a disease of poverty, as it has almost disappeared in wealthy countries, however, it has been increasing in low- and middle income countries according to data of the 2019 Global Burden of Cardiovascular diseases [1,2].

ARF is caused by a complex interaction between group A streptococcus (GAS), a vulnerable host and environmental factors, which commonly affects the joints and heart. The cardiac involvement remains the gravity of this disease, which can be the origin of cardiac valves fibrosis, resulting of chronic heart failure. In contrast to joints involvement that always heal without sequelae[3].

Currently, the advancement of echocardiography and Doppler technology has allowed for a more accurate assessment of valvular damage, improved monitoring, and consequently a significant enhancement in the management of rheumatic carditis [4].

One of the most significant challenges in managing rheumatic heart disease is its late diagnosis, frequently attributable to the absence or under-diagnosis of preceding acute rheumatic fever episodes. Many patients in low- and middle-income countries present with advanced RHD without a documented history of ARF, which can lead to delayed initiation of secondary prevention, thereby permitting disease progression and culminating in severe morbidity or mortality.

The objective of our study was to conduct a descriptive analysis of the characteristics of chronic rheumatic heart disease, by examining the epidemiological, clinical, and echocardiographic profile through an analytical study conducted in Marrakesh, Tahannaout and Chichaoua. This analysis aimed to identify the factors contributingto the delayed diagnosis and management of RHD.

PATIENTS AND METHODS

I. Study type:

We conducted an observational, analytical study on patients followed for chronic rheumatic valvular heart disease and patients who have undergone cardiac surgery for rheumatic valvular affections over a period of 6 months, from February to July 2023.

For that purpose, patients were questioned using a survey that we developed for this study.

II. Aim of the study:

This study aims to assess the epidemiological, clinical, and echocardiographic features' findings in comparison to existing literature. We also identify the factors implicated in the delay in diagnosis and management of RHD.

III. Population:

1. Inclusion criteria:

Our target was patients followed for chronic rheumatic heart disease in the Cardiology Department at the Mohammed VI University Hospital, the Mohammed VI Provincial Hospital in Tahannaout, the Mohamed VI Provincial Hospital in Chichaoua, a private cardiology practice and patients who have undergone cardiac surgery for rheumatic valvular affections in the Cardiovascular Surgery Department at the Mohammed VI University Hospital.

2. Exclusion criteria:

We have excluded from the study, the patients with:

- Conditions not considered of rheumatic etiology, including:
  - Patients with degenerative valvular lesions
  - Patients with congenital valvular lesions
  - Patients with systemic diseases
  - Patients with infectious diseases (Syphilis...)
  - Patients with a medical history of radiotherapy
  - Patients with inconclusive anatomopathological findings for RHD

- Patients with unusable or lost medical records.

IV. Methods:

1. Data collection:

On one hand, the data (epidemiological profile, clinical profile and echocardiographic features) were obtained during consultations in the cardiology departments. On the other hand the data were provided by a thorough review of medical records in the cardiovascular surgery department at the Mohammed VI University Hospital. Following the record review, the patients were contacted to complete the necessary information.

The data from each patient was summarized in a patient medical sheet which contains our different studied criterions inclusive of: demographic characteristics, past medical history, clinical presentation, and echocardiographic profile. (Detailed in the Annex)

The demographic characteristics of the patients included data regarding their place of residence, distinguishing between urban and rural areas, and the region they resided in. Socio-economic conditions were assessed using several parameters, including the number of people living in the household, the number of rooms in the household, the educational level of the parents, sanitation facilities, access to clean water supply, household electrification, and access to healthcare services.

Additionally, the patients were inquired about their past medical history, including occurrences of recurrent tonsillitis, arthralgia, arthritis and previous episodes of acute rheumatic fever. For patients with a history of acute rheumatic fever, the 2015 revised Jones Criteria were searched for, and the prescribed treatment and secondary prophylaxis were reviewed. It should be noted that patients with a history of acute rheumatic fever in childhood could be diagnosed according to the older Jones criteria.

Furthermore, the data regarding the circumstances of the onset of rheumatic heart disease and its clinical manifestations were collected. The assessment of the severity of

rheumatic heart disease and its consequent impact were accomplished through the utilization of echocardiography.

2. Statistical analysis:

We recorded the collected data and performed a data analysis using Microsoft Excel 2021 version, and IBM SPSS Statistics.

RESULTS

I. Epidemiologic profile:

1. Establishment:

Our research encompassed both the public and private healthcare sectors and included a total of 150 participants. Within the public sector, representing 90% of the study population, the investigation included the Cardiology and Cardiovascular Surgery Departments of Arrazi Hospital, the Mohammed VI Provincial Hospital in Tahannaout, and the Mohamed VI Provincial Hospital in Chichaoua. Conversely, the private sector encompassed 10% of the studied population (Figure 1).

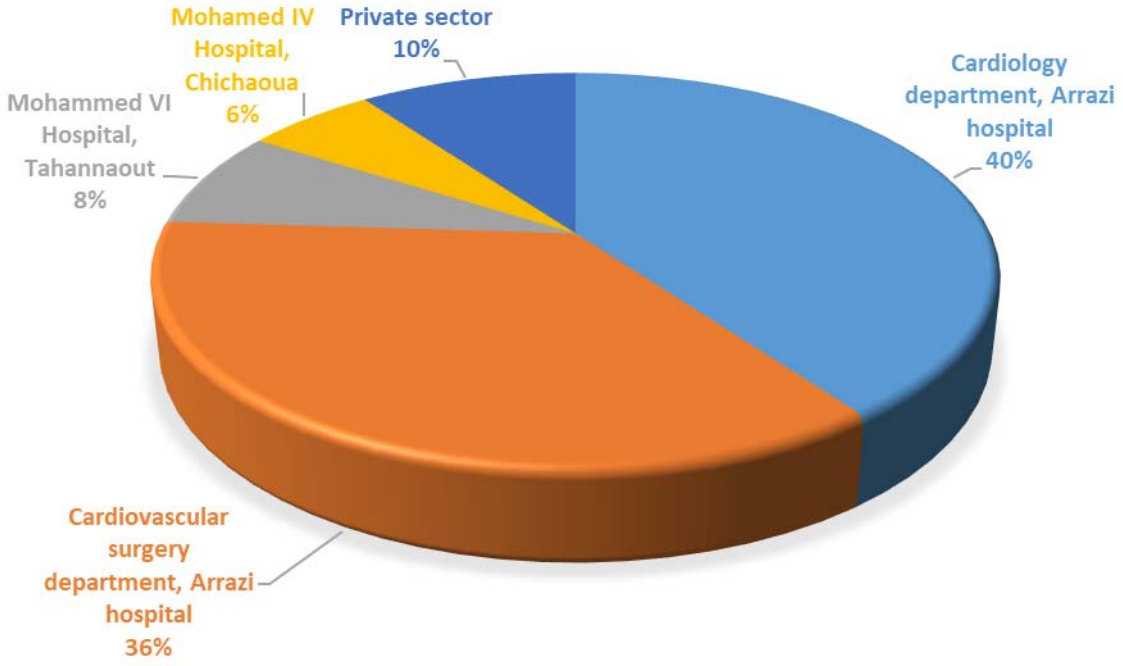

Figure 1: Distribution of the patients according to the establishment

2. Origin:

The patient demographic predominantly consisted of individuals from Marrakesh (37.3%), which comprised the largest proportion of the study population, followed by Tahannaout (10%), Chichaoua (8%) and, El Kelâat Es-Sraghna (8%) (Figure 2).

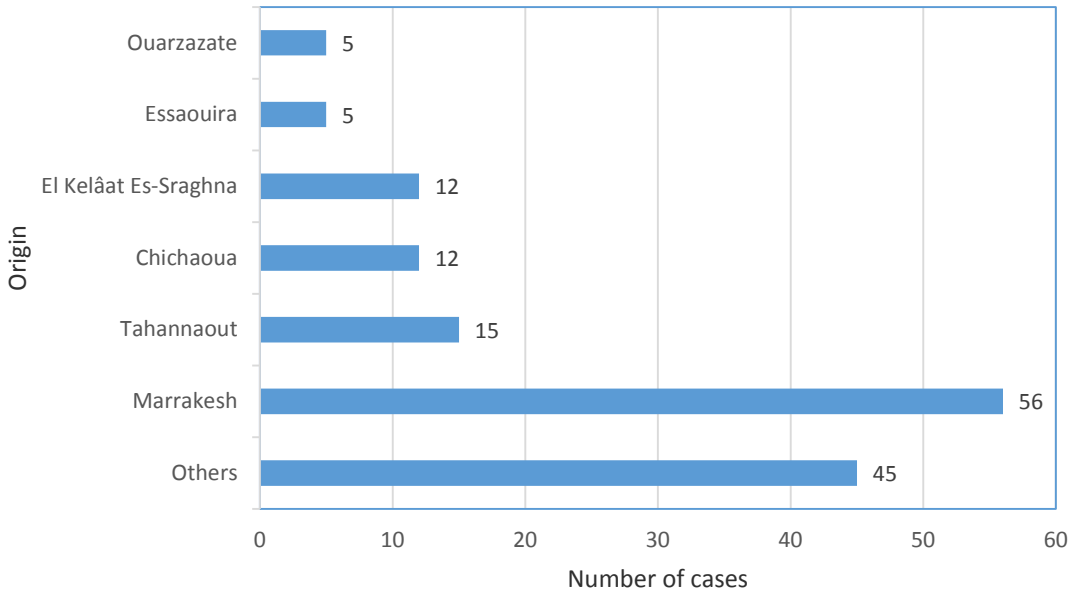

Figure 2: Distribution of the patients according to the origin

The majority of the patients in the study were from the Marrakesh-Safi region (83%) (Figure 3).

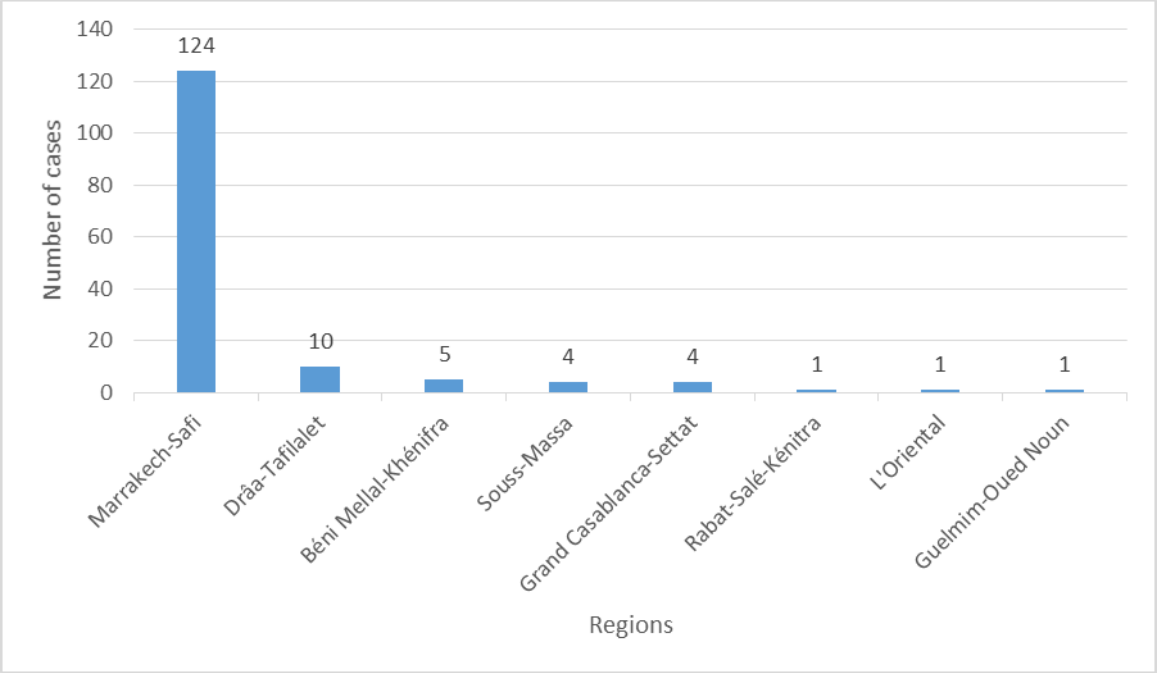

Figure 3: Distribution of the patients according to the region

3. Age:

The age distribution of the patients in the study ranged from 9 to 80 years, with a median age of 43.5. A high frequency was observed in the age group between 40 and 49 (Figure 4). It should be noted that the two patients aged 80 years had mitral stenosis, which is why they were included in the study.

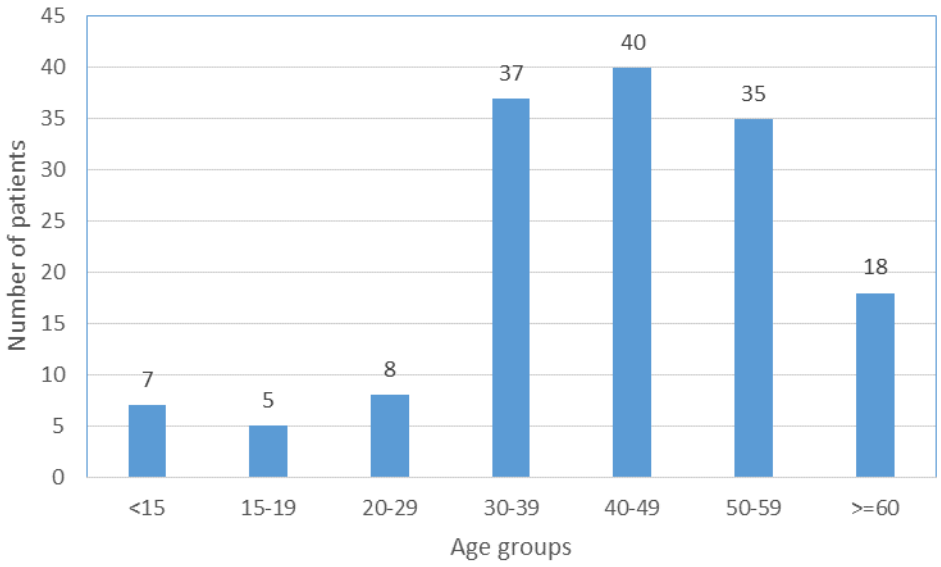

Figure 4: Distribution of the patients according to age groups

4. Gender:

In our study, we noted a female predominance, with 73% of the participants being female and 27% male, yielding a sex-ratio of 0.38 (Figure 5).

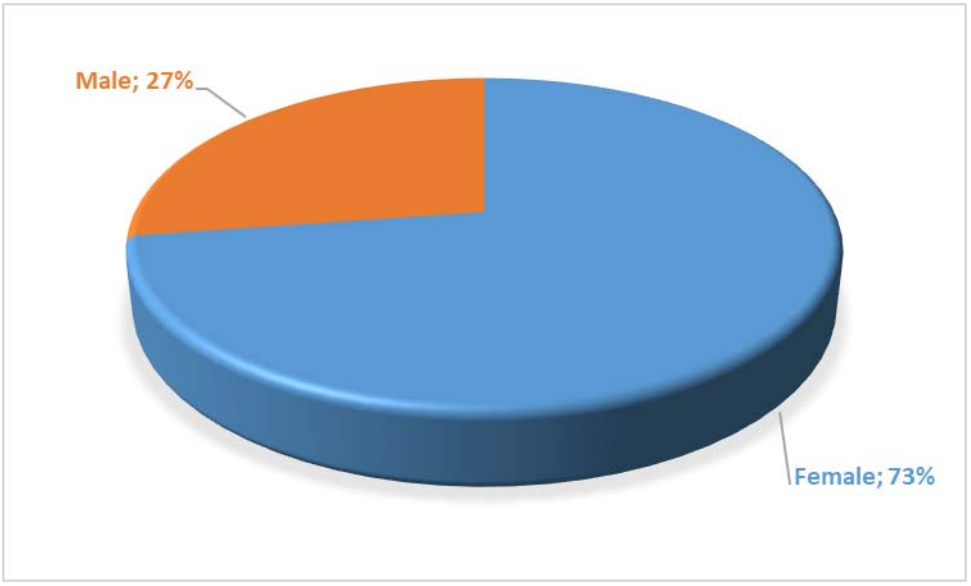

Figure 5: Distribution of the patients according to the gender

II. Socioeconomic Status:

1. Occupation:

Patients' occupations in the study ranged from homemakers to laborers, employees, and students. Homemaking was the most common occupation among the patients, accounting for 66% of the total. Additionally, 9.33% of the patients were students (Figure 6).

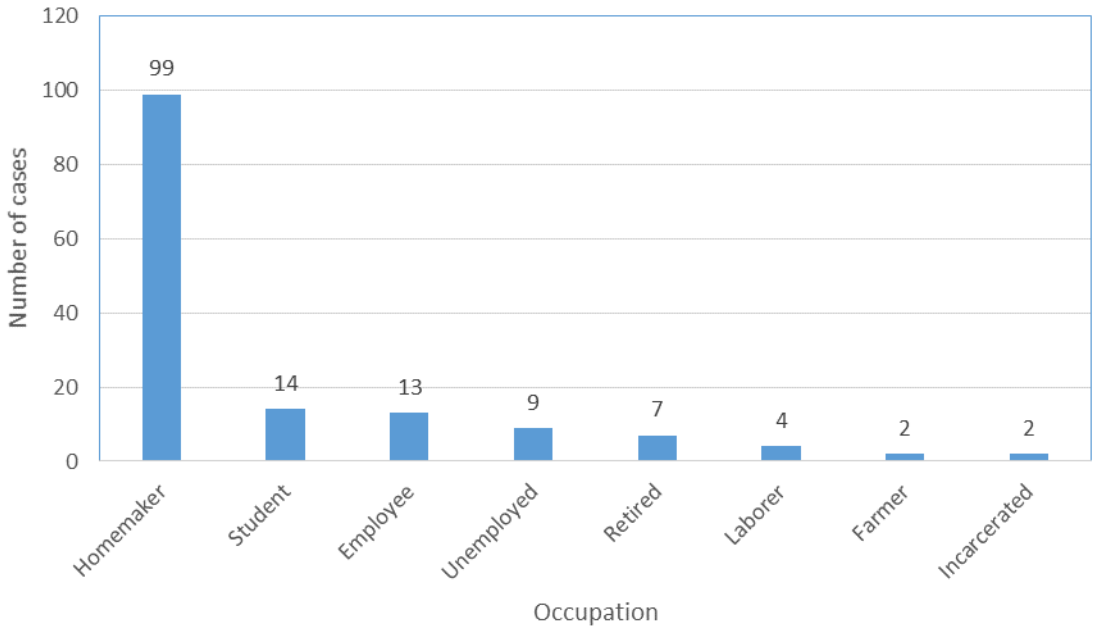

Figure 6: Occupation of the patients

2. Health insurance:

The most common health insurance among the patients was RAMED (Régime de l'Assistance Médicale), followed by AMO (Assurance Maladie Obligatoire). Additionally, 16% of the patients had no health insurance (Figure 7).

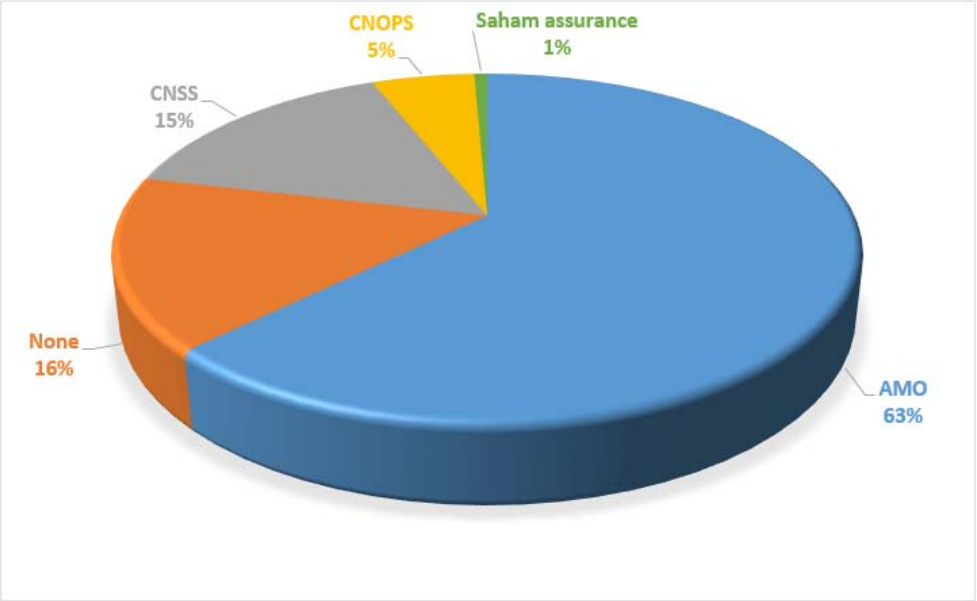

Figure 7: Distribution of the patients according to the health insurance

3. Area of residence:

The majority of the patients were recruited from urban areas (56%), and the remaining patients came from rural areas (44%) (Figure 8).

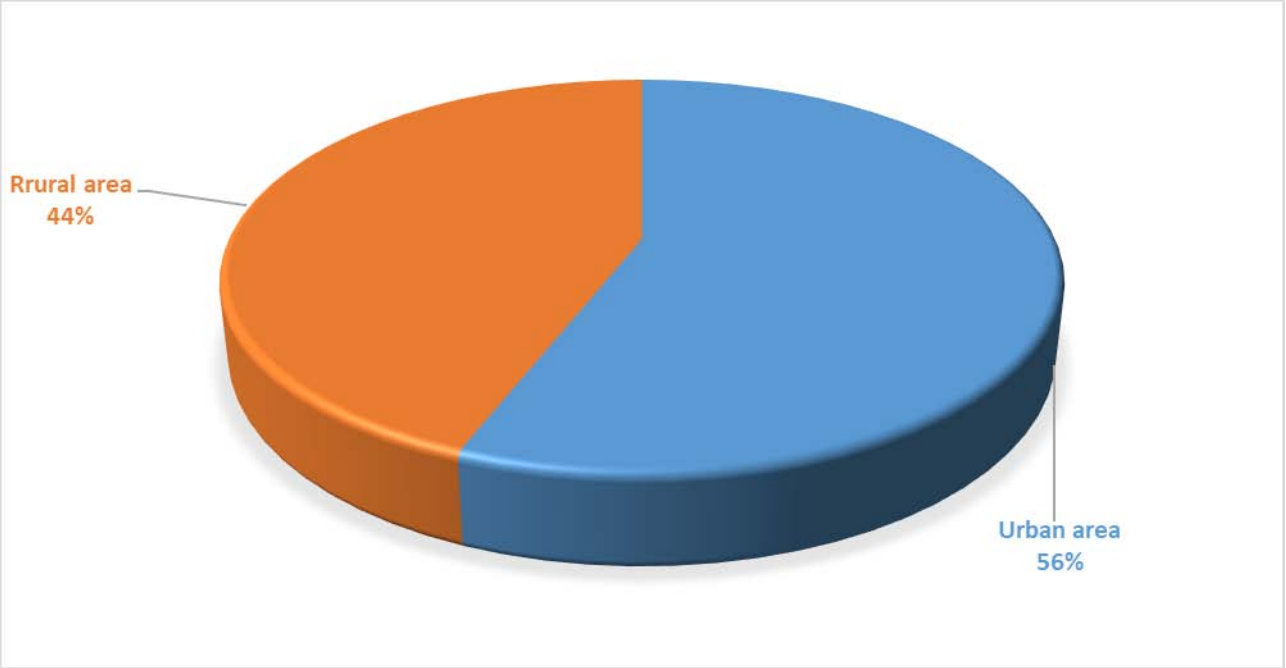

Figure 8: Distribution of the patients according to the areas of residence

4. Number of people per household:

The mean number of individuals per household in the study population was 6.51 (Figure 9).

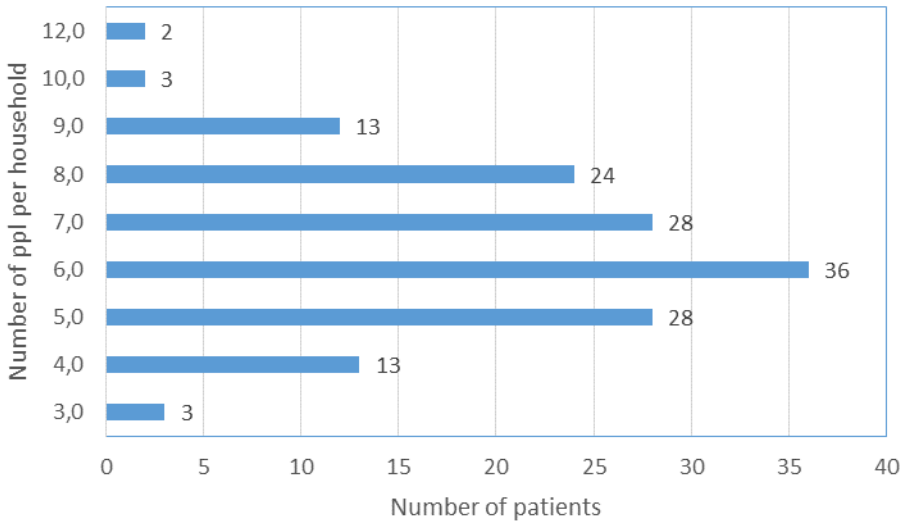

Figure 9: Distribution of the patients according to the number of people per household

5. Number of rooms per household:

The mean number of rooms per household in the study population was 3.25 (Figure 10).

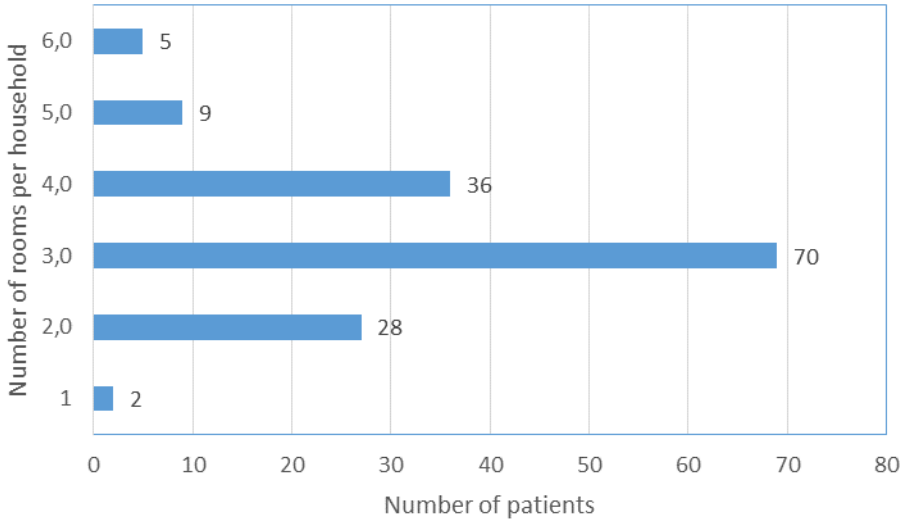

Figure 10: Distribution of the patients according to the number of rooms per household

6. Parent's education level:

In our study population, educational attainment among the patients' parents was notably low. Specifically, 90% of mothers had not received formal schooling. In contrast, among the fathers, 23.33% had completed primary school education, 20.67% had attained a middle school level of education, and 48% were unschooled. (Figure 11).

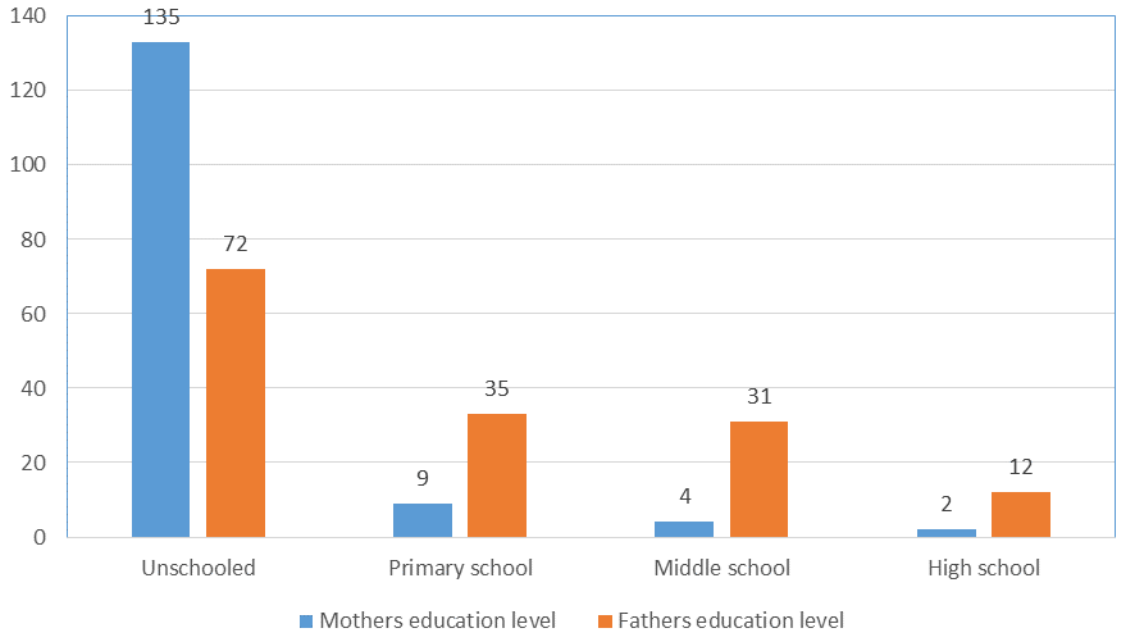

Figure 11: Parents' education level

7. Sanitary facilities:

Among the population studied, all 124 patients had access to at least one toilet in their house (Figure 12).

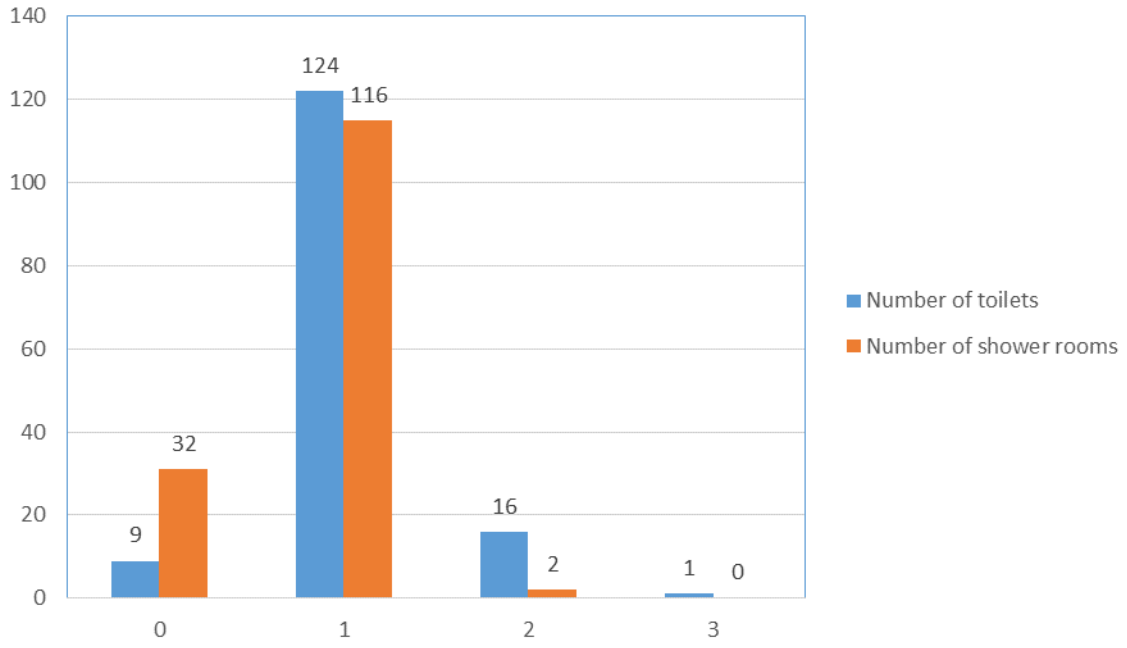

Figure 12: Distribution of the patients according to the number of toilets and shower rooms

8. Water supply:

Of the patients evaluated in the study, 92.7% had access to potable water.

9. Household electrification:

Of the patients evaluated in the study, 93.3% had access to electricity.

10. Access to healthcare:

Within our study, we found that 92% of the cases had some form of healthcare. Specifically, about 25.36% could see only a general practitioner, while about 74.64% had the advantage of seeing both a general doctor and a specialist. Unfortunately, around 8% lacekd any form of access to primary healthcare (Figure 13).

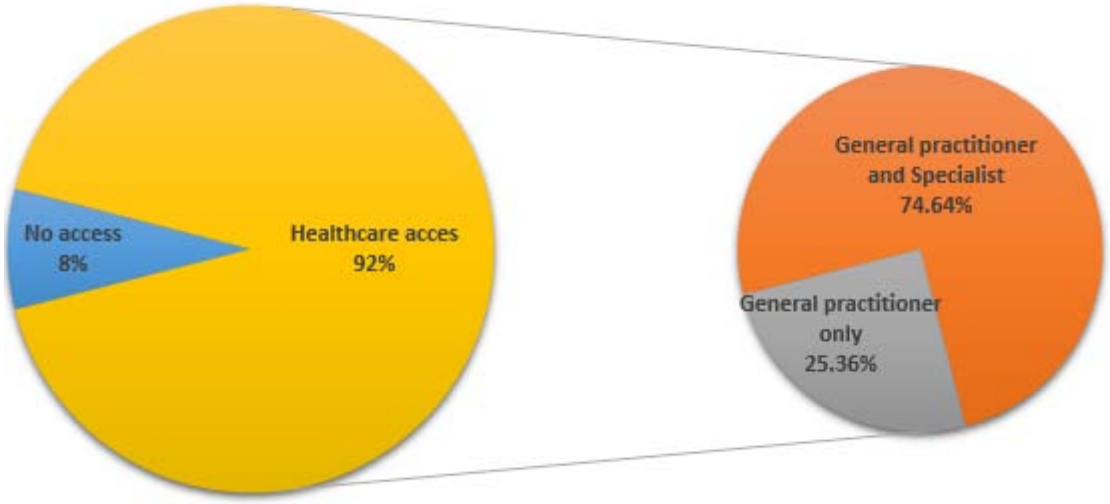

Figure 13: Access to healthcare

III. Clinical profile:

1. Past medical history

a) History of recurrent tonsillitis

A history of recurrent tonsillitis was present among 72% of the patients in the study (Figure 14). Furthermore, 52.78% of these patients had more than five episodes per year (Figure 15), and 60% remained untreated (Figure 16).

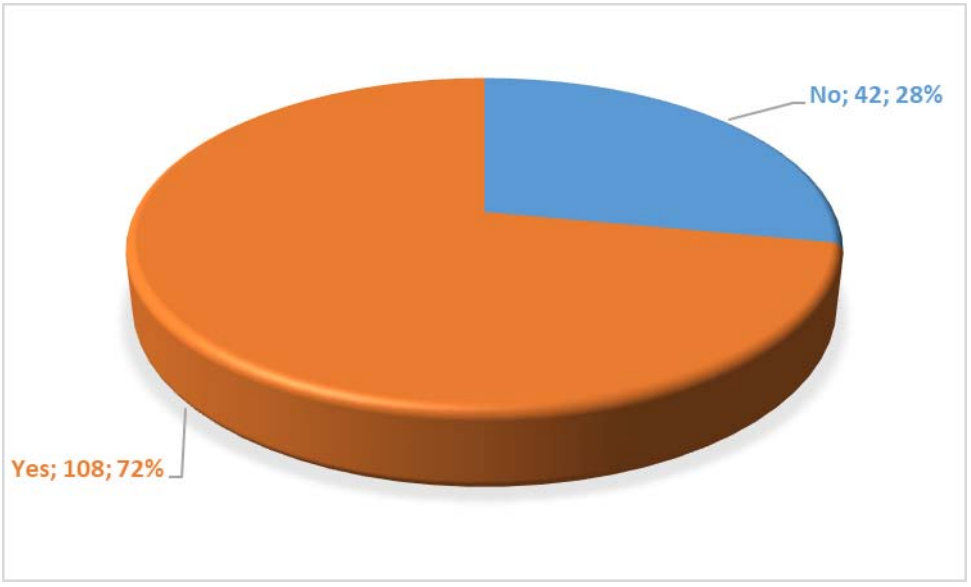

Figure 14: Distribution of the patients according to the history of tonsillitis

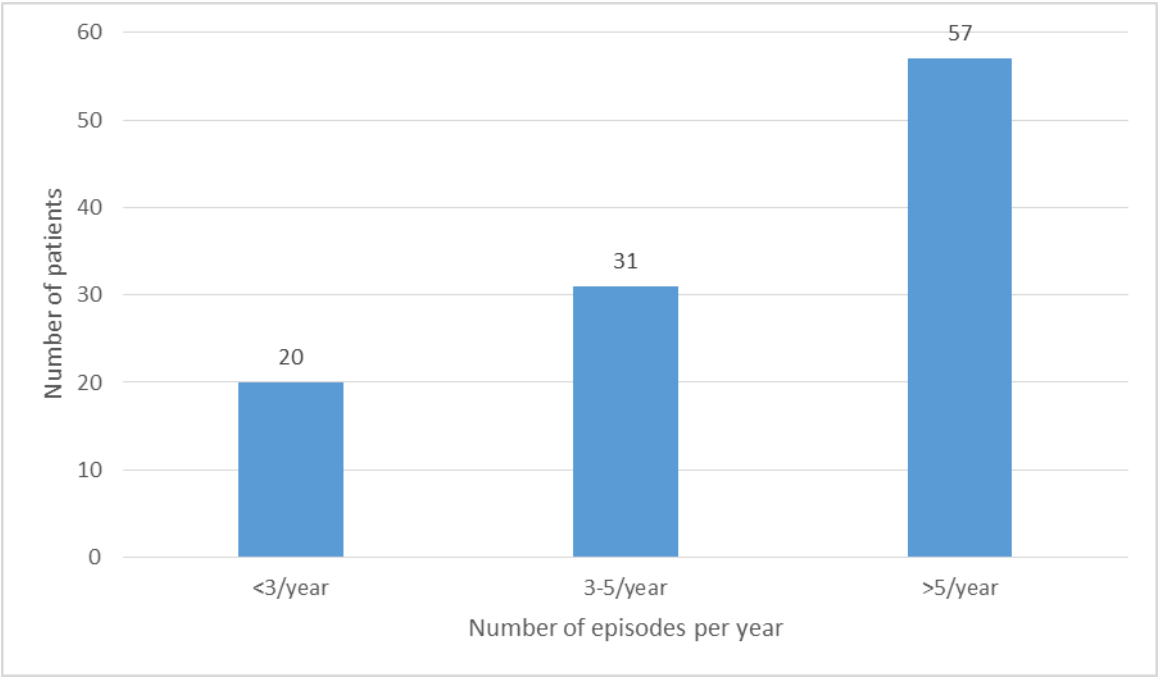

Figure 15: Distribution of the patients according to the number of episodes per year

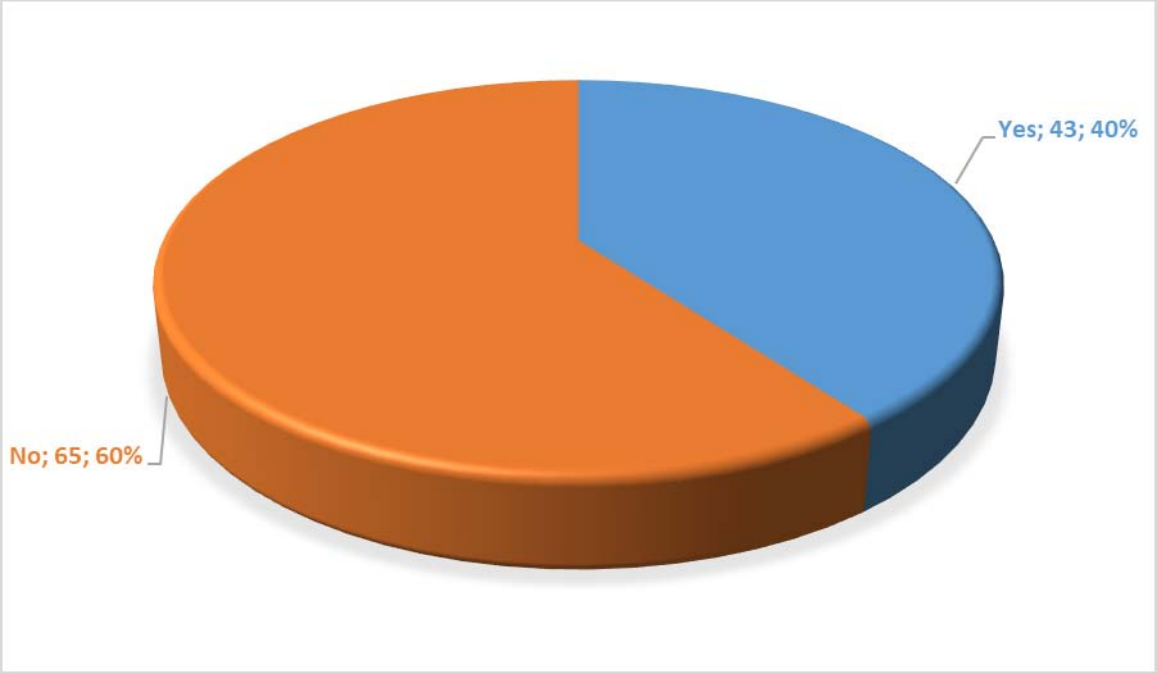

Figure 16: Treated cases of tonsillitis

b) History of arthralgia/arthritis:

Out of the 150 patients evaluated in our study, we noted that 93 (62%) had a history of arthralgia, and only 2 (1%) had arthritis (Figure 17). Among these cases, the site of arthralgia was localized to the large joints in 92.47% (Figure 18), and only 8 (8.42%) of these patients consulted a doctor.

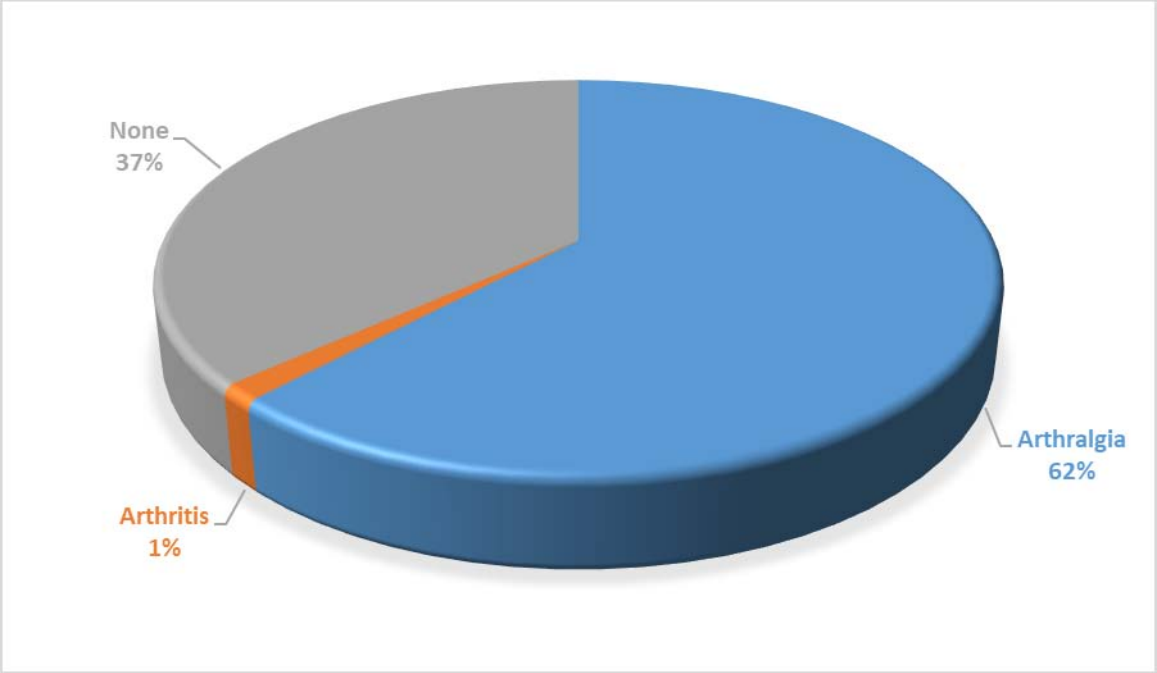

Figure 17: Distribution of the patients according to the history of arthritis/arthralgia

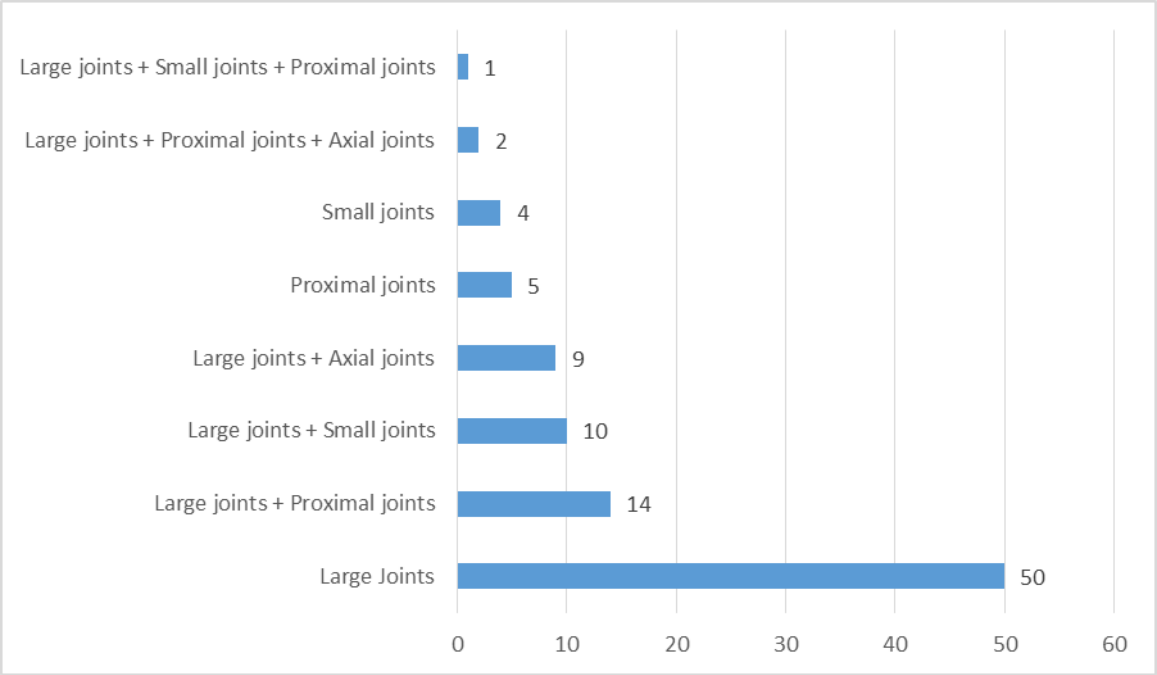

Figure 18: Localization of arthralgia/arthritis:

c) Tonsillectomy:

Only 4 of the patients (2.67%) evaluated in our study had a history of tonsillectomy.

d) Family history of ARF:

A family history of Acute Rheumatic Fever was present within 5 patients (3.33%) in our study.

e) Personal medical history of ARF:

Our study reported a history of acute rheumatic fever in 31 patients (21%) (Figure 19).

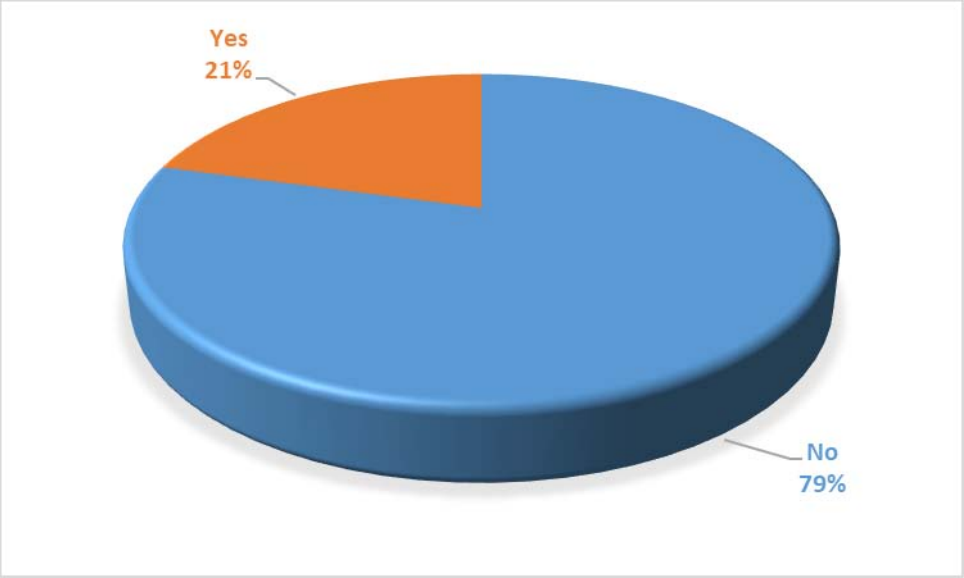

Figure 19: Distribution of the patients according to the personal medical history of ARF

f) Prescribed treatment:

In the management of patients diagnosed with acute rheumatic fever within our study, various therapeutic interventions were prescribed. Corticosteroids were administered to 19 patients, 10 patients received benzathine penicillin G, while Aspirin was prescribed for 3 patients. Additionally, 8 patients (25.8%) reported having received no treatment (Figure 20).

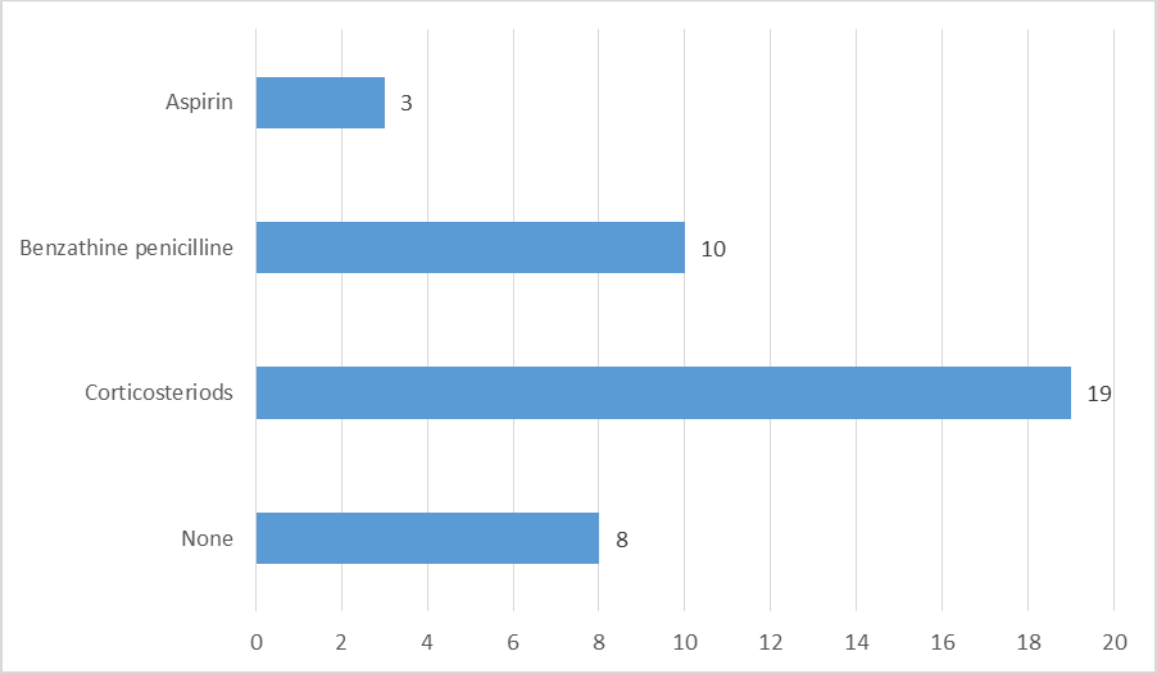

Figure 20: The prescribed treatment for patients with a history of ARF

g) Secondary prevention:

55% of the patients with a history of acute rheumatic fever benefited from secondary prevention.

h) Recurrence of ARF:

None of the patients in our study reported a recurrence of acute rheumatic fever.

i) Jones criteria:

Among the patients with acute rheumatic fever in our study, 12 patients (38.71%) presented with polyarthralgia, 2 patients (6.45%) had monoarthritis, and 10 patients (32.26%) had carditis.

Regarding minor criteria, 22 patients (70.97%) had hyperpyrexia, and only 6 patients (19.35%) had an erythrocyte sedimentation rate (ESR) ≥ 30 mm/h and/or C-reactive protein (CRP) ≥ 3.0 mg/dl (Table I). It shoud be noted that 6 patients had undocumented ARF history.

Table I: Jones Criteria

Variable	N (%)
Major manifestations	
Polyarthralgia	12 (38.71)
Carditis	10 (32.26)
Monoarthritis	2 (6.45)
Polyarthritis	0 (0)
Erythema marginatum	0 (0)
Subcutaneous nodules	0 (0)
Chorea	0 (0)
Minor manifestations	
Hyperpyrexia	22 (70.97)
Monoarthralgia	0
ESR ≥ 30 mm/h and/or CRP ≥ 3.0 mg/dl	6 (19.35)
Prolonged PR Interval	0 (0)
Evidence of preceding streptococcal infection	6 (19.35)

2. Rheumatic heart disease

a) Age of diagnostic

The median age of diagnosis for rheumatic heart disease in our study was 39 years.

b) Circumstances of onset

The circumstances of onset in our study ranged from the beginning of symptoms to complications (Figure 21), the surveillance of acute rheumatic fever, and incidental findings.

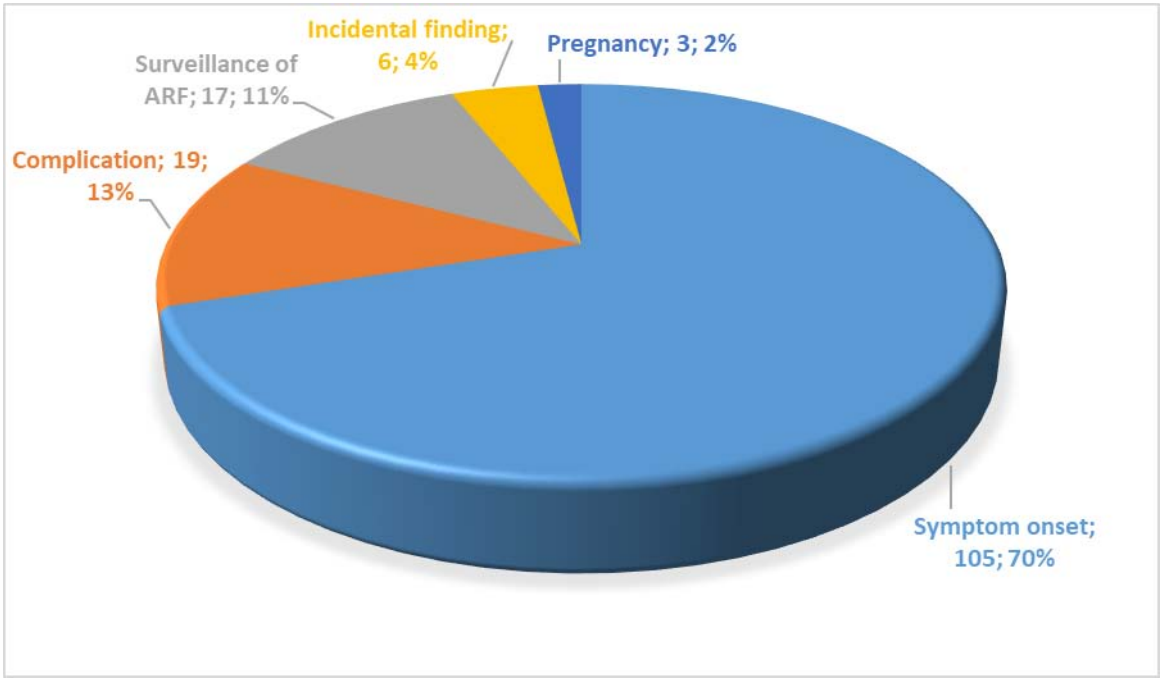

Figure 21: Distribution of the patients according to circumstances of onset

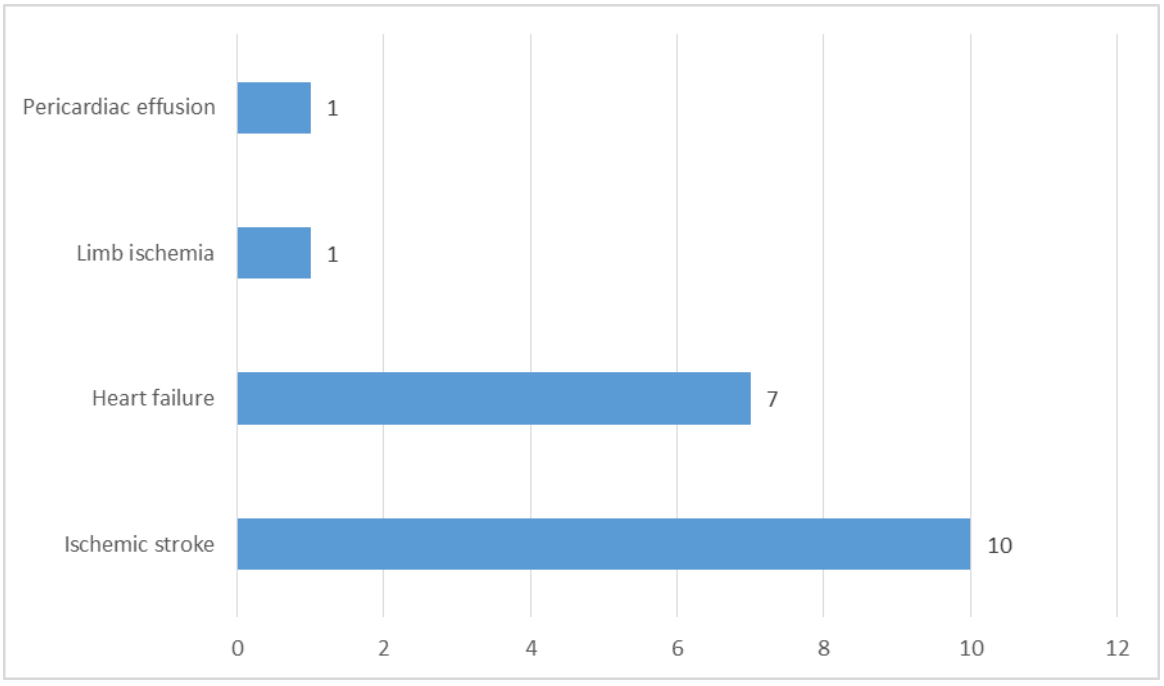

Figure 22: The complications precipitating the diagnosis of RHD

c) Clinical manifestations:

Among the 150 patients evaluated in our study, 137 (91.33%) suffered from dyspnea, 49 (32.67%) had asthenia and 43 (28.67%) had palpitations (Figure 23).

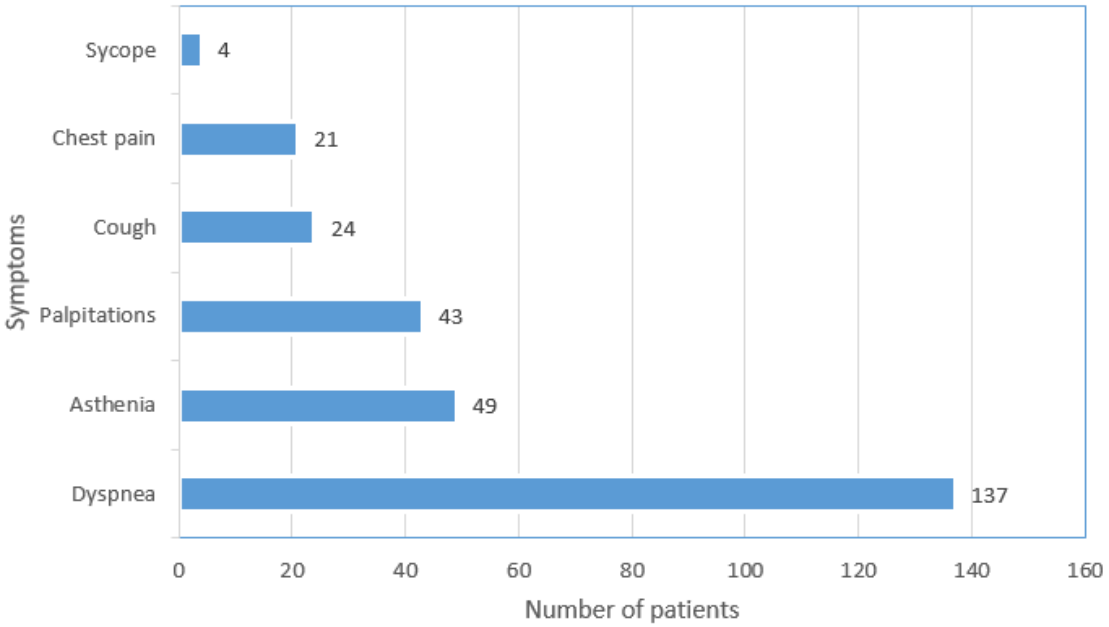

Figure 23: Clinical Manifestations among the Patients with RHD

d) Complications:

The complications observed in our study ranged from atrial fibrillation, and heart failure to pulmonary hypertension (Figure 24).

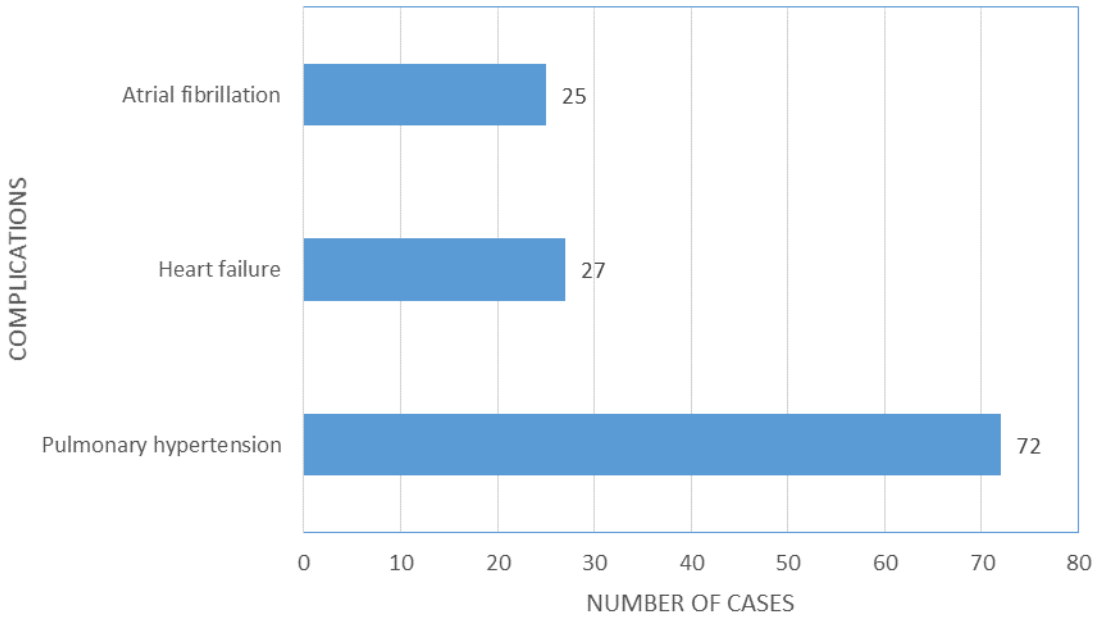

Figure 24: The complications observed in the study

e) Cardiac echography:

Table II depicts the various combinations of valvular involvement in the study population.

Table II: Valvular affection in RHD patients

Type of lesion	N (%)
Isolated Mitral regurgitation (MR)	26 (17.33)
Isolated Mitral stenosis (MS)	14 (9.33)
Mitral disease	28 (18.68)
Isolated Aortic regurgitation (AR)	2 (1.33)
Isolated Aortic stenosis (AS)	2 (1.33)
Aortic disease	7 (4.67)
MR +AR	12 (8)
MR + AS	2 (1.33)
MS + AR	10 (6.67)
MS + AS	2 (1.33)
MR + MS + AR	15 (10)
MR + MS + AS	3 (2)
MR + AR + AS	4 (2.67)
MS + AR + AS	6 (4)
MR + MS + AR + AS	17 (11.33)

Common valve lesions included mitral regurgitation in 107 patients (71.33%), mitral stenosis in 95 patients (63.33%), aortic regurgitation in 73 subjects (48.67%), and aortic stenosis in 43 subjects (28.67%). The severity of each valvular lesion is illustrated in Figure 26.

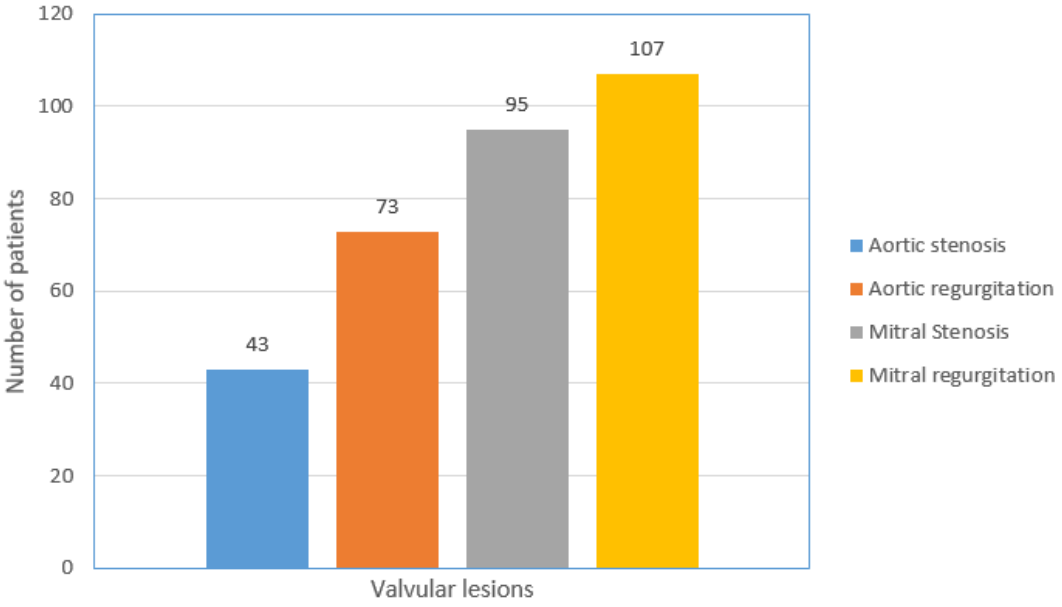

Figure 25: Total prevalence of valvular affections

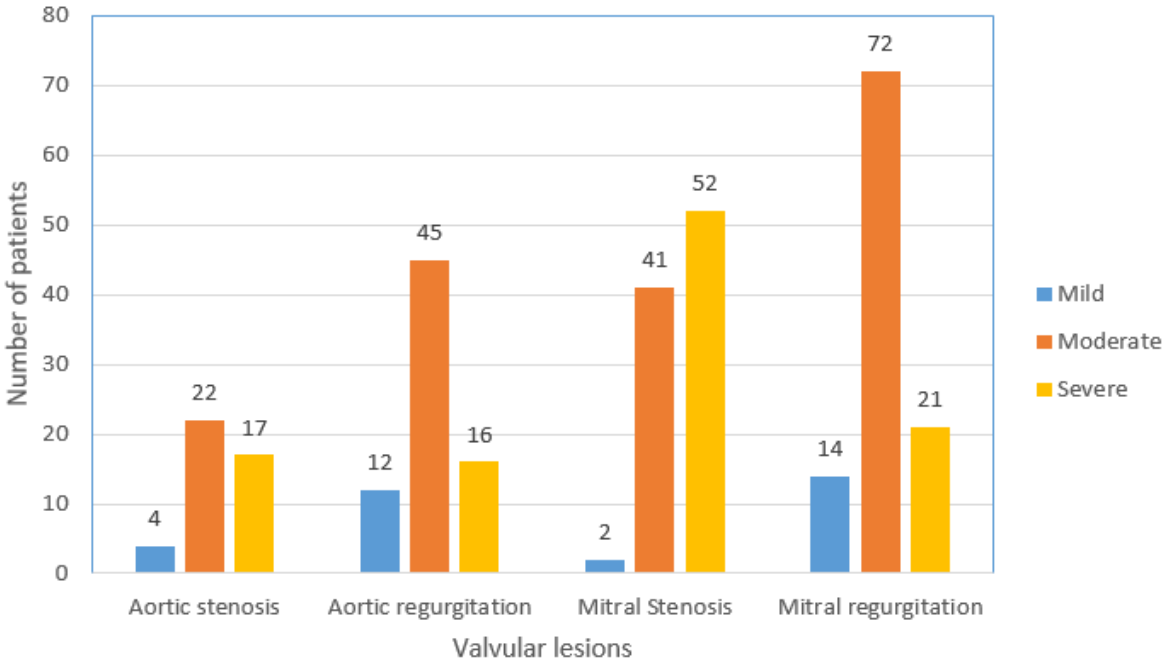

Figure 26: Distribution of valvular lesions according to severity

The impact of rheumatic heart disease is illustrated in Table III.

Table III: The impact of rheumatic heart disease

Variables	N (%)
Left ventricle (LV)	
Dilated	34 (22.67)
Left ventricle hypertrophy	10 (6.67)
LV function	
Moderately reduced	12 (8)
Severely reduced	2 (1.33)
Left atrium	
Dilated	109 (72.67)
Ectasia	6 (4)
Right ventricle dilation	16 (10.67)
Right ventricle	
Moderately reduced	11 (7.33)
Severely reduced	2 (1.33)
Tricuspid regurgitation	**105 (70)**
Mild	36 (24)
Moderate	53 (35.33)
Severe	16 (10.67)
Pulmonary hypertension	**72 (48)**
Mild	25 (16.67)
Moderate	27 (18)
Severe	20 (13.33)
Atrial fibrillation	25 (16.67)

DISCUSSION

I. Historical Background:

Acute rheumatic fever is a disease known since antiquity. In fact, Hippocrates described it as a non-fatal febrile disease affecting the joints and primarily occurring in childhood. Thereafter, there was often confusion within the term “arthritis” regarding various joint diseases. In 1591, Guillaume de Baillou applied the term “Rheumatism” to what was referred to as “arthritis”, thereby emphasizing the nosological entity of ARF. In 1812, the English physician William Charles Wells recorded the first clinical study on the association between ARF and cardiac valve lesions[5]. In 1835 and 1836, Jean Baptiste BOUILLAUD identified the valvular heart lesions, which he associated with ARF. He then published his “law of coincidence” between rheumatism and cardiac disease[6]. In 1840, he stated that more than half of 300 patients with cardiac disease dated their symptoms from an attack of acute rheumatism[7]. In 1931, the responsibility of hemolytic streptococcus in the pathogenesis of ARF was demonstrated by the work of Schlesinger, Coburn, and Collis[8]. In the 1930s and 1940s, in the United States and Europe, ARF, and chronic rheumatic heart disease were among the leading causes of death in young individuals aged 5 to 20, and second after tuberculosis in the 20 to 30 age group[9]. In 1944, Jones established the diagnostic criteria for ARF that bear his name[10], and which have been modified several times, notably revised twice by the American Heart Association (AHA), in 1992 and recently in 2015 [11]. In 1949, Hench and Kendall established a therapeutic protocol combining penicillin and corticoids[12]. Previously, sulfonamides and salicylates had been prescribed. In 1963, Kaplan and colleagues demonstrated a relationship between group A streptococcal antigen and antibodies in human myocardial tissue, the first time the immunological hypothesis had been proven[13]. Moreover, echocardiography has emerged as a cornerstone in screening programs to assess the prevalence of rheumatic heart disease [14]. In 2012, the World Heart Federation developed the echocardiographic criteria for rheumatic heart disease[15]. In 2020, the Australian guidelines were published, which align with the 2015 revised Jones criteria, although there are differences in the definition of the population risk[16].

II. Review of acute rheumatic fever and rheumatic heart disease:

1. Natural history [17-20]:

The natural history and progression of acute rheumatic fever and rheumatic heart disease remain incompletely understood. Studies support the view that ARF results from an autoimmune response to pharyngeal infection caused by the sole member of group A Streptococcus, Streptococcus pyogenes. Furthermore, the infecting strain and the genetic predisposition may play a crucial role in the development of ARF. In fact, 0.3-3% of people with GAS pharyngitis develop ARF. The finding of more severe cases of RHD at a young age in Sub-Saharan Africa is linked to genetic background and recurring group A Streptococcus infections.

The chronic nature is considered as long as this disease is not discovered during the first episode of acute rheumatic fever and the cardiac involvement is already present.

2. Pathogenesis:

Rheumatic heart disease's pathogenesis involves an immune response consisting of humoral and cellular components[21]. GAS antigens activate both B and T cells following the GAS adhesion to and invasion of the pharyngeal epithelium. This process requires the expression of M protein and fibronectin-binding proteins by GAS[22,23]. This bacterium evades host defense mechanisms through the presence of M protein and hyaluronic acid capsule leading to its carriage and persistence[24]. The host response is initiated by neutrophils, macrophages, and dendritic cells, which are responsible for phagocytosing bacteria and presenting antigens to T cells. Both B and T cells respond to the GAS infection through antibody production and T cell activation. In susceptible individuals, this immune response cross-reacts with host tissues such as the heart, joints, skin, brain, and subcutaneous tissues. This process known as molecular mimicry, is the cornerstone of this disease's pathophysiology (Figure 27) [25]. This antigen mimicry occurs due to structural similarity (epitopes) between the host tissues and GAS antigens, leading to their recognition by antibodies and T cells.

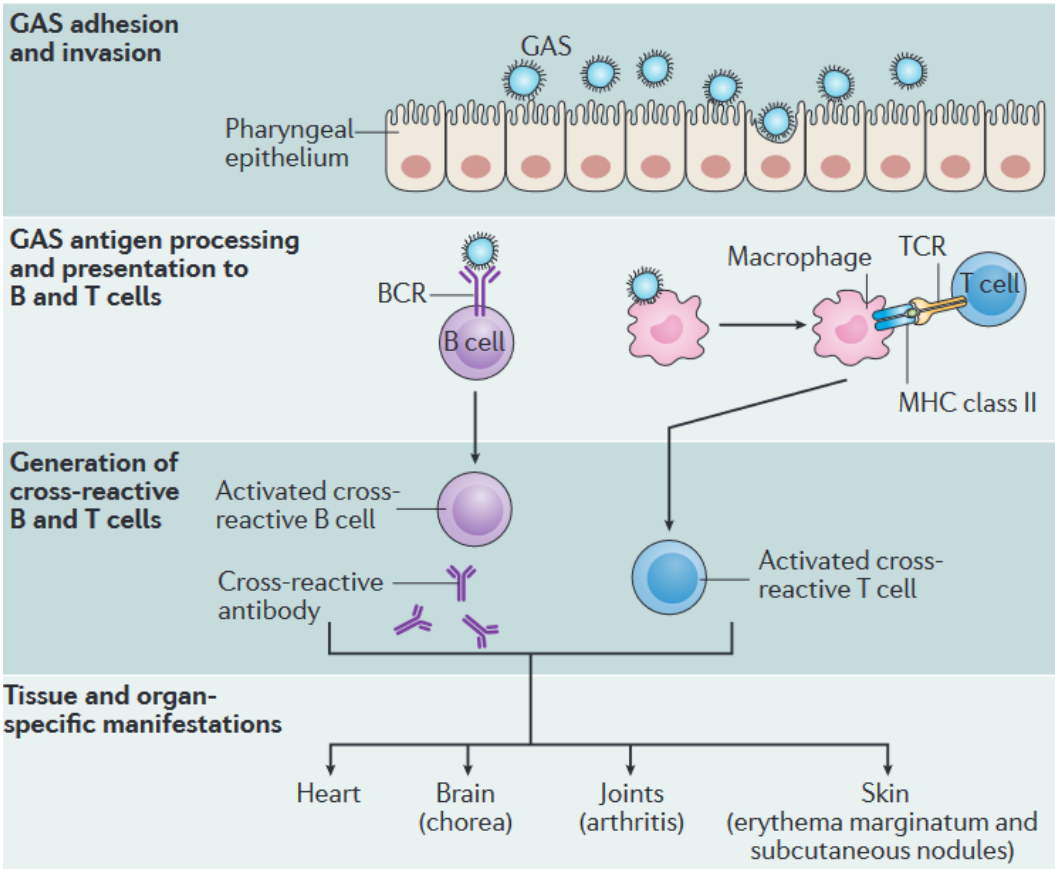

Figure 27: Generation of a cross-reactive immune response in ARF [17]

The pathogenesis of rheumatic carditis and valvulitis involves a combination of cellular and antibody-mediated mechanisms. The valve endothelium and lamina are the primary targets of antibodies directed against cross-reactive group A Streptococcus polysaccharides, although there is also a reaction towards myocardial myosin[23]. This antibody cross-reactivity initiates inflammatory responses on the valve surface and upregulates the expression of VCAM-1 (Vascular cell adhesion molecule 1), facilitating the binding, infiltration, and extravasation of cross-reactive T-cells. These T-cells have cross-reactivity with streptococcal M proteins and host alpha-helical protein antigens (e.g., myosin, laminin, tropomyosin, or vimentin). Upon differentiation into CD4+ TH1 cells, they produce gamma interferon, which induces scarring and fibrosis, as well as IL-17A, which promotes neovascularization in the normally avascular valve tissue[26,27]. These processes increase the susceptibility of the valve to cellular infiltration through both the activated valve endocardial surface and the neovascularized scar

tissue. Additionally, antibodies to collagen have been detected in rheumatic heart disease and may contribute to valve damage, albeit this pathway becomes activated only after the valve has already suffered damage and the underlying collagen is exposed. Notably, Aschoff bodies represent the characteristic histopathological lesions observed in RHD[28].

3. Diagnosis:

The diagnosis of acute rheumatic fever is primarily established using clinical criteria known as the Jones Criteria and by excluding other differential diagnoses[10]. The Jones Criteria were initially established in 1944 and have undergone multiple modifications, revisions, and updates, with the most recent occurring in 2015. These criteria consist of major and minor manifestations (Figure 28). To diagnose an initial episode of ARF, a patient must present with either two major manifestations or one major manifestation along with at least two minor manifestations. For a recurrent episode of rheumatic fever, the patient must display either two major manifestations, one major coupled with two minor manifestations, or three minor manifestations alone. Additionally, evidence of preceding infection with Group A Streptococcus needs to be demonstrated, typically through streptococcal serology. However, there are exceptions to these criteria for patients presenting with chorea or indolent carditis. These manifestations may only become apparent months after the initial streptococcal infection, and as a result, additional manifestations may not be present, and streptococcal serology testing may appear normal in such cases.

Arthritis, observed in approximately 75% of patients, and fever, present in over 90% of patients, are the most common initial manifestations of acute rheumatic fever. The disease often affects large joints unilaterally, with frequent involvement of the knee, elbow, wrist, and ankle. However, the hip and shoulder joints, despite being large, are rarely affected. Arthritis is migratory, transitioning from one joint to another. The arthritis in each joint lasts for a duration shorter than two weeks[29]. Diagnosing ARF-associated arthritis can be challenging due to the wide range of potential differential diagnoses, particularly when patients present with isolated monoarthritis. In such cases, it is crucial to exclude septic arthritis. Notably, the arthritis seen

in ARF shows a robust response to anti-inflammatory medications like aspirin and nonsteroidal anti-inflammatory drugs (NSAIDs). If there is no improvement within 48-72 hours after initiating treatment, alternative diagnoses should be considered[30]. Before the 2015 revised Jones criteria, arthritis was considered a major criterion for the diagnosis of rheumatic fever. However, under the updated criteria, the classification of arthritis as a major criterion depends on the population's risk. In low-risk populations, only polyarthritis is considered a major criterion, whereas in high-risk populations, both monoarthritis and polyarthritis are considered major criteria.

As per the final Jones criteria, polyarthralgia is considered a minor criterion in low-risk populations, while monoarthralgia is considered a minor criterion in moderate- and high-risk populations, including our country. However, the exclusion of the other causes by differential diagnosis is very important in terms of making an accurate diagnosis when joint findings are used for the diagnosis[29].

Subcutaneous nodules and erythema marginatum are less frequent manifestations of ARF, occurring in less than 10% of patients. Subcutaneous nodules are painless, small (0.5-2 cm in diameter), and develop over bony prominences or extensor tendons. Erythema marginatum manifests as bright pink, blanching macules or papules that spread outward in a circular pattern, typically observed on the trunk and proximal limbs[31,32].

Carditis, affecting more than 50% of ARF patients, is predominantly characterized by valvulitis, particularly involving the mitral valve (mitral regurgitation) and less commonly the aortic valve (aortic regurgitation)[33]. Moderate or severe valvular regurgitation can lead to cardiomegaly. The 2015 revision of the Jones Criteria introduced the inclusion of Doppler echocardiography as a recommended diagnostic tool for assessing cardiac involvement in ARF. Both clinical and subclinical carditis now fulfill a major criterion, even in the absence of typical auscultatory findings[14].

Chorea, observed in up to 30% of ARF cases, is characterized by involuntary and purposeless movements of the trunk, limbs, and face. It can also occur as an isolated feature without other ARF manifestations or recent streptococcal infection. In such cases, it is crucial to exclude other potential causes of chorea, such as drug reactions, systemic lupus erythematosus, Wilson disease, and other conditions. An echocardiogram should be performed as chorea is strongly associated with carditis[17].

The 2015 revision of the Jones Criteria was undertaken by the American Heart Association in response to emerging data regarding differences in the presentation of ARF between low- and moderate-high-risk cohorts. Moderate-high risk is defined as a population with an ARF incidence of more than 2 per 100,000 school-aged children per year or an all-age rheumatic heart disease prevalence of more than 1 per 1,000 people per year. In moderate-high-risk populations, the inclusion of monoarthritis, in addition to classic polyarthritis, fulfills a major manifestation. This modification aims to enhance the sensitivity of the criteria in areas where ARF remains endemic while maintaining high specificity in low-risk regions[14].

Criteria	Patient population*	Manifestations
Major	Low risk‡	• Carditis§ (clinical and/or subclinical§) • Arthritis (polyarthritis only) • Chorea • Erythema marginatum • Subcutaneous nodules
	Moderate and high risk	• Carditis (clinical and/or subclinical) • Arthritis (including monoarthritis, polyarthritis or polyarthralgia‖) • Chorea • Erythema marginatum • Subcutaneous nodules
Minor	Low risk‡	• Polyarthralgia • Fever (≥38.5 °C) • An ESR of ≥60 mm per hour and/or CRP of ≥3.0 mg per dL¶ • Prolonged PR interval, after accounting for age variability (unless carditis is a major criterion)
	Moderate and high risk	• Monoarthralgia • Fever (≥38 °C) • An ESR of ≥30 mm per hr and/or CRP of ≥3.0 mg per dL¶ • Prolonged PR interval, after accounting for age variability (unless carditis is a major criterion)

Figure 28: The Jones Criteria 2015 for the diagnosis of rheumatic fever[17]

The 2020 Australian guidelines are in alignment with the revised Jones criteria, although there are differences in the definition of the population risk as these guidelines consider endemic settings are populations with ARF incidence over 30 per 30 per 100,000 per year in 5-14 year-olds or RHD all-age prevalence over 2 per 1,000 (Figure 29).

Risk	Setting
High risk	• Living in an ARF-endemic setting[†] • Aboriginal and Torres Strait Islander peoples living in rural or remote settings • Aboriginal and Torres Strait Islander peoples, and Māori and/or Pacific Islander peoples living in metropolitan households affected by crowding and/or lower socio-economic status • Personal history of ARF/RHD and age < 40 years
May be high risk	• Family or household recent history of ARF/RHD • Household overcrowding (> 2 people/bedroom) or low socio-economic status • Migrant or refugee from low or middle income country and their children
Additional considerations which increase risk	• Prior residence in a high ARF risk setting • Frequent or recent travel to a high ARF risk setting • Aged 5–20 years (peak years for ARF)

Figure 29: Risk groups for acute rheumatic fever and Rheumatic heart disease[30]

4. Treatment:

The management of ARF is based on an etiological treatment, targeting streptococcal infection, as well as a symptomatic treatment (anti-inflammatory treatment).

Hospitalization is necessary in all cases, and rest is essential and applies to all individuals. Complete bed rest is recommended for 2 weeks in the absence of carditis and 4 to 6 weeks in its presence[34].

The purpose of anti-infective treatment is to sterilize the pharyngeal infectious foci, and its duration is 10 days. It is based on penicillin G at a dose of 2 million IU per day in two injections or penicillin V at a dose of 2 million IU per day divided into 3 doses taken with meals. Benzathine Benzyl Penicillin allows for a single injection at a dose of 1.2 million IU for adults and children over 30 kg, or 600,000 IU for children under 30 kg. Erythromycin, at a dose of 40 to 50 mg/kg/day in 3 oral doses for 10 days, is used in cases of penicillin allergy[35].

The anti-inflammatory treatment is based on salicylates and corticosteroids[36]. Some authors consider salicylates as the treatment of choice during an acute crisis, given in high

doses. If fever or inflammatory symptoms persist, corticosteroid therapy is initiated. Other authors systematically use corticosteroid therapy in cases of carditis, preferably oral prednisone at a dose of 1 to 2 mg/kg/day in a single dose for 3 to 4 weeks (maximum 80 mg/day), followed by a gradual decrease of 5 mg every 3 to 5 days. Adjunctive measures will be prescribed, including a hypoglycemic, restricted-sodium diet with potassium and calcium supplementation[37]. In the absence of carditis, oral salicylates are used at a dose of 100 to 120 mg/kg/day in 4 doses for 15 days (maximum 6 g/day), followed by a gradual decrease over 4-6 weeks to a maintenance dose of 75 mg/kg/day. However, according to the 2020 Australian guidelines, corticosteroids are considered for use in selected cases of severe carditis, despite meta-analyses in which overall benefit was not evident. In all cases, salicylates are prescribed at a dose of 75 mg/kg/day for 6 weeks[34].

Surgical treatment is indicated in the presence of functional symptoms, clinical signs of valvular severity, heart failure, pulmonary hypertension, or based on echocardiographic evidence of severe valvular disease with cardiac impact. The surgical treatment can either be conservative, involving valvuloplasty or open-heart surgery with valve repair, or radical by valve replacement[37].

III. Discussion of the results:

1. Epidemiologic aspect:

3.3 Frequency:

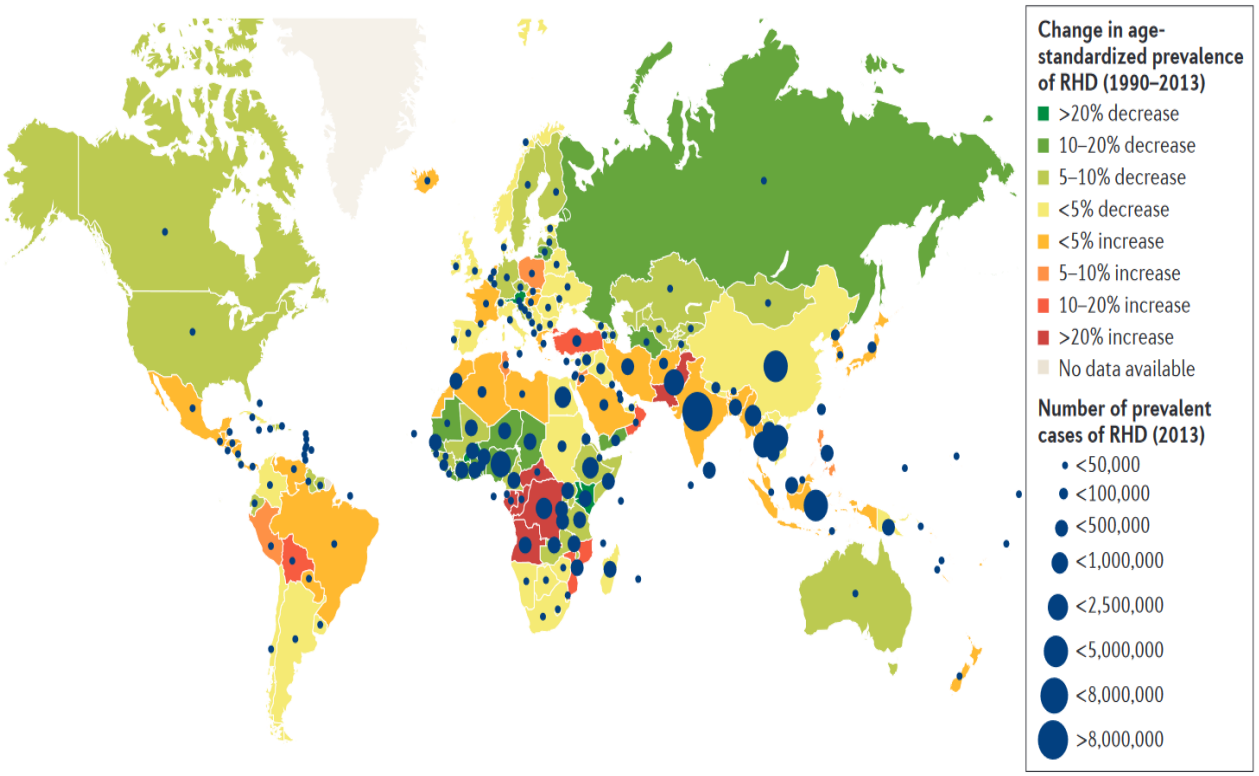

Figure 30: The global burden of RHD[17]

The incidence of acute rheumatic fever varies significantly worldwide (Figure 30). In fact, it is influenced by multiple factors such as geographic location, climate, economic and nutrition status, housing and sanitation, gender, and family susceptibility[38]. It is estimated that the prevalence of ARF ranges from 8 to 51 per 100000 people worldwide[39]. Accurate estimates of ARF and RHD disease burden are lacking due to a paucity of comprehensive disease registries, and the underreporting of both acute and chronic cases from endemic areas for Streptococcus pyogenes infections[18]. In Morocco, there has been a slight decrease in the incidence of acute rheumatic fever over a period of 10 years. The incidence rate decreased from 20.5 cases per 100,000 inhabitants in 2000 to 18.3 cases per 100,000 inhabitants in 2010. The

decrease is more significant for rheumatic heart disease, with the incidence rate decreasing from 6.3 cases per 100,000 inhabitants in 2000 to 3.1 cases per 100,000 inhabitants in 2010. The average incidence rate of ARF among the age group of 5 to 14 years old was 33.1 cases per 100,000 population[40]. Compared to Uganda, a conducted study in 2019 estimated the incidence of definite ARF among children of the same age group as 25 per 100000 person-years[41]. In Victoria (Australia), the overall incidence of ARF between 2010 and 2019 was 0.8 per 100 000 5-14 year-olds[42].

The African continent, which represents 18% of the world's population, also accounts for half of the children affected by rheumatic heart disease globally[43]. In Morocco, two school-based surveys conducted in Rabat and Casablanca revealed a prevalence rate of rheumatic heart disease equivalent to 10.5 cases per 1000 and 3.5 cases per 1000 respectively[44]. According to a study conducted by the World Health Organization (WHO), the prevalence of rheumatic heart disease among children aged 5 to 14 years is estimated to be 7.6 cases per 1,000 among the indigenous population of Australia, New Zealand, and the Pacific region. In sub-Saharan Africa and Latin America, the prevalence is estimated to be 3 cases per 1,000, while in the Middle East and North Africa, it is 1.9 cases per 1,000. In Central Asia, the prevalence is estimated to be 1.6 cases per 1,000. The same study also estimates that the global number of rheumatic heart disease cases ranges from 15.5 to 19.6 million[45].

However, some statistics remain controversial, especially in developing countries, and have been criticized by recent studies for underestimating the prevalence of ARF/RHD, as they were based only on clinical examination without echocardiographic screening, which increases the detection of RHD[46], given that echocardiographic examination has a sensitivity of 81% and a specificity of 93% for diagnosing rheumatic heart disease and subclinical valvular pathologies[33]. Table IV provides a comparison between the prevalence found in some clinical studies and studies that primarily rely on echocardiography as the main diagnostic tool for rheumatic heart disease.

Table IV: The prevalence of ARF and RHD depending on the diagnostic method employed.

Location	Year	Number of examined patients	Number of ARF or RHD cases detected	Prevalence
Studies based essentially on clinical examination				
India[47]	2007	118.212	61	0.5/1000
Egypt[48]	1998	5465	34	6.2/1000
Nepal[49]	1997	4736	6	1.2/1000
Studies based essentially on echocardiographic screening				
Egypt[50]	2022	1560	36	23/1000
India[51]	2017	16,294	125	7.7/1000
New Zealand[52]	2016	465	10	22/1000
Mozambique[53]	2007	2170	66	30.4/1000

Despite advances in medical knowledge and treatment, RHD remains a significant public health problem in many parts of the world, particularly in low-income countries. One reason for this is that RHD is often only diagnosed at the stage of carditis, when the heart valves have already been damaged, and not during the earlier stage of acute rheumatic fever.

According to the literature, 40% to 60% of cases of ARF will develop RHD[54]. Considering the reported cases of ARF from 2000 to 2010, which amounted to 63,622 cases, we can estimate the minimum number of RHD cases (using the 40% threshold) to be approximately 25,448. However, the surveillance system only reported half of that number (12,690). This underreporting is partly attributed to the lack of a standardized definition within the system and the limited availability of echocardiography[40].

Furthermore, the results indicate that the peak prevalence of RHD affected the age group of 5 to 14 years (0.7 per 1000), whereas the prevalence in the age group of 15 years and older was lower. This contrasts with the findings on ARF incidence since the incidence is higher in children aged 5 to 14. According to the pathophysiology, we would expect a higher incidence of RHD in older age groups[40].

These findings confirm the existence of underreporting, particularly among individuals aged 15 years and older. It is possible that when a cardiac condition is found in advanced age, it is not attributed to ARF and therefore not reported, unlike cardiac conditions observed in the target population.

3.4 Age:

Rheumatic fever primarily affects school-aged children. However, children under the age of 5 are at higher risk of developing rheumatic carditis[55]. By contrast, recurrent episodes of acute rheumatic fever tend to occur in slightly older individuals, including children, adolescents, and young adults. However, these episodes are seldom observed beyond the age of 35-40 years[17].

Rheumatic heart disease is a chronic condition resulting from the accumulation of heart valve damage, primarily due to single severe or multiple recurrent episodes of acute rheumatic fever. While RHD can develop in children, its prevalence typically reaches its peak during adulthood, usually between the ages of 25 and 45 years[56].

In Australia, the median age of diagnosis for indigenous Australians was 21, compared with age 56 for non-indigenous Australians[57].

The median age of the 309 patients in Uganda was found to be 30[58], whereas a study of 52 patients in Bamako (Mali) showed that the most affected age group was 16 to 25 years old[59].

In our study, the median age of the 150 patients was found to be 43.5.

This variance of age at diagnosis within our country compared to others may signify potential gaps in early detection, public awareness, and healthcare accessibility.

3.5 Gender:

According to the 2020 Australian guidelines, females had higher ARF rates than males, and about 66% of RHD cases in Australia occur in females[60]. Compared to a study conducted in the village of Ait Hammou (Morocco), 53% of children with RHD were female[61]. In Turkey, an epidemiological study conducted on 1900 cases of rheumatic carditis demonstrated that 72% of the cases were female[62].

The sex-ratio in Uganda was found to be 0.57 and in Bamako 0.85 [58,59].

In our study, 73% of the participants were female with a sex-ratio of 0.38.

Table V: Comparison of the various sex ratios found in the literature to the one in our study.

Location	Sex-ratio
Our study	0.38
Australia[60]	0.52
Mali [59]	0.85
Uganda[58]	0.57
Turkey[62]	0.38
Morocco[61]	0.88
Mozambique[53]	0.59
Cambodia[53]	0.77

It's important to note that the reasons for these sex-based differences in RHD prevalence are likely to be multifactorial and complex. Possible contributing factors could include differences in genetic susceptibility, hormonal influences, immune response variations, and social or environmental factors.

2. Socioeconomic status

2.1 Occupation:

In a study conducted in Ghana, trading (42%) was the most common occupation among the patients, students represented 18.57% of the patients, followed by the unemployed at 17.86% and farmers at 15% [63]. In comparison, a study in Uganda reported farming (49.1%)

as the most common occupation and 24.58% of the patients were students[58]. In Lahore (Pakistan), 78% of the patients were Laborers (Unskilled workers)[64].

Patients' occupations in our study ranged from homemakers to laborers, employees, and students. Homemaking was the most common occupation among the patients, accounting for 66% of the total. Additionally, 9.33% of the patients were students.

Occupations can be indicative of the socioeconomic status of individuals in different regions. The prevalence of RHD may be influenced by factors such as income, and living conditions. Socioeconomic disparities could play a role in the burden of RHD in these regions.

2.2 Area of residence:

In most studies, the risk of developing rheumatic heart disease is found to be highest in rural areas. For example, a study conducted in India revealed that 70.4% of patients diagnosed with rheumatic heart disease were residing in rural areas[51]. Similarly, in Australia, the proportion was even higher, with 85% of RHD cases reported from rural locations[32].

In Nicaragua, the prevalence of pediatric subjects with RHD is 77 per 1,000 in rural residences, while in urban residences, it is 35 per 1,000[65]. Likewise in Kinshasa, the prevalence was significantly greater in slum schools (22.2/1000) than in urban schools (4/1000)[66].

In our study, the majority of the patients were recruited from urban areas (56%), and the remaining patients came from rural areas (44%).

Rural areas often face socioeconomic challenges, including limited access to healthcare, lower socioeconomic status, and reduced awareness of preventive measures. These factors could influence the incidence and management of RHD.

2.3 Number of people per household:

Household overcrowding is widely recognized as a significant risk factor, and the reduction of overcrowding has been identified as one of the key factors contributing to the decline in acute

rheumatic fever incidence in wealthy countries throughout the twentieth century[67]. In fact, overcrowding results in higher chances of spread of streptococcal sore throat[68].

In Bangladesh, the proportion of subjects with ≥5 members in the family was significantly higher in both ARF and RHD patients than in the reference population[69].

The mean number of individuals per household in our study population was 6.51.

Table VI: Comparison of the average number of individuals per household found in the literature with the one in our study.

Year	Location	Average number of individuals per household
Our study	Morocco	6.51
2017[51]	India	5
2012[70]	Uganda	8
2009[64]	Pakistan	7
2006[71]	Morocco	6.67

Given the pronounced implication of overcrowding in the incidence of RHD in our study population, efforts to address this issue should be considered a public health priority in our country. Mitigating overcrowding through targeted interventions could play a substantial role in decreasing the rates of ARF and consequently, RHD.

2.4 Number of rooms per household:

The 2020 Australian guideline considers household overcrowding (more than 2 people per bedroom) as a potential high-risk group for primary prevention of ARF[30]. In the study conducted in New Caledonia, the number of people per bedroom was identified as a significant factor associated with persistent rheumatic heart disease. Notably, 36.3% of the cases with persistent RHD had more than 3 people per bedroom[2].

In Bangladesh, sharing a living room with >3 people was found to be detrimental for RHD. A significant 65% of RHD cases were observed to have more than 3 people per room [69].

In Pakistan, each household had an average of 7 members living in 2.3 rooms[64]. In Ait Hammou, the average number of rooms per house among children with rheumatic heart disease was 6.11 rooms per household [71].

In comparison to these referenced studies, the mean number of rooms per household in our study population was 3.25.

2.5 Parent's educational level:

In New Zealand, a developed country where acute rheumatic fever clusters in poorer sections of the population, there is a clear association between ARF and socioeconomic deprivation, which includes education[72].

In another study conducted in Brazil by Meira et al. between 1983 and 1998, it was shown that severe chronic rheumatic valvular disease was more frequent among patients with moderate or severe carditis, with ARF recurrence, and whose mothers had a low educational level[73].

The study of sociodemographic and household characteristics of patients and their families in Pakistan revealed that 88% of mothers were illiterate, and 69% of fathers were illiterate[64].

In our study population, educational attainment among the patients' parents was notably low. Specifically, 90% of mothers had not received formal schooling. In contrast, among the fathers, 23.33% had completed primary school education, 20.67% had attained a middle school level of education, and 48% were unschooled.

The higher prevalence of ARF and RHD in populations with lower educational levels and higher illiteracy rates suggests that there are health disparities related to socioeconomic factors. These disparities may affect access to healthcare, timely diagnosis, and appropriate management of streptococcal infections, leading to a higher burden of RHD in vulnerable populations.

2.6 Sanitary facilities:

In addition to overcrowded homes, inadequate sanitation leads to recurrent group A streptococcal infection, and the causal relationship between group A streptococcal infection and

ARF/RHD is well-established[74]. In southeast Anatolia, the most severe forms of rheumatic valve disease patients were living in sub-district regions in rural areas with low levels of home sanitation[75].

In Lahore, 30% of the participants reported not having a latrine within their house[64].

In our study, significant gaps in basic amenities were noted: 21.33% of participants reported the absence of a shower room within their house, and 6% lacked toilet facilities.

The lack of these basic amenities can serve as breeding grounds for infectious diseases and are significant environmental determinants that may exacerbate the prevalence of rheumatic heart disease.

2.7 Water supply:

In Ait Hammou village, none of the households had access to potable water distributed by the National Water Office. The water supply mainly relied on wells, cisterns, and fountains[71].

In Bangladesh, 65% of RHD patients had access to a water supply[69].

Of the patients evaluated in our study, 92.7% had access to potable water.

Improving access to safe and potable water, as well as sanitation infrastructure, is vital for public health and can contribute to the prevention of communicable diseases, including RHD.

2.8 Access to healthcare:

Numerous studies, some conducted in the United States during the 1960s and 1970s, have consistently demonstrated lower rates of acute rheumatic fever in settings with improved access to medical care compared to communities with limited access to healthcare services[76].

In our research, we found that 92% of the cases had some form of healthcare, with 25.36% of participants relying solely on a general practitioner, 74.64% consulting both a general practitioner and a specialist and 8% lacking any form of healthcare access.

However, despite healthcare access, a significant number of patients did not seek medical consultation for recurrent tonsillitis (60%) or arthralgia (91.58%).

To address these discrepancies, multi-faceted policy interventions should be considered. Firstly, extending the reach of primary care by setting up additional community healthcare centers can serve the population without any healthcare access. Secondly, upskilling general practitioners in the diagnosis and early management of ARF and RHD could mitigate the impact of limited specialist consultation. Lastly, given the advent of telemedicine, a focus on digital healthcare could bridge gaps in specialist care, especially in remote regions.

By concentrating on these areas, healthcare systems can not only improve general healthcare access but can also take specific action against conditions like ARF and RHD, which have long-term implications for cardiac health.

3. Clinical aspect:

3.1 Past medical history:

a) History of recurrent tonsillitis:

Sore throat, which can be caused by Group A Streptococcus infection, can lead to the autoimmune disease of acute rheumatic fever. If left untreated, acute rheumatic fever can progress to chronic rheumatic heart disease[26].

At the Dakar University Hospital, a history of repeated angina was found in 22.69% of cases[77]. In Bamako, Mali, Maiga reported that 65.8% of cases had repeated angina[78]. Meanwhile, in Brazzaville, 76% of the cases had frequent sore throat[79].

In Ait Hammou, the results of the study revealed that recurrent tonsillitis significantly marked the medical history of the majority of the patients with rheumatic carditis. In fact, the average number of tonsillitis episodes during the year ranged from 0 to 12 episodes, with an overall average of 3.45. Furthermore, only 52.94% of children suffering from rheumatic carditis reported having received treatment with penicillin retard, and only 29.41% received penicillin A.

In our study, a history of recurrent tonsillitis was present among 72% of the patients in the study. Furthermore, 52.78% of these patients had more than five episodes per year, and 60% remained untreated.

Recurrent tonsillitis is defined as having seven episodes in one year, or ten episodes over the course of the last two years. However, in our context more than five episodes per year was significant.

Therefore in order to reduce the risk of development of ARF, treatment of GAS pharyngitis must be initiated within 9 days of onset of a sore throat[80]. A Cochrane review on antibiotics for sore throat (ST) found that antibiotics reduced ARF by more than two-thirds within 1 month [81]. In addition, more than five episodes of tonsillitis per year should be considered as a risk factor of developing ARF.

b) History of arthralgia/arthritis:

Rheumatic Heart Disease and arthralgia are interlinked and stem from an autoimmune reaction triggered by group A streptococcal infection.

Thakur et al., in their study conducted in India, asserted that 84% of the patients had a history of arthralgia [82]. In Bamako, the personal medical histories of the patients were marked by polyarthralgia in 25% of the cases[59].

Compared to these findings, our study revealed that 62% of the patients had a history of arthralgia. On the other hand, arthritis (1%) remains uncommon in our context.

These findings highlight the link between rheumatic heart disease and arthralgia. Thus, medical professionals must focus on comprehensive assessments and integrated care strategies to effectively address both cardiac and joint symptoms in RHD patients. Given the connection between RHD and joint pain, patients experiencing such symptoms should promptly consult a healthcare provider, as this may be indicative of an underlying

c) Family history of ARF:

In a study conducted by Mirabel et al. in the Pacific, a family history of rheumatic heart disease or acute rheumatic fever was found in 60.6% of the cases [83]. Another study in New Zealand reported a family history of ARF/RHD in 12% of the individuals [52]. In a Ukrainian study, a family history of rheumatic heart disease was present in 19.2% of the patients.

In our study, the family history of acute rheumatic fever was present within 3.33% of the cases.

Consequently, a tailored approach to screening and prevention, considering the local context and family history, may be vital for early detection and treatment of RHD and ARF.

d) Personal history of ARF:

Rheumatic heart disease is often associated with a personal history of acute rheumatic fever, as the latter can lead to chronic valvular damage if left untreated.

The table presents various studies assessing the percentage of patients diagnosed with rheumatic heart disease who have a personal history of acute rheumatic fever. It should be noted that our patients did not have a complete medical record of acute rheumatic fever; however, the history of ARF was ascertained through questioning.

Table VII: Comparison of the percentage of patients with history of ARF found in the literature with the one in our study.

Location	Number of patients	Personal history of ARF
Our study	150	21%
Australia [57]	2381	20%
Gambia [84]	111	48.7%
Italy [85]	79	100%
Rwanda [85]	135	4%
Ukraine [86]	78	61.5%
Nepal [87]	211	22.3%
Ethiopia [88]	365	24.9%
Uganda [58]	309	11%
Fiji [31]	103	62%
India [89]	550	40.72%

The data presented illustrates a wide variation in the prevalence of a personal history of acute rheumatic fever among patients across different locations, ranging from 4% in Rwanda to 100% in Italy. This disparity may reflect differences in genetic susceptibility, environmental factors, healthcare accessibility, or diagnostic practices. Consequently, a recommendation would be to adopt region-specific strategies for screening, education, and early intervention of ARF, leveraging local insights to enhance the prevention and management of rheumatic heart disease.

e) Prescribed treatment:

In a previous study conducted in Gambia, encompassing a cohort of 111 patients, 15.8% of those with a history of acute rheumatic fever (54 patients) were reported to have received the appropriate treatment [84]. In contrast, our investigation revealed a higher treatment adherence rate, with 74.2% of the patients (23 patients) with a history of ARF reporting that they had received a treatment.

These findings emphasize the need to invest in targeted patient education, adherence monitoring, and personalized healthcare strategies to ensure optimal treatment outcomes and reduce the potential progression to rheumatic heart disease.

f) Secondary prevention:

Currently, secondary prophylaxis is the best available weapon in the fight against RHD[90]. The efficacy of secondary penicillin prophylaxis in preventing recurrent acute rheumatic fever and halting the progression of rheumatic heart disease is firmly established and constitutes a pivotal aspect of ARF management. The significance of this preventive strategy has been substantiated through Randomized Controlled Trials, demonstrating its ability to prevent ARF recurrence [91]. Intramuscular benzathine penicillin G has been shown to be superior to oral penicillin, reinforcing its role in therapeutic regimens.

Furthermore, robust evidence supports that secondary prophylaxis not only mitigates the severity of RHD but actively deters disease progression [92]. Studies conducted in the mid-twentieth century illustrated that 40–60% of patients with ARF eventually developed RHD.

Remarkably, the introduction of penicillin was associated with an increase in the rate of regression of mitral regurgitation from 20% to 70% [93]. This underscores the transformative impact of penicillin in the management and prognosis of these conditions.

Additionally, optimal adherence to secondary prevention was nearly universal (99%) in Italy compared to slightly less than half (48%) in Rwanda [85]. In Lahore, less than 2% of the affected children took secondary rheumatic prophylaxis [64].

In our study, 55% of the patients with a history of acute rheumatic fever benefited from secondary prevention.

This discrepancy underscores the crucial role of healthcare infrastructure, education, accessibility and the variability of clinical presentations in managing ARF. Therefore, enhancing public awareness, improving healthcare accessibility, and implementing standardized protocols for secondary rheumatic prophylaxis are essential steps toward mitigating the disparities in prevention and ultimately reducing the incidence of rheumatic heart disease.

g) Recurrence of ARF:

In our study, we noted the absence of reported recurrence of acute rheumatic fever among the patients. This finding stands in contrast to other research outcomes from different geographical regions. Specifically, a study conducted in Fiji revealed a recurrence rate of ARF at 39%. Similarly, in South India, among patients diagnosed with rheumatic heart disease, recurrence of acute rheumatic fever was observed in 43.7% of the cases.

The contrasting findings between our study and other research could be indicative of underlying issues such as a lack of patient consultation or barriers to health access. Moreover, this discrepancy underscores the potential for missed or underreported recurrence in certain regions, perhaps due to insufficient follow-up care, patients' unawareness of the importance of reporting symptoms, or challenges in accessing healthcare services.

h) Jones criteria:

Polyarthralgia (38.71%) and carditis (32.26%) were the most common major manifestations in our study. Similar observations were made in Australia [42]. In Indonesia, carditis (66.67%) and arthritis (25.92%) were the most prevalent manifestations.

As for the minor criteria, fever (70.97%) was the commonest clinical manifestation, similar to the studies in Australia, India, and Indonesia [42,94,95]. Elevated levels of Erythrocyte Sedimentation Rate (ESR) and/or C-reactive protein (CRP) were documented in only six patients, constituting 19.35% of the patients with a medical history of ARF. This frequency is insufficient to draw statistically significant conclusions regarding the role of these inflammatory markers in our study. In Australia, elevated CRP was present in 85.2% of the patients and elevated ESR in 63.2% of the patients[42].

As for the evidence of antecedent streptococcal infection, only six patients (19.35%) in our study had documented elevated anti-streptococcal antibody titers, which constitute the same problem as the inflammatory markers.

These findings accentuate the importance of recognizing these specific symptoms for early diagnosis and intervention across different populations. As a recommendation, healthcare providers should employ standardized diagnostic criteria, laboratory access should be enhanced, and public health campaigns should educate communities on these symptoms to promote early consultation and treatment, potentially reducing the progression to rheumatic heart disease.

3.2 Rheumatic heart disease:

a) Age of diagnosis:

The median age of diagnosis for rheumatic heart disease in our study is 39 years.

Similarly, the mean age in the study conducted in Ghana was 39.7[63]. In contrast with these results, the median age of patients with newly diagnosed RHD in New Caledonia is 18 years, and 24.7 years in Fiji [2,31].

This later age of diagnosis in our study may point to delayed detection, potentially due to factors like limited awareness, inadequate screening programs, or other healthcare system challenges. To address this, Morocco should invest in targeted education campaigns to raise awareness about RHD, especially among high-risk populations. Implementing early screening and intervention programs at community levels and strengthening healthcare provider training in recognizing early signs of RHD can also contribute to reducing the age of diagnosis and improving outcomes for patients with RHD in our country.

b) Clinical manifestations:

According to the World Heart Federation, heart valve damage symptoms associated with rheumatic heart disease may include dyspnea, chest pain, asthenia, and palpitations [96].

In our study, Dyspnea was identified as the most common symptom, occurring in 91.33% of the patients, and asthenia in 32.67% of the cases. Additionally, palpitations were reported by 28.67% of the subjects.

In studies conducted in Morocco and Nepal, functional symptoms were dominated by dyspnea, which was reported respectively by 96% of the patients in Morocco and 88.6% of the patients in Nepal [97,87].

In a study in Soweto, dyspnea (67.9%) and palpitations/chest pain (66.7%) were the commonest symptoms[98].

In comparison, palpitation (85.1%) and asthenia (84.5%) are the most prevalent symptoms in Uganda[58].

These findings emphasize the importance of recognizing these particular symptoms for early diagnosis and treatment of RHD within our country.

c) Complications:

Rheumatic heart disease stands as the foremost cause of death of cardiac origin [99]. A recurring clinical observation reveals that patients with RHD frequently present at healthcare

facilities with exacerbated symptoms, often attributable to the complex complications of the disease. These complications are often associated with untreated severe rheumatic valvular disease, including pulmonary hypertension, atrial fibrillation, heart failure, Infective Endocarditis, and embolic events[100].

Our study revealed the presence of pulmonary hypertension in 48% of the patients, followed by heart failure (18%) and atrial fibrillation (16.67%). Similar results were found in a Nigerian study, in which pulmonary hypertension was the dominant condition (72.1%)[43]. However, in another study in Nigeria, congestive heart failure was the most common complication (81.8%) [101].

These findings necessitate the implementation of robust strategies for early detection and management of RHD and its associated complications. Solutions should include comprehensive training for healthcare providers in recognizing and managing the specific complications associated with RHD, improved screening protocols, and the development of specialized care pathways for managing complications like pulmonary hypertension and heart failure. Additionally, public health initiatives should focus on preventive measures, including early treatment of streptococcal infections and ongoing patient education about the importance of timely medical care, to mitigate the progression to severe valvular disease and associated complications.

d) Cardiac echography:

Echocardiography is the primary evaluation tool for patients with suspected and confirmed RHD, as it illustrates the distribution and severity of valvular involvement and excludes alternate pathology[102].

Screening programs for rheumatic heart disease frequently employ portable echocardiography devices, owing to their ease of mobility and application in remote regions[103]. These portable systems have demonstrated considerable utility in RHD screening, as corroborated by numerous studies across diverse geographic locations with high RHD

prevalence, including but not limited to Uganda [90,104], Sudan[105], South Africa[106], Ethiopia[106], Egypt[107], Italy[108], Brazil[109], and Fiji[110]. These investigations generally leverage standard portable echocardiography or handheld devices with simplified criteria for on-site screening.

Such portable echocardiographic modalities not only facilitate enhanced detection of RHD but also present a cost-effective approach in resource-constrained environments. Given its efficacy and adaptability, handheld echocardiography with simplified criteria emerges as a promising alternative to conventional echocardiographic techniques in remote settings. The incorporation of this methodology could be particularly beneficial for the RHD screening program in Morocco, enabling broader geographical coverage and thereby enhancing case detection.

In terms of valvular lesions, mitral disease emerged as the most prevalent, a finding that is corroborated by other reports [94,111]. Other studies, however, reported that isolated mitral regurgitation is the most common valvular lesion in RHD cases [63,87,112].

The observation that tricuspid regurgitation is present in 70% of rheumatic heart disease cases in our study closely aligns with findings from a similar study conducted in Indonesia [95]. However, it is noteworthy that other studies have reported a lower incidence of tricuspid regurgitation in RHD patients [63,94,112].

Overall, mitral regurgitation was found to be present in almost every combination of multivalvular lesion.

KEY POINTS

- Recurrent sore throat occurring more than five times per year was significant in our study and should be considered a high-risk factor for developing acute rheumatic fever.
- Low socioeconomic status and overcrowding remain prevalent elements and may play a crucial role in the development of ARF and RHD.
- The female gender was predominant. Possible contributing factors could include variations in genetic susceptibility, hormonal influences, differences in immune response, as well as social or environmental factors.
- The family history of ARF was insignificant in our study.
- The issue of late diagnosis in rheumatic heart disease is of considerable concern, often occurring only after the onset of symptoms or complications. This delay could be attributed to a general reluctance to seek medical consultation, even when healthcare access is available. Additionally, the diagnosis of acute rheumatic fever was primarily based on the older Jones criteria. Furthermore, arthritis was a key criterion for diagnosing ARF, however, it was almost absent in our study population. Conversely, arthralgia was often trivialized by parents and healthcare professionals, even though it was present in more than half of our study participants. Moreover, cardiac echography was usually only performed if a cardiac murmur was detected, potentially overlooking cases with subclinical manifestations.

RECOMMENDATIONS

At the conclusion of our study, we recommend the following:

1. To better appreciate the scope of the health problem posed by acute rheumatic fever and to monitor hospital incidence more effectively, mandatory reporting of ARF should be implemented in both the public and private sectors. Additionally, a specialized register for rheumatic carditis should be established in Marrakesh and surrounding regions to inform our recommendations.
2. Develop a strategy to combat ARF, with a specific focus on rural areas where there is a high prevalence of rheumatic carditis.
3. Arthralgia should not be overlooked by either parents or medical staff. Achieving this necessitates a multipronged approach involving information, education, and communication, all coordinated under the national program against ARF.
4. Improvement of environmental hygiene and socio-economic conditions are crucial for prevention. These goals can be achieved through sustainable development projects that not only improve living conditions but also disseminate essential health information.
5. Conduct awareness campaigns in educational institutions such as schools, colleges, and high schools, involving general practitioners, cardiologists, and educators from various disciplines.
6. Engage the media in raising awareness, place informative posters in public areas, and produce advertisements, documentaries, and patient testimonials.
7. Emphasize the pivotal role of cardiac auscultation in the early detection of rheumatic heart disease, as it remains a fundamental, non-invasive diagnostic tool that can identify characteristic murmurs indicative of valvular pathology often associated with RHD.
8. Implement screening campaigns for valvular diseases within educational institutions, employing cardiac auscultation as a primary diagnostic tool.
9. Raise awareness among healthcare professionals to apply the new Jones criteria

10. Echocardiographic examinations should be requested for any suspected cases of ARF, even when cardiac murmurs are absent, given the high incidence of subclinical carditis.
11. Finally, in cases of symptomatic valvular disease, prompt surgical intervention is crucial to prevent cardiac decompensation, thromboembolic events (particularly stroke), and ultimately, death.

STRENGTHS AND LIMITATIONS OF THE STUDY

I. Strengths of the study:

- Our study is the first in Morocco and the second in Africa, following the study by Jaiteh et al. in Gambia, to evaluate the reasons for the delayed diagnosis of chronic rheumatic heart disease, taking into consideration the socioeconomic, clinical and echocardiographic aspects of the patients.
- Our research encompassed both the public and private healthcare sectors, providing a comprehensive view of the subject area across various institutional settings.

II. Limitations of the study:

The number of patients in our study could have been higher, particularly as recruitment from the private sector was limited.

CONCLUSION

In the context of our research on delayed diagnosis of rheumatic heart disease, it is evident that RHD is not merely a medical issue but also a significant public health problem. Particularly in low-to-middle-income countries, multiple factors contribute to the delayed diagnosis of RHD. These include social conditions, economic status, educational background, geographical location, and the bacterial agent, Group A Streptococcus.

A solely medical approach is insufficient to address this multifaceted issue. A comprehensive, multi-sectoral strategy led by the Ministry of Health is essential for effective management. This strategy should also involve other governmental departments such as education and social welfare, and engage non-governmental organizations for a more holistic intervention. These collaborative efforts aim to mitigate the diverse factors contributing to the delayed diagnosis of RHD.

In addition to these broader initiatives, specific medical interventions are crucial. Implementing rapid tests for Group A Streptococcus can facilitate the immediate treatment of conditions like tonsillitis, which are precursors to RHD. Immediate identification and treatment of streptococcal infections can reduce the risk of RHD development. Furthermore, cardiac auscultation remains a fundamental tool in the diagnosis of rheumatic heart disease, underscoring its clinical importance. Moreover, healthcare professionals should receive training in the application of the new Jones criteria, which provide updated diagnostic guidelines that aid in the early and accurate detection of RHD. Therefore, cardiac echography serves as a vital diagnostic tool, capable of identifying cardiac abnormalities related to RHD even at asymptomatic stages. Expanding access to this technology is of paramount importance, especially in areas with limited healthcare resources.

In summary, tackling the delayed diagnosis of RHD necessitates a comprehensive, multi-sectoral approach that goes beyond medical interventions alone. Effective policy-making should account for the various social, economic, and educational factors influencing RHD diagnosis and management, while incorporating essential medical practices such as rapid streptococcal testing, the new Jones criteria, and cardiac echography.

ABSTRACT

Abstract

In Morocco, as in many developing countries, acute rheumatic fever and rheumatic heart disease present significant public health challenges. Cardiac involvement during episodes of ARF constitutes a crucial prognostic factor, both in the immediate term due to the risk of cardiac failure and in the long term because of the potential for valvular sequelae. The objective of our study, conducted between February and July 2023 in Marrakesh, Tahannaout, and Chichaoua, was twofold. First, we aimed to conduct a descriptive analysis of the characteristics of rheumatic heart disease by examining epidemiological, clinical, and echocardiographic profiles, through an observational and analytical study. Second, we sought to identify the factors implicated in the delay in diagnosis and management of RHD. The mean age of the 150-person study population was 43.5 years. We noted a female predominance with a sex ratio of 0.38. Approximately 56% of the patients hailed from urban areas. Our study indicated the impact of socio-economic parameters, including occupation, health insurance, overcrowding, and parental illiteracy. A history of recurrent tonsillitis was present in 72% of the patients; among these, 52.78% had experienced more than five episodes per year, and 60% remained untreated. Notably, 62% of the cases had a history of arthralgia and only 1% had arthritis. The most common localization of arthralgia and arthritis was the major joints with 92.47%. Only 8.42% of these patients had consulted a physician. A family history of ARF was present in 3.33% of patients, and a personal medical history of ARF was noted in 21%; 55% of this latter group benefited from secondary prevention, which may reflect underreporting of the disease. The median age at which RHD was diagnosed was 39 years. A total of 70% of patients were diagnosed after the onset of symptoms, and 13% were diagnosed following complications. Dyspnea was reported in 91.33% of patients, and pulmonary hypertension in 48%. Common valve lesions included mitral regurgitation in 71.33% of patients and mitral stenosis in 63.33%. The management of ARF and RHD is fundamentally preventive in nature, necessitating a multidimensional approach concretized under the supervision of the Ministry of Health as part of a comprehensive program aimed at combating rheumatic fever and its sequelae.

Résumé

Au Maroc, tout comme dans de nombreux pays en développement, le rhumatisme articulaire aigu et la cardite rhumatismale chronique représentent des défis majeurs en matière de santé publique. L'atteinte cardiaque lors des épisodes de rhumatisme articulaire aigu constitue un facteur pronostique crucial, à la fois à court terme en raison du risque d'insuffisance cardiaque et à long terme en raison du potentiel de séquelles valvulaires. L'objectif de notre étude, réalisée entre février et juillet 2023 à Marrakech, Tahannaout, et Chichaoua, était double. Premièrement, nous avons cherché à réaliser une analyse descriptive des caractéristiques des cardiopathies rhumatismales chroniques en examinant les profils épidémiologiques, cliniques et échographiques, à travers une étude observationnelle et analytique. Deuxièmement, nous avons cherché à identifier les facteurs incriminés dans le retard de diagnostic et de prise en charge des cardiopathies rhumatismales chroniques. L'âge moyen de la population de l'étude, composée de 150 personnes, était de 43.5 ans. Nous avons noté une prédominance féminine avec un sex-ratio de 0,38. Environ 56% des patients provenaient de zones urbaines. Notre étude a indiqué l'impact de paramètres socio-économiques, incluant la profession, l'assurance maladie, la promiscuité et l'analphabétisme parental. Des antécédents d'angine à répétition étaient présents chez 72% des patients ; parmi ceux-ci, 52.78% avaient connu plus de cinq épisodes par an et 60% étaient demeurés non traités. Notamment, 62% des cas avaient des antécédents d'arthralgie, et seulement 1% des cas avaient des antécédents d'arthrites. La localisation des arthralgies et d'arthrites la plus fréquente était les grosses articulations avec 92.47% de ces cas. Seulement 8.42% de ces patients avaient consulté un médecin. Une histoire familiale de RAA était présente chez 3,33% des patients, et une histoire médicale personnelle de RAA était notée chez 21% ; 55% de ce dernier groupe bénéficiaient d'une prévention secondaire, ce qui pourrait refléter une sous-déclaration de la maladie. L'âge médian auquel le diagnostic de la cardite rhumatismale chronique a été posé était de 39 ans. Un total de 70% des patients ont été diagnostiqués après l'apparition des symptômes, et 13% ont été diagnostiqués suite à des complications. La dyspnée était signalée chez 91.33% des patients, et l'hypertension pulmonaire chez 48%. Les lésions

valvulaires courantes comprenaient une régurgitation mitrale chez 71.33% des patients et une sténose mitrale chez 63.33%. La prise en charge du rhumatisme articulaire aigu et de la cardite rhumatismale chronique est fondamentalement préventive par nature, nécessitant une approche multidimensionnelle concrétisée sous la supervision du Ministère de la Santé dans le cadre d'un programme global visant à combattre le rhumatisme articulaire aigu et ses séquelles.

ملخص

في المغرب، كما في العديد من الدول النامية، تعد الرثية المفصلية الحادة والافات القلبية الرثية تحديات كبيرة في مجال الصحة.وتشكل إصابة القلب خلال نوبات الروماتيزم الحاد عامل تكهني حاسم، سواء في المدى القريب بسبب خطر الفشل القلبي، أو في المدى البعيد بسبب الإمكانية لحدوث أضرارالصمام. كان هدف دراستنا، التي أجريت بين فبراير ويوليوز 2023 في مراكش، تاحناوت، وشيشاوة، ثنائيا. أولا، سعينا لإجراء تحليل وصفي لخصائص أمراض القلب الروماتيزمية من خلال فحص الملفات الوبائية والسريرية والايكوكارديوغرافية، عبر دراسة رصدية وتحليلية. ثانيا، بحثنا عن تحديد العوامل المتورطة في التأخير في تشخيص وإدارة أمراض القلب الروماتيزمية. كان متوسط عمر مجموعة الدراسة المكونة من 150 شخصا 43.5 عامًا. لاحظنا سيادة الإناث بنسبة نوع الجنس تبلغ 0.38. حوالي 56٪ من المرضى كانوا من المناطق الحضرية. أشارت دراستنا إلى تأثير المعايير الاقتصادية والاجتماعية، بما في ذلك المهنة، والتأمين الصحي، والاكتظاظ السكاني، وأمية الوالدين. كان لدى 72٪ من المرضى سوابق طبية لالتهابات متكررة للوزتين ؛ من بين هؤلاء، كان 52.78٪ قد شهدوا أكثر من خمس حالات في السنة، وظل 60٪ بدون علاج. يُلاحظ أن 62٪ من الحالات كان لديها سوابق طبية لآلام المفاصل، وفقط 1% كان لديها سوابق طبية للإتهاب المفاصل. أكثر الأماكن شيوعًا لآلام المفاصل والتهاب المفاصل كانت المفاصل الكبيرة بنسبة 92.47٪ من هذه الحالات. فقط 8.42٪ من هؤلاء المرضى قد استشاروا الطبيب. كان لدى 3.33٪ من المرضى سوابق عائلية للرثية المفصلية الحادة ، وتم تدوين سوابق طبية شخصية للرثية المفصلية الحادة في 21٪؛ استفاد 55٪ من هذه المجموعة الأخيرة من الوقاية الثانوية، مما قد يعكس التقارير غير الكافية عن المرض. كان العمر المتوسط عند تشخيص الأمراض القلبية الروماتيزمية 39 عامًا. تم تشخيص ما مجموعه 70٪ من المرضى بعد ظهور الأعراض، وتم تشخيص 13٪ بعد حدوث مضاعفات. أبلغ عن ضيق التنفس في 91.33٪ من المرضى، وارتفاع ضغط الدم الرئوي في 48٪. تضمنت الإصابات الصمامية الشائعة ارتجاع الصمام الميترالي في 71.33٪ من المرضى، وتضيق الصمام الميترالي في 63.33٪. إدارة الرثية المفصلية الحادة والأمراض القلبية الروماتيزمية هي بالأساس وقائية بطبيعتها، وتتطلب نهجا متعدد الأبعاد يجسد تحت إشراف وزارة الصحة كجزء من برنامج شامل يهدف إلى مكافحة الرثية المفصلية الحادة ومضاعفاتها.

ANNEX

Fiche d'exploitation

Détail du patient :

Nom : ……..

Prénom : ……..

Origine : ……..

Profession : ……..

Adresse : ……..

N° de téléphone : ……..

Profil épidémiologique :

Age : ……..

Sexe : ……..

Condition socio-économique :

Lieu de résidence :

Urbain : ☐

Rural : ☐

Région : ……..

Nombre de personnes par foyer : ……..

Nombre de pièces par foyer : ……..

Niveau de scolarisation des parents :

La mère : ……..

Le père : ……..

Les sanitaires :

Nombre de toilettes : ……..

Nombre de douches : ……..

Approvisionnement en eau : ☐

Electrification du foyer : ☐

Accès aux soins :

Centre de santé : ☐

Médecin généraliste : ☐

Pédiatre : ☐

Médecin spécialiste : ☐

Non : ☐

Profil clinique :

Motif de consultation : ……..

Antécédent :

Angine à répétition : ☐

Nombre d'épisodes : ……..

Angines traitées : ☐

Arthralgie/ Arthrite : ☐

Siège :

Grosses articulations: ☐

Petites articulations : ☐

Articulations proximales : ☐

Articulations axiales : ☐

Consultation : ☐

Traitement prescrit : ……..

Amygdalectomie : ☐

Antécédent de scarlatine : ☐

Antécédent familial de RAA :

Fratrie : ☐

Autre : ……..

Antécédent personnel de RAA : ☐

Traitement prescrit :

Corticothérapie : ☐

Aspirine : ☐

Aucun : ☐

Prophylaxie secondaire : ☐

Rechute du RAA : ☐

Critères diagnostiques de Jones:

Date du diagnostic : ……..

Critères majeurs	Critères mineurs	Preuve d'une infection streptococcique
Poly-arthralgie : ☐ Mono-arthrite aseptique : ☐ Polyarthrite : ☐ Localisation : ……	Mono-arthralgie : ☐ Localisation : ……	ASLO élevées : ☐ Valeur : ……

Critères majeurs					Critères mineurs	Preuve d'une infection streptococcique
Nodule de Meynet : ☐					Fièvre : ☐	Culture pharyngée positive: ☐
Erythème marginé de Besnier :☐					VS ou CRP élevée : ☐ Valeur : ……..	Test diagnostic rapide positif : ☐
La chorée de Sydenham : ☐					L'espace PR allongé à l'ECG: ☐	
Cardite	Min	Mod	Moy	Sév		
IAo	☐	☐	☐	☐		
IM	☐	☐	☐	☐		
RAo	☐	☐	☐	☐		
RM	☐	☐	☐	☐		

Cardiopathie rhumatismale chronique(CRC) :

Date de la survenue de la CRC : ……..

Circonstance de survenu :

- Lors d'une surveillance de RAA : ☐
- Découverte fortuite : ☐
- Lors d'apparition des symptômes : ☐
- Lors d'une grossesse : ☐
- Lors d'une complication : ☐
- Insuffisance cardiaque : ☐
- Accident vasculaire cérébral : ☐
- Ischémie des membres : ☐
- Endocardite infectieuse : ☐
- Autre **:** ……..

Signes cliniques :

- Douleurs thoraciques : ☐
- Dyspnée : ☐
- Toux : ☐
- Asthénie : ☐
- Palpitation : ☐
- Souffle cardiaque : ☐
- Frottement péricardique : ☐
- Autres : ……..

Hospitalisation : ☐

- Durée d'hospitalisation: ……..
- Traitement prescrit : ……..
- Nombre d'hospitalisation : ……..

Echographie doppler cardiaque :

Valvulopathies :

- Type : ……..
- Morphologie : ……..
- Sévérité : ……..

VG : Normal :☐ Dilaté :☐ HVG :☐

FE : Conservée :☐ Moy altérée : ☐ Très altérée : ☐

OG : Normale : ☐ Dilatée : ☐

VD : Normal : ☐ Dilaté : ☐

IT : Min:☐ Mod :☐ Moy:☐ Sév :☐

Fonction du VD :

HTP: Min:☐ Mod :☐ Moy:☐ Sév :☐

Autres : ……..

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قسم الطبيب

أقْسِم بِالله العَظِيم

أن أراقبَ الله في مِهْنَتِي.

وأن أصُونَ حياة الإنسان في كآفّةِ أطوَارهَا في كل الظروف

والأحَوال باذلا وسْعِي في انقاذها مِن الهَلاكِ والمرَضِ

والألَم والقَلَق.

وأن أحفَظَ لِلنَاسِ كرَامَتهُم، وأسْتر عَوْرَتهُم، وأكتمَ سِرَّهُمْ.

وأن أكونَ عَلى الدوَام من وسائِل رحمة الله، باذلا رعايتي الطبية للقريب والبعيد،

للصالح والطالح، والصديق والعدو.

وأن أثابر على طلب العلم، وأسَخِّرَه لِنَفْعِ الإِنْسَان لا لأذَاه.

وأن أُوَقّرَ مَن عَلَّمَني، وأُعَلّمَ مَن يَصْغرَني، وأكون أخا لِكُلِّ زَميلٍ في المِهنَةِ الطِّبِّيَة

مُتعَاونِينَ عَلى البرِّ والتقوى.

وأن تكون حياتي مِصْدَاق إيمَاني في سِرّي وَعَلانيَتي،

نَقِيَّة مِمّا يُشينهَا تجَاهَ الله وَرَسُولِهِ وَالمؤمِنين.

والله على ما أقول شهيد

كليـــــــة الـطب
والصيدلة - مراكش
FACULTÉ DE MÉDECINE
ET DE PHARMACIE - MARRAKECH
جامعة القاضي عياض
UNIVERSITÉ CADI AYYAD

السنة 2023 الاطروحة رقم427

تشخيص المرض الروماتيزمي في مرحلة المرض القلبي الصمامي الروماتيزمي المزمن

الأطروحة

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لنيل شهادة الدكتوراه في الطب

الكلمات المفتاحية

المرض القلبي الروماتيزمي –الوثية المفصلية الحادة -الآفة القلبية التحت سريرية–تشخيص متأخر

اللجنة

السيد	م. الحطاوي أستاذ في أمراض القلب.	الرئيس
السيدة	س. الكريمي أستاذة في أمراض القلب.	المشرف
السيد	د. بومزبرة. أستاذ في جراحة القلب و الشرايين.	الحكام
السيدة	ز. زويزرة. أستاذة في جراحة القلب و الشرايين.	
السيدة	و. لحميني أستاذة في طب الأطفال.	