
RHEUMATIC HEART DISEASE WITH NYHA CLASS III HEART FAILURE IN CHILDREN: A CASE REPORT

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Abstract

Rheumatic Heart Disease (RHD) is one of the serious complications of Acute Rheumatic Fever (ARF) which is still a major health problem, especially in developing countries. RHD can cause permanent damage to the heart valves, increasing the risk of heart failure in the pediatric population. This study aims to describe the clinical management of RHD cases with class III heart failure according to the New York Heart Association (NYHA) classification in a pediatric patient. The research method used a descriptive case study approach with a retrospective review of the medical records of a 13-year-old pediatric patient who experienced progressive dyspnea, fatigue, lower extremity edema, and intermittent fever. Physical and supporting examinations showed cardiomegaly, pulmonary edema, and severe mitral regurgitation. Management included administration of Benzathine Penicillin G, Prednisone 2 mg/kg/day, and other supportive therapies. The results showed significant clinical improvement within one week of treatment, with a long-term follow-up plan to prevent recurrence. The implications of this study emphasize the importance of early diagnosis and appropriate therapy to prevent the development of ARF into RHD and improve the long-term prognosis of pediatric patients. This study also highlights the need to increase public awareness and strengthen the primary health care system in early detection and management of RHD.

Keywords: rheumatic heart disease (rhd), acute rheumatic fever (arf), mitral valve disease, pediatric heart failure

INTRODUCTION

Rheumatic Heart Disease (RHD) is a significant global health problem, especially in developing countries. This disease is a chronic complication of acute rheumatic fever (ARF), which is caused by group A β -hemolytic Streptococcus infection in the upper respiratory tract. The World Health Organization (WHO) notes that RHD causes more than 270,000 deaths each year, with approximately 33 million people worldwide living with the disease (Vos et al., 2015). The high prevalence of RHD in developing countries indicates inequality in access to adequate health services, poor sanitation, and lack of public awareness regarding the prevention and treatment of streptococcal infections (Auala et al., 2022).

Indonesia is one of the countries with endemic RHD status, with a prevalence ranging from 0.3 to 0.8 per 1,000 population between 1981 and 1990. (Dian, 2023) The latest data from the Global Burden of Disease Study 2015 shows that Indonesia still faces major challenges in handling RHD, especially among children aged 5–15 years (Vos et al., 2016). This is reinforced by the study of Hasanah and Suryati (2020) which revealed that most cases of RHD in children in Indonesia are not diagnosed until they reach an advanced stage.

RHD often results in serious complications in the form of heart valve damage, especially the mitral and aortic valves. One of the most significant clinical manifestations of RHD is heart failure, which occurs due to structural and functional dysfunction of the heart in pumping blood (Puggia et al., 2018). Among children with RHD, mitral valve involvement is the most common complication, with a prevalence reaching 75% (Allen HD et al., 2017). Research by Iddawela et al., (2022) highlights that mitral valve disease in children tends to be diagnosed late, increasing the risk of developing heart failure.

Heart failure in children due to RHD often has a poor prognosis. Arafuri et al., (2022) reported that children with severe heart dysfunction according to NYHA III-IV classification showed a lower survival rate. This is exacerbated by limited access to specialist health services, especially in remote areas in Indonesia. Lilyasari et al., (2020) noted that most RHD patients in Indonesia are referred to tertiary heart centers in severe conditions, increasing the risk of complications and death.

RHD in children is not only focused on clinical aspects, but also on prevention and early detection efforts. Early diagnosis and appropriate treatment can reduce the risk of ARF progression to RHD, as well as minimize long-term complications such as heart failure (Gerber et al., 2009). However, epidemiological data in Indonesia are still limited, especially regarding the clinical profile of RHD in children and risk factors that contribute to disease progression. Therefore, this study aims to fill this knowledge gap and provide evidence-based information to improve RHD prevention and management strategies in Indonesia.

Several studies have highlighted the risk factors and long-term impact of RHD in children. Carapetis et al., (2016) revealed that untreated streptococcal infection is the main trigger for ARF, which then progresses to RHD. Studies by (Iskandar et al., 2016) showed that children from families with a history of rheumatic fever have a higher risk of recurrent attacks, especially if they do not receive routine secondary prophylaxis.

In the Indonesian context, Syam et al., (2020) reported that the prevalence of subclinical RHD is quite high in elementary schools, indicating the need for routine screening for early detection. Hasnul et al., (2015) also identified that delays in diagnosis are often due to lack of community awareness and limitations of primary health facilities in performing echocardiography examinations.

This study offers a new approach in understanding the clinical dynamics of RHD in children with a focus on the management of heart failure based on the NYHA classification. This study not only highlights the risk factors and complications, but also evaluates the effectiveness of standard therapies such as the use of Benzathine Penicillin G and corticosteroids in reducing symptoms and improving heart function (Gewitz et al., 2015). In addition, this study examines the obstacles in implementing secondary prophylaxis, which is often overlooked in health care systems in developing countries (Rheumatic Fever and Rheumatic Heart Disease, 2004).

This study aims to identify the main risk factors contributing to the progression of ARF to RHD in children in Indonesia. Evaluate the clinical profile of children with RHD, including the most common types of valve abnormalities and severity of heart failure based on the NYHA classification. Analyze the effectiveness of the applied treatment strategies, including the use of antibiotics, corticosteroids, and surgical intervention if necessary. Provide evidence-based recommendations to improve prevention strategies, early detection, and management of RHD in Indonesia.

RESEARCH METHODS

Types of research

This study is a case study that describes a case of Rheumatic Heart Disease (RHD) with manifestations of class III heart failure according to the NYHA classification in pediatric patients. This case study research is used to provide a detailed description of the diagnosis process, treatment, and clinical outcomes of patients based on a retrospective observational approach.

Research Approach

The research approach uses a descriptive method with qualitative analysis. Data were collected through a review of patient medical records, physical examination results, supporting examinations such as laboratory, electrocardiography (ECG), chest X-ray, and echocardiography, as well as documentation of therapy that has been given during treatment.

Population and Sample

The population in this study were all pediatric patients with a diagnosis of Rheumatic Heart Disease (RHD) who were treated at the Bogor City Regional General Hospital. The sample used was one 13-year-old pediatric patient who met the diagnostic criteria for Rheumatic Heart Disease based on the Jones criteria and WHO criteria.

Data collection technique

1. Anamnesis and Physical Examination: To evaluate clinical symptoms such as shortness of breath, chest pain, fatigue, and signs of heart failure.
2. Supporting Examination: Includes laboratory examination (leukocytes, CRP, ASO titer), ECG (to detect prolonged PR interval), chest X-ray (to evaluate cardiomegaly and pulmonary edema), and echocardiography (to assess valve abnormalities and heart function).
3. Therapy Documentation: Includes recording of drugs administered (Benzathine Penicillin G and Prednisone), as well as the patient's clinical development during the treatment period.

Data Analysis Techniques

1. Clinical data were analyzed using a descriptive approach to describe disease course and therapy response.
2. The results of the patient examination were compared with findings from previous literature regarding the characteristics of Rheumatic Heart Disease in children to identify similarities or differences in clinical conditions.
3. The Jones and WHO criteria are used as a reference for comparing diagnostic results, as well as assessing the effectiveness of treatment based on current clinical practice guidelines.
4. If there is a comparison between this case and previous studies or other references, a comparative analysis will be used to assess the relevance of the findings and highlight unique factors that may influence clinical outcomes.

RESULTS AND DISCUSSION

Case Presentation

Child A, a 13-year-old male patient weighing 27 kg, came with complaints of shortness of breath experienced for the past two weeks. Complaints worsened especially during physical activity so that the patient easily tired and sweated a lot. During the past

week the patient also experienced swelling of the abdomen and legs that were getting worse. The patient had intermittent fever since a day ago accompanied by nausea, vomiting, and abdominal pain. History of intermittent cough accompanied by a runny nose since the past 4-6 weeks. Physical examination showed mild retraction and a grade 3 systolic murmur was heard in the 4th and 5th intercostal spaces. Blood tests showed increased leukocytes and C-reactive Protein (CRP), accompanied by a positive antistreptococcal (ASO) titer. Electrocardiography (ECG) showed a prolonged PR interval (0.16 seconds), chest X-ray showed cardiomegaly, pulmonary edema, and right pleural effusion. Echocardiography showed severe mitral regurgitation. The appropriate therapy to be given is Benzathine Penicillin G 600,000 IU IM single dose, and the patient also received Prednisone 2 mg/kg/day, divided into three doses. Other therapies given are symptomatic. The child recovered and was discharged after one week of hospitalization.

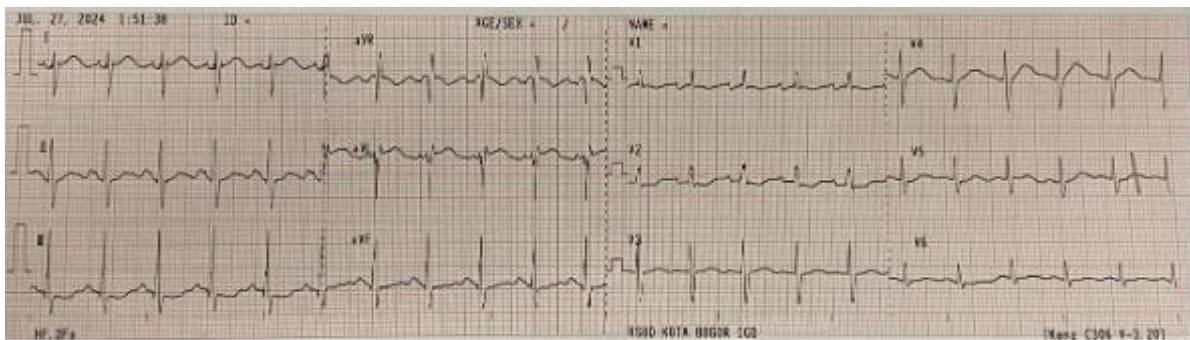


Figure 1. Electrocardiography

Source: Bogor City Hospital Medical Records



Figure 2. Chest X-ray.



Figure 3. Echocardiography.

Source: Bogor City Hospital Medical Records

Research Discussion

Acute rheumatic fever is an autoimmune reaction that occurs after a throat infection caused by *group A Streptococcus bacteria*. This condition can cause inflammation of the heart, joints, skin, and nervous system. Rheumatic fever mainly affects children aged 5 to 14 years, with low socioeconomic status and education levels associated with limited awareness of the disease, prevention, and early treatment (Carapetis et al., 2016; Hasnul et al., 2015). One of the main clinical manifestations of acute rheumatic fever, which contributes to long-term morbidity and mortality, is carditis (Hasbrima et al., 2021). The diagnosis of acute rheumatic fever or rheumatic heart disease can be made if the criteria outlined in the Jones criteria and WHO criteria, as shown in the table:

Table 1. Clinical Manifestations of Acute Rheumatic Fever

Main Manifestations	Small Manifestations
Polyarthritis	Fever
Carditis	Polyarthralgia
Sydenham's Korea	<i>Acute phase reactions</i> (ESR, leukocytosis)
Erythema Marginatum	
Subcutaneous Nodules	

Source: data obtained

Table 2. WHO Criteria for the Diagnosis of Rheumatic Fever and Rheumatic Heart Disease/RHD

Diagnostic Category	Criteria
First attack of rheumatic fever	Two major criteria or one major and two minor criteria, plus evidence of previous infection with <i>Group A β-hemolytic Streptococcus</i>
Recurrent attacks of rheumatic fever without RHD	Two major criteria or one major and two minor criteria, plus evidence of previous infection with <i>Group A β-hemolytic Streptococcus</i>
Recurrent rheumatic fever attacks with RHD	Two minor criteria, plus evidence of previous infection with <i>Group A β-hemolytic Streptococcus</i>
Rheumatic Korea	No major criteria or evidence of previous infection with <i>Group A β-hemolytic Streptococcus</i> are required.
RHD (pure mitral stenosis or combined with mitral insufficiency and/or aortic valve disease)	No additional criteria are required to diagnose RHD

Source: data obtained

The inflammatory process occurs due to the immune response to molecular mimicry between *Group A Streptococcus* and heart valve components, which can cause permanent damage to the mitral and aortic valves or both (Allen HD et al., 2017; Hasbrima et al., 2021). Laboratory findings in patients often show increased leukocytes and C-reactive protein (CRP), indicating ventricular dysfunction leading to myocardial injury. This results in increased production of pro-inflammatory cytokines such as TNF- α , interleukin-6, proteolytic enzymes, and CRP. Inflammation also causes an increase in the number of leukocytes, especially neutrophils, which release cytokines that damage the myocardium and reduce the ventricular ejection fraction (Hasbrima et al., 2021).

Rheumatic heart disease (RHD) is a heart condition caused by residual symptoms (sequelae) of rheumatic fever. RHD is a long-term complication caused by valve damage due to rheumatic fever (Hasnul et al., 2015). Severe valve damage can lead to heart failure. The diagnosis of heart failure in children is based on anamnesis, physical examination, and supporting examinations (Hasbrima et al., 2021). The severity of heart failure is classified

using the NYHA classification system (Table 3). Heart failure is characterized by significant limitations in physical activity, although the patient remains comfortable at rest. In a study by Marhamah Hasnul, shortness of breath was the most common complaint reported by RHD patients (Hasnul et al., 2015).

Table 3. Functional Classification according to the New York Heart Association (NYHA)

Class I	There are no restrictions on physical activity. Ordinary activity does not cause fatigue, shortness of breath, or palpitations.
Class II	Mild physical activity limitation. Ordinary activity results in fatigue, shortness of breath, palpitations, or angina.
Class III	Marked limitation of physical activity. Although the patient is comfortable at rest, even light physical activity can cause symptoms.
Class IV	Inability to perform any physical activity without discomfort. Symptoms of heart failure occur even at rest.

Source: data obtained

Echocardiography is essential for diagnosing and managing RHD (Auala et al., 2022; Suwari & Gede, 2023). This examination assesses the severity of valve abnormalities, chamber function and enlargement, pulmonary hypertension, and guides the planning of surgical intervention or therapy (Suwari & Gede, 2023; Vahanian et al., 2022). Mitral regurgitation (MR) is the most commonly observed valve abnormality, with a prevalence of 30.40%, while no cases of tricuspid stenosis (TS) or pulmonary stenosis (PS) have been reported. Severe valve lesions are the most common, while mild to moderate lesions are less common (Hasnul et al., 2015). Echocardiographic findings in this patient indicate severe mitral regurgitation.

Management of RHD involves medical therapy. Every patient diagnosed with rheumatic fever or RHD requires secondary prophylaxis to prevent recurrent acute rheumatic fever (Carapetis et al., 2016; *Rheumatic Fever and Rheumatic Heart Disease*, 2004). Patients with severe RHD may require surgical intervention; however, limited equipment and the absence of a specialized surgical team are significant barriers to its implementation (Hasnul et al., 2015).

Patients diagnosed with acute rheumatic fever should receive definitive therapy to eradicate *Group A Streptococcus bacteria*, usually through the administration of penicillin. This treatment involves intramuscular benzathine penicillin or oral penicillin for 10 days. The goal is to reduce the risk of recurrence of rheumatic fever and progression to RHD (Gerber et al., 2009; Suwari & Gede, 2023). RHD accompanied by heart failure requires treatment with diuretics, ACE inhibitors, digoxin, and beta blockers to stabilize the patient's condition until intervention or surgery is available. Therapy follows WHO guidelines for managing RHD, as demonstrated in this patient with Benzathine Penicillin G 600,000 IU IM and Prednisone 2 mg/kg/day. The main challenge lies in ensuring compliance with secondary prophylaxis to prevent recurrent acute rheumatic fever, with non-compliance often being a significant barrier to reducing long-term morbidity.

Case Comparison with Literature

The results of this study show similarities with the report by Arafuri et al. (2022) which describes the high rate of heart failure complications in pediatric patients with severe RHD. However, differences were found in the severity of mitral regurgitation and patient response. *Rheumatic Heart Disease With Nyha Class Iii Heart Failure In Children: A Case Report*

to anti-inflammatory therapy. In the study by Iddawela et al. (2022), patients with severe mitral regurgitation showed a worse prognosis than patients in this report, who showed faster recovery. In addition, the report by Lilyasari et al. (2020) stated that cases of RHD with complications of NYHA class III-IV heart failure have a high risk of morbidity and mortality. However, in this case, early treatment and timely therapy allow for more optimal recovery.

CONCLUSION

Thorough monitoring of symptoms associated with heart failure is an important step in identifying potential underlying causes. One condition that requires special attention is Acute Rheumatic Fever (ARF), which if not treated promptly, can progress to severe complications such as Rheumatic Heart Disease (RHD). RHD has the potential to cause valve abnormalities, which significantly impair cardiovascular function, limit a person's ability to perform daily activities, and interfere with growth and development, especially in the pediatric population. Without appropriate and timely intervention, these complications can increase the risk of death. Therefore, early and thorough management is essential to prevent long-term adverse effects.

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