

## An Overview of Rheumatic Heart Disease Role of Physicians, Clinical Laboratory and Pharmacist in Management and Prevention

Ahmed Salman Alsharef<sup>1</sup>, Riyadh Makki Ajzaji<sup>1</sup>, Amer Hassan Alshahre<sup>2</sup>, Abdulaziz Salem Almasabi<sup>3</sup>, Ghassan Mohammed Zaki Damanhori<sup>4</sup>, Maryam Mudhhi Ahmad Alshehri<sup>5</sup>, Muaath Ahmed Alghamdi<sup>6</sup>, Abdullah Nasser Abdullah Aljadaan<sup>7</sup>, Amani Saeed Alturaifi<sup>8</sup>, Hatim Mohammed Hamed AL harbi<sup>9</sup>, Walaa Mohammed Brashi<sup>10</sup>, Mohammed Ahmed Alzahrani<sup>11</sup>, Abdullah Awadah Alrefaie<sup>12</sup>, Najlaa Abdulkader Basamad<sup>13</sup>, Fahad Mohammed Ahmed Alzahrani<sup>14</sup>

<sup>1</sup>King Salman Bin Abdulaziz Medical City, General Medicine Senior Registrar

<sup>2</sup>Family medicine, Ministry of Health southwestern region

<sup>3</sup>Family medicine, Riyadh second cluster, ministry of health, Saudi Arabia

<sup>4</sup>Emergency Department Resident, King Abdul-Aziz Hospital Jeddah

<sup>5</sup>General practitioner, Eradah and Mental Health Complex - Tabuk

<sup>6</sup>Physician (general practitioner), alizdihar phc

<sup>7</sup>Physician (general practitioner), Ezdihar phc

<sup>8</sup>Laboratory Technician, Riyadh Regional Laboratory

<sup>9</sup>Lab specialist, King Abdulaziz Hospital

<sup>10</sup>Lab technician, King Abdullah medical complex

<sup>11</sup>Laboratory specialist, King Fahd general hospital jeddah

<sup>12</sup>Molecular virology, King fahad general hospital jeddah

<sup>13</sup>Microbiology, King Fahad general hospital jeddah

<sup>14</sup>Pharmacy Technician - Qilwah general hospital, Al Baha, Saudi Arabia

### Abstract

Rheumatic heart disease (RHD) continues to be a significant public health concern that impacts children and young people in developing nations. This study sought to assess the contributions of physicians, clinical laboratories, and pharmacists in the field of treatment and prevention. Chronic rheumatic heart disease (RHD) sometimes manifests with illness complications or the recurrence of rheumatic fever (RF). Insufficient management of RF/RHD results in significant harm to the heart valves and subsequent impairments. It is crucial to make active efforts in diagnosing and treating RF/RHD at an early stage, as well as implementing effective preventive measures. And everyone of the healthcare worker including physicians, nurses, pharmacist and clinical laboratory teams, have a very important roles in the management and increase the awareness among population, as well as they play a crucial role in management of RHD.

**Keywords:** *Rheumatic heart disease (RHD), rheumatic fever (RF), clinical laboratory.*

### Introduction

Rheumatic heart disease (RHD) is a persistent cardiovascular condition and a prominent noncommunicable illness in countries with

lower- and middle-income levels (LMICs). It is distinctive because to its contagious and transferable character. Group A Streptococcus (GAS), a bacteria, is one of the leading causes of death worldwide, ranking among the top 10

infectious agents. This bacterium is responsible for causing acute pharyngitis. If not treated properly or left untreated, it triggers an aberrant immune response in certain individuals, resulting in non-purulent inflammatory processes that affect the heart valves, joints, and skin. This condition is known as acute rheumatic fever (ARF) [1].

Subsequent occurrences of acute rheumatic fever (ARF) typically happen after the initial episode. If not effectively treated, particularly in cases of recurring pharyngitis, this can lead to irreversible damage to the heart valves, known as rheumatic heart disease (RHD). RHD is a chronic inflammatory condition of the heart valves that occurs as a result of GAS pharyngitis. In 2015, Rheumatic Heart Disease (RHD) impacted a total of 33.4 million individuals worldwide, resulting in 319,400 fatalities. It is worth noting that the prevalence of RHD seems to be on the rise [2]. Individuals within the age range of 5 to 15 years have a higher likelihood of developing the disease and have long-lasting consequences. The burden is more severe in low- and middle-income countries (LMICs), where the primary risk factors, such as overcrowding, inadequate healthcare access, lack of knowledge, poverty, and malnutrition, are also prevalent [3]. The statement is backed by evidence indicating a greater occurrence of RHD among youngsters, specifically 12.4 per 1000, in Sokoto, a region with a majority of residents belonging to the lower socio-economic class. In comparison, the frequency of RHD is 1.1 per 10,000 in Lagos and 0.07 per 1000 in Jos, which are more cosmopolitan locations [4].

The preventive measures span from primordial to tertiary. Primordial prevention involves the eradication of risk factors by developing policies and providing health education to community members, including healthcare professionals, in order to enhance awareness. The primary goal of primary prevention is to promptly identify and treat GAS pharyngitis in order to prevent the production of antibodies that trigger the immunological response, which can result in the initial or recurring occurrence of acute rheumatic fever (ARF). This also encompasses the utilization of a vaccine that is currently in the process of being developed. Secondary prevention aims to prevent the recurrence of acute rheumatic fever (ARF) by administering monthly penicillin injections to

individuals who are at risk of experiencing ARF again. Tertiary prevention seeks to mitigate problems once the disease has already been established. To limit impairment and prevent complications and early death, symptoms of heart failure are effectively managed by the treatment of heart failure and surgical replacement of damaged heart valves [5].

The importance of basic health care in preventing RHD cannot be overstated. Healthcare professionals such as physicians, clinical laboratory technicians, and pharmacists at this level require extensive expertise as they have frequent interactions with patients and community members. Over the past 20 years, numerous assessments of the disease's impact and appeals for action have been made, but there has been no notable progress. An identified challenge is the insufficient number of health workforce, particularly at the primary health care level, where there is a need for lower-level health workers such as nurses, community health officers, and community health extension workers in the early, primary, and secondary prevention stages [6].

### **Review:**

Rheumatic fever (RF) typically impacts children of school age, following an infection caused by group A streptococcus (GAS), which presents with various symptoms. The risk factors for streptococcal infection encompass poverty, hunger, overcrowding, inadequate housing, and limited healthcare facilities, which contribute to the elevated prevalence in underdeveloped nations [6]. Every symptom of RF disappears entirely, with the exception of heart valvular damage, which is the defining characteristic of RHD. Post-rheumatic valvulopathies continue to be the primary cause of heart failure in children and young people [7]. Hence, those displaying clinical manifestations of RF/RHD should receive immediate treatment and be referred for a definitive diagnosis and long-term care in order to minimize the extent of cardiac harm. Nevertheless, in underdeveloped nations where obtaining medical treatment is challenging, patients frequently arrive at specialized medical facilities with pre-existing debilitating symptoms such as congestive heart failure or pulmonary hypertension. All patients should

undergo secondary penicillin prophylaxis to avoid the reactivation of RHD. However, long-term care and patient compliance have shown to be difficult [8].

RHD is the primary cause of death resulting from cardiac origins. Frequently, individuals with RHD commonly arrive at the hospital with deteriorating symptoms caused by consequences of RHD. Untreated severe rheumatic valvular disease can lead to several complications, including infective endocarditis, embolic events, atrial fibrillation, heart failure, and pulmonary hypertension. These are among the most often observed sequelae [8]. Frequently, both children and young adults commonly experienced notable consequences of advanced RHD, namely congestive heart failure and pulmonary hypertension. Out of the total number of patients, 14.33% (40 individuals) developed secondary pulmonary hypertension. Among these patients, 11 were youngsters and 29 were young adults. It is worth noting that roughly half of these cases were classified as severe. Pulmonary hypertension commonly arises in patients with valvular heart disease, especially in cases involving mitral and aortic valve defects. This occurs due to the left ventricle (LV) becoming hypertrophic and less flexible, resulting in elevated LV end-diastolic pressure. Consequently, the left atrium (LA) undergoes hypertrophy and enlargement, leading to a decrease in its output and the subsequent development of pulmonary hypertension [9]. Atrial fibrillation was more prevalent in the young adult demographic and had a notable impact due to its incapacitating consequence of spontaneous blood clot formation in the left atrium, compounded by the limited availability of anticoagulant medications in rural regions. The juvenile population also exhibited cases of infective endocarditis (IE), consistent with a prior study that reported IE in 16% of children with rheumatic heart disease (RHD). RHD was identified as the underlying factor in 84% of cases of IE, particularly in Asian nations [10]. This correlation had the potential to be life-threatening, given that IE is difficult to diagnose and treat, particularly when there is minimal diagnostic assistance available. The sequelae frequently emerged as the primary grievances, rather than the rheumatic fever itself, suggesting that an acute episode of RF often went unnoticed and untreated. This

highlighted the significance of educating the population and healthcare professionals in remote regions about RF/RHD in order to promptly identify and treat it, with the aim of preventing additional undesirable sequelae. Access to laboratory facilities is essential for establishing the presence of streptococcal infections and determining a diagnosis.

Cardiac involvement in rheumatic heart disease (RHD) affects the pericardium, myocardium, and endocardium. Valvulitis is the most prevalent manifestation, which can vary from mild to severe instances with congestive heart failure and/or mortality [11]. Carditis was the primary criteria observed in both the child and young adult groups, making up 63.79% of the patients in this study. This percentage is consistent with earlier studies that have reported carditis rates ranging from 37.5% to 93%. Children were more prone to have polyarthritis and skin manifestations, such as subcutaneous nodules and erythema marginatum. Both skin abnormalities were rare occurrences, observed in less than 10% of individuals in a prior study [12]. Chorea exclusively manifested in the young adult demographic, often causing asymmetrical facial involvement, and rarely presented as the sole symptom.

The most common type of valve damage caused by rheumatic fever was found in both the children and young adults, and it affected the mitral valve. The significant involvement of the mitral valve has been well-documented in the literature, including in a prior study conducted at a tertiary care institution in developing nations. This involvement is typically followed by the occurrence of aortic valve disease [12].

In the children's population, isolated pure mitral valve lesion (12.96%) was more prevalent than isolated aortic valve lesion (4.62%) in cases of single valvular lesion. In the young adult group, there was a similar outcome, with a higher prevalence of isolated mitral valve lesions (22.22%) compared to isolated aortic valve lesions (5.26%). Similarly, research conducted by Laudari et al. and Alkhalifa et al. revealed that the solitary mitral valve lesion was the most often impacted valve lesion, accounting for 46.8% and 60% of cases, respectively [13].

RHD primarily impacts the heart valves on the left side, although the exact cause remains

unknown. Contrary to one study, rheumatic tricuspid valve disease ranked as the second most prevalent condition among all groups affected by rheumatic heart disease (RHD). The data documented two instances of isolated tricuspid valve lesion in children, a condition that is exceptionally uncommon. Typically, tricuspid valve lesions are either functional or occur in conjunction with other valve abnormalities. The initial case involved a 14-year-old male who exhibited signs of acute rheumatic fever (carditis, polyarthritis, subcutaneous nodule, and fever). Echocardiography revealed mild tricuspid regurgitation, although it was uncertain whether the patient had a history of previous rheumatic fever. Another instance was a 10-year-old male who displayed symptoms of congestive heart failure, such as orthopnea, paroxysmal nocturnal dyspnea, and dyspnea on effort. An echocardiographic examination revealed the presence of mild tricuspid regurgitation, which was determined to be of rheumatic origin. Subsequently, these individuals received secondary prophylaxis (PMP) [14].

### Conclusion:

Hypertrophic cardiomyopathy (HD) continues to be the primary acquired valvular heart disease observed in children and young adults. Individuals suffering from chronic rheumatic heart disease (RHD) frequently exhibit problems associated with the condition or experience a resurgence of RHD symptoms. The main abnormality observed was a mitral valve lesion, which was especially prevalent in cases of dual-valve illness. In children, this lesion typically manifested as mitral regurgitation, while in young adults it presented as stenosis. The presence of tricuspid, aortic, and pulmonary valve involvement was frequently observed, often presenting with different patterns and combinations. The presence of multivalve lesions suggests that the disease has reached an advanced stage. Surgical intervention was performed, particularly in severe instances with a low rate of mortality shortly after the operation. Inadequate adherence and restricted availability of secondary prophylaxis continue to pose substantial obstacles to RF/RHD reduction initiatives, particularly in rural regions. To address the lack of knowledge among primary

health care workers regarding the prevention of RHD, it is suggested that the Primary Health Care stakeholders in the Federal Ministry of Health, National Primary Health Care Development Agency, and Community Health Practitioners Registration Board assign representatives to revise their training curriculum. This revision should focus on enhancing knowledge of pharyngitis, ARF, and RHD. Additionally, regular on-the-job training sessions, aligned with the practices of tertiary hospitals or relevant specialists within the respective zones, should be organized. Healthcare professionals, such as doctors, clinical laboratory teams, and pharmacists, should be equipped with necessary resources, such as visual aids, quick diagnostic kits, and gram staining capabilities, to aid in the diagnosis of pharyngitis. Medications such as penicillin V and injectable benzathine penicillin should be provided to those with a high likelihood of non-compliance in order to ensure proper treatment.

### Reference

- [1] Katzenellenbogen JM, Ralph AP, Wyber R, Carapetis JR. Rheumatic heart disease: Infectious disease origin, chronic care approach. *BMC Health Serv Res.* 2017;17:793.
- [2] Carapetis JR. The stark reality of rheumatic heart disease. *Eur Heart J.* 2015;36:1070–3.
- [3] Webb RH, Grant C, Harnden A. Acute rheumatic fever. *BMJ.* 2015;351:h3443.
- [4] Sani UM, Ahmed H, Jiya NM. Pattern of acquired heart diseases among children seen in Sokoto, NorthWestern Nigeria. *Niger J Clin Pract.* 2015;18:718–25.
- [5] Animasahun B, Madise-wobo A, Itiola A, Adekunle M, Kusimo O, Bode Thomas F. The burden of rheumatic heart disease among children in Lagos: How are we faring? *Pan Afr Med J.* 2018;29:150.
- [6] Bode-Thomas F, Okolo S, Ekedigwe J, Kwache I, Adewunmi O. Paediatric echocardiography in Jos University Teaching Hospital: Problems, prospects and preliminary audit. *Niger J Paediatr.* 2003;30:143–9.

- [7] Mayosi B. The four pillars of rheumatic heart disease control. *S Afr Med J*. 2010;100:506.
- [8] Gandhi GD, Krishnamoorthy N, Motal UM, Yacoub M. Towards developing a vaccine for rheumatic heart disease. *Glob Cardiol Sci Pract* 2017. 2017 e201704.
- [9] Kasmaei P, Atrkar-Roushan Z, Majlesi F, Joukar F. Mothers' knowledge about acute rheumatic fever. *Paediatr Nurs*. 2008;20:32–4.
- [10] Nkoke C, Luchuo EB, Jingi AM, Makoge C, Hamadou B, Dzudie A. Rheumatic heart disease awareness in the South West region of Cameroon: A hospital based survey in a Sub-Saharan African setting. *PLoS One*. 2018;13:e0203864.
- [11] Sadoh W, Akinsete A. Physicians' management of sorethroat in children in Benin City, Nigeria. *Niger J Clin Pract*. 2009;12:407–11.
- [12] Osman GM, Abdelrahman SM, Ali SK. Evaluation of physicians' knowledge about prevention of rheumatic fever and rheumatic heart disease before and after a teaching session. *Sudan J Paediatr*. 2015;15:37–42.
- [13] Myint N, Aung N, Win M, Htut T, Ralph A, Cooper D, et al.. The clinical characteristics of adults with rheumatic heart disease in Yangon, Myanmar: an observational study. *PLoS ONE*. (2018) 13:e0192880.  
10.1371/journal.pone.0192880
- [14] Joseph N, Madi D, Kumar G, Nelliyanil M, Saralaya V, Rai S. Clinical spectrum of rheumatic fever and rheumatic heart disease: a 10 year experience in an urban area of south. *North Am J Med Sci*. (2013) 5:647. 10.4103/1947-2714.122307