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ECHOCARDIOGRAPHIC DETECTION OF VALVULAR LESIONS IN RHEUMATIC HEART DISEASE

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Abstract

Rheumatic heart disease is a late complication of acute rheumatic fever and remains a significant cause of valvular heart disease. Valvular lesions in RHD result from an autoimmune response to streptococcal infection, leading to chronic inflammation, scarring, and damage to cardiac valves, particularly the mitral valve. The objective of the study was to determine the echocardiographic findings of valvular lesions in patients with rheumatic heart disease. A retrospective study was conducted in the Radiology department of Fatima Memorial Hospital, Shadman, Lahore. A total of 47 patients were selected according to the inclusion criteria. Among the 47 patients, 25 were diagnosed with rheumatic heart disease and 16 had valvular lesions detected on echocardiography. Mitral regurgitation and aortic regurgitation were the common valvular lesions observed. Doppler echocardiography proved to be a simple and effective technique for detecting valvular lesions. The findings indicate that valvular involvement is common among patients with rheumatic heart, with mitral and aortic valve lesions being the most frequent abnormalities.

INTRODUCTION:

Rheumatic Heart Disease (RHD) is a chronic cardiovascular condition that develops because of rheumatic fever, an autoimmune response triggered by infection with Group A Streptococcus (GAS) [1]. The disease primarily affects the heart valves, leading to progressive fibrosis, leaflet thickening, commissural fusion, and valvular dysfunction [2]. The mitral valve is the most affected valve, often resulting in mitral stenosis due to chordal shortening and commissural fusion, while mitral regurgitation is more frequently observed in children during the early stages of the disease[3]. The aortic valve is the second most commonly involved valve and commonly presents with aortic regurgitation, whereas tricuspid valve involvement is less frequent and usually manifests as regurgitation rather than stenosis[4]. Pulmonary valve involvement is rare. Chronic inflammatory damage to the valves can lead to serious complications, including heart failure, atrial fibrillation, thromboembolism, pulmonary hypertension, and progressive cardiac dysfunction[5][6].

Valvular lesions in RHD cause structural and functional abnormalities that impair normal cardiac hemodynamic[7]. Mitral stenosis, the

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hallmark lesion of RHD, restricts blood flow from the left atrium to the left ventricle, resulting in elevated left atrial pressure, pulmonary congestion, shortness of breath and eventually pulmonary hypertension [8]. Regurgitant lesions of the mitral and aortic valves lead to volume overload, chamber dilation, reduced cardiac efficiency, and symptoms such as fatigue and palpitations[9][10]. Echocardiography is the primary diagnostic tool for assessing the severity and functional impact of rheumatic valvular lesions and monitoring disease progression[11][12]. Management includes secondary prevention with benzathine penicillin, medical therapy to control symptoms and complications, and surgical interventions such as valve repair, valve replacement or percutaneous balloon mitral valvotomy (PBMV) in severe cases[13][14]. Early diagnosis, regular echocardiographic monitoring, and timely intervention are essential to prevent long-term complications and improve patient outcomes[15].

OBJECTIVE:

The objective of this study is to determine the frequency and pattern of valvular lesions detected by echocardiography in patients with rheumatic heart disease.

MATERIALS AND METHODS:

This retrospective study was conducted in the Radiology Department of Fatima Memorial Hospital, Lahore, over a three-month period from 25 September 2025 to 30 December 2025 after obtaining approval from the Institutional Review Board (IRB) of FMH College of Medicine and Dentistry. The sample size of 47 patients was calculated using the formula SS = (Z value^2 × P × (1 − P)) ÷ d^2, assuming a prevalence of 89.4%, a 95% confidence interval, and a precision of 9%. A non-probability convenience sampling technique was employed, and data were collected using a self-designed proforma. Adult patients aged 25–80 years presenting with symptoms suggestive of valvular heart disease and providing written informed consent were included in the study, while patients with non-rheumatic valvular heart disease or electrolyte imbalance were excluded. Rheumatic heart disease was defined as chronic valvular damage resulting from previous rheumatic fever, whereas valvular lesions were considered structural or functional abnormalities of one or more heart valves leading to stenosis and/or regurgitation. Acute rheumatic fever was defined as an autoimmune inflammatory response to GAS throat infection characterized by fever, polyarthritis, arthralgia, and elevated inflammatory markers. Data were analysed using IBM SPSS Statistics version 26. Descriptive statistics were presented as frequencies, percentages, tables, and graphical representations where appropriate.

RESULTS:

A total of 47 patients fulfilling the inclusion criteria were enrolled in this study to determine the echocardiographic detection of valvular lesions in rheumatic heart disease. The age of the study participants ranged from a minimum of 18 years to a maximum of 94 years, with a mean age of 61.00 ± 21.351 years (Table 1, Graph 1), reflecting a broad age distribution across the study population.

On echocardiographic evaluation, valvular lesions were detected in 16 of the 47 patients (34.0%), while the remaining 31 patients (66.0%) showed no evidence of valvular abnormality (Graph 2). This finding highlights the diagnostic utility of echocardiography in identifying valvular involvement among patients with rheumatic heart disease.

Assessment of individual valve lesions revealed the following pattern of distribution:

- **Mitral stenosis** was identified in only 2 of the 47 patients (4.3%), with the remaining 45 patients (95.7%) free of the lesion, indicating a comparatively low prevalence of mitral stenosis in this **cohort (Graph 3).**
- **Mitral regurgitation** was the most frequently observed lesion, present in 30 patients (63.8%), while 17 patients (36.2%) showed no mitral regurgitation (Graph 4), confirming it as a predominant valvular abnormality in this population.
- **Aortic stenosis** was detected in 3 patients (6.4%), with 44 patients (93.6%) unaffected

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(**Graph 5**), again indicating a low frequency of this lesion.

- **Aortic regurgitation** was observed in 31 patients (66.0%), the highest frequency among all lesions assessed, while 16 patients (34.0%) were unaffected (Graph 6).
- **Tricuspid stenosis** was found in only 2 patients (4.3%), with 45 patients (95.7%) free of disease (Graph 7), consistent with the generally low prevalence of stenotic lesions in this cohort.
- **Tricuspid regurgitation** was present in 29 patients (61.7%), while 18 patients (38.3%) showed no tricuspid regurgitation (Graph 8), reflecting a considerable burden of regurgitant tricuspid disease.

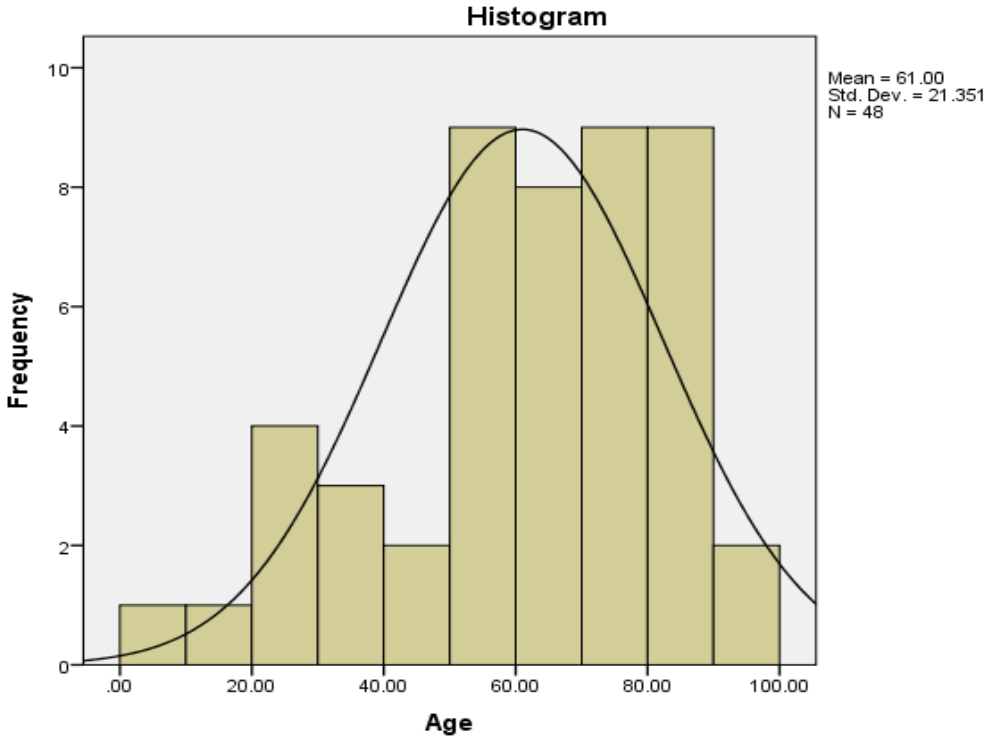
Overall, regurgitant lesions (mitral, aortic, and tricuspid regurgitation) were considerably more common than stenotic lesions (mitral, aortic, and tricuspid stenosis) across the study population, a pattern consistent with the typical natural history of rheumatic valvular damage.

With regard to the underlying diagnosis, rheumatic heart disease was confirmed in 25 of the 47 patients (53.2%), while 22 patients (46.8%) showed no detectable evidence of rheumatic heart disease (Graph 9). Taken together, these findings demonstrate a substantial burden of both rheumatic heart disease and associated valvular lesions within the studied population, with mitral and aortic regurgitation emerging as the most frequently detected echocardiographic abnormalities.

- A total of 47 individuals were enrolled in the study to determine the echocardiographic detection of valvular lesions in rheumatic heart disease. Out of 47 patients, the minimum age group is 18 years and the maximum age group is 94 years.

Table 1: Descriptive Statistics of Age

Total	Minimum	Maximum	Mean	Std. Deviation
47	18 Years	94 Years	61.00	21.351



Graph 1: Age distribution of subjects

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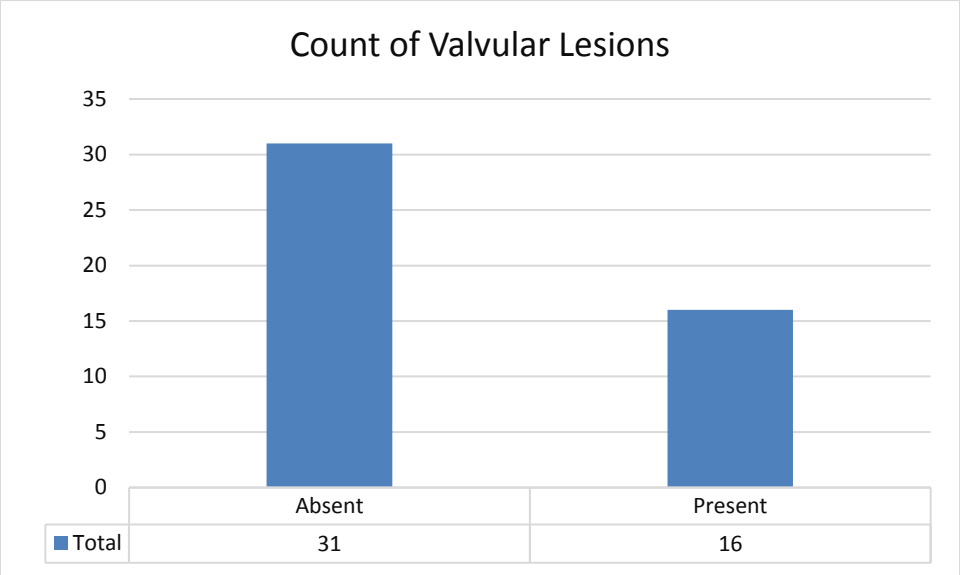
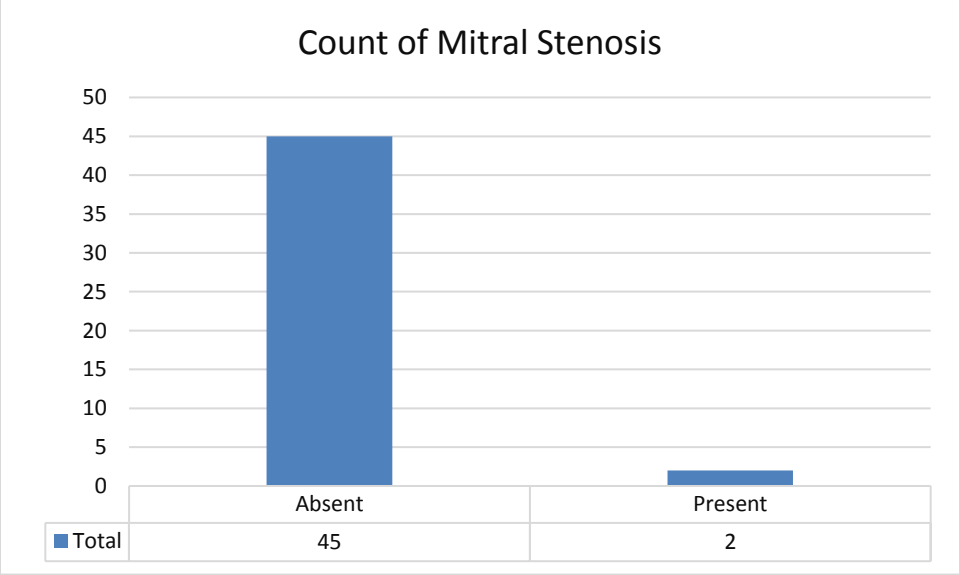
- A total of 47 subjects were evaluated using echocardiography for the detection of valvular lesions in rheumatic heart disease. Echocardiographic findings revealed that 16 patients had valvular lesions, whereas 31 patients showed no evidence of valvular abnormalities. These findings demonstrate the usefulness of echocardiography in identifying valvular involvement in patients with rheumatic heart disease.



Graph 2: Frequency distribution of valvular lesion

- A total of 47 subjects were assessed using echocardiography for the detection of mitral stenosis. Echocardiographic findings revealed that 2 patients had mitral stenosis, whereas 45 patients were free of the disease. These findings indicate a low prevalence of mitral stenosis within the studied population.



Graph 3: Frequency distribution of mitral stenosis

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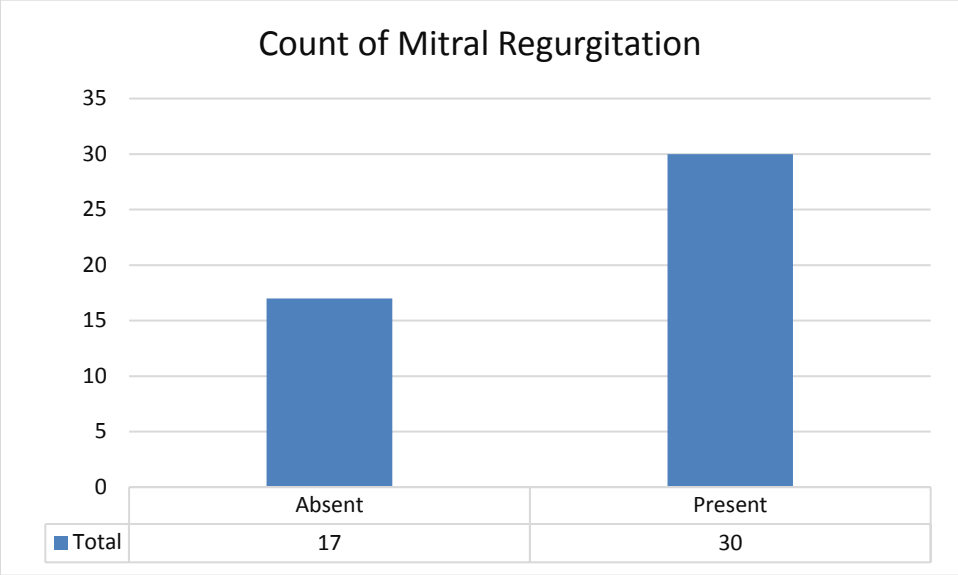
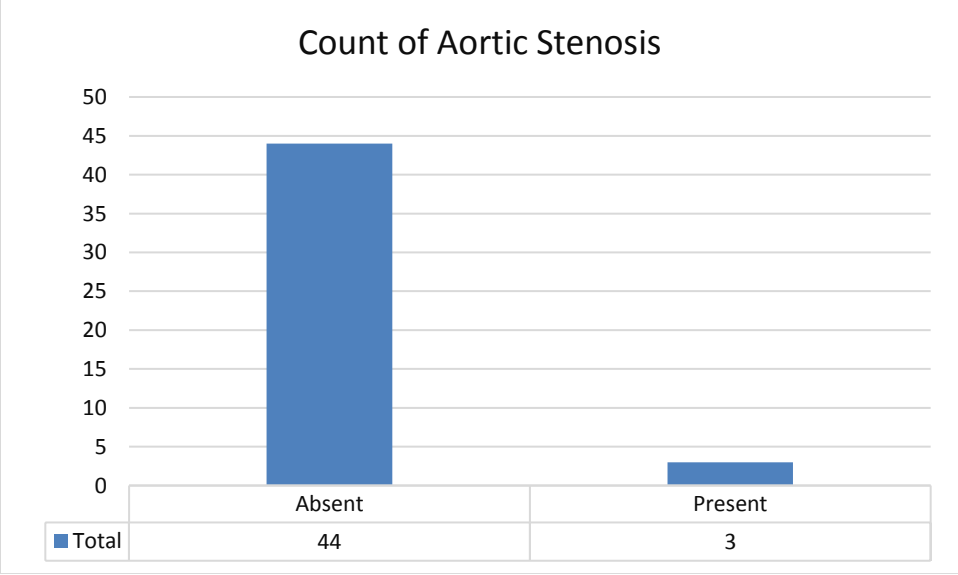
- A total of 47 subjects were assessed using echocardiography for the detection of mitral regurgitation. Echocardiographic findings revealed that 30 patients had mitral regurgitation, whereas 17 patients were free of the disease. These results indicate that mitral regurgitation was a common valvular abnormality among the studied population.



Graph 4: Frequency distribution of mitral regurgitation

- A total of 47 subjects were assessed using echocardiography for the detection of aortic stenosis. Echocardiographic findings revealed that 3 patients had aortic stenosis, whereas 44 patients were free of the disease. These findings indicate a low frequency of aortic stenosis in the studied population.



Graph 5: Frequency distribution of aortic stenosis

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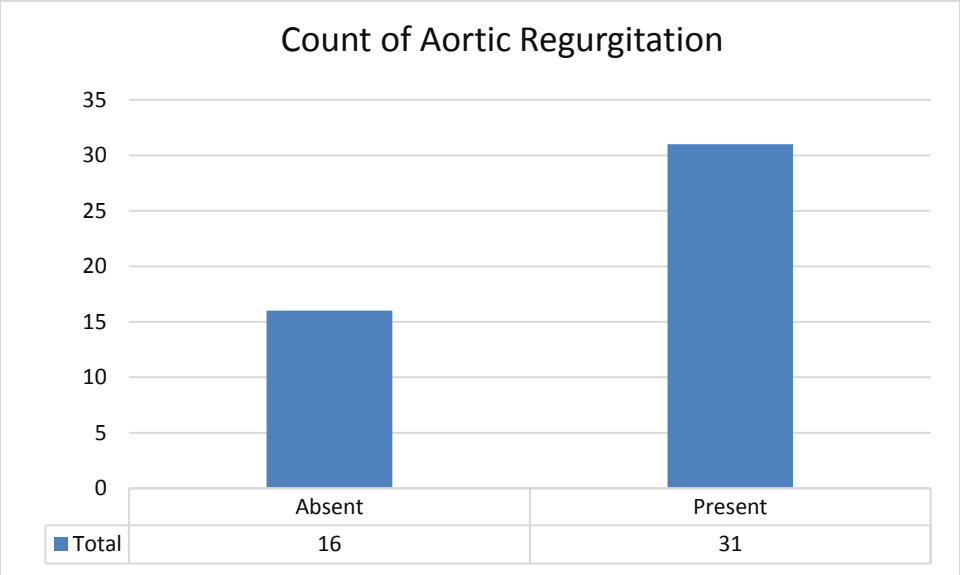
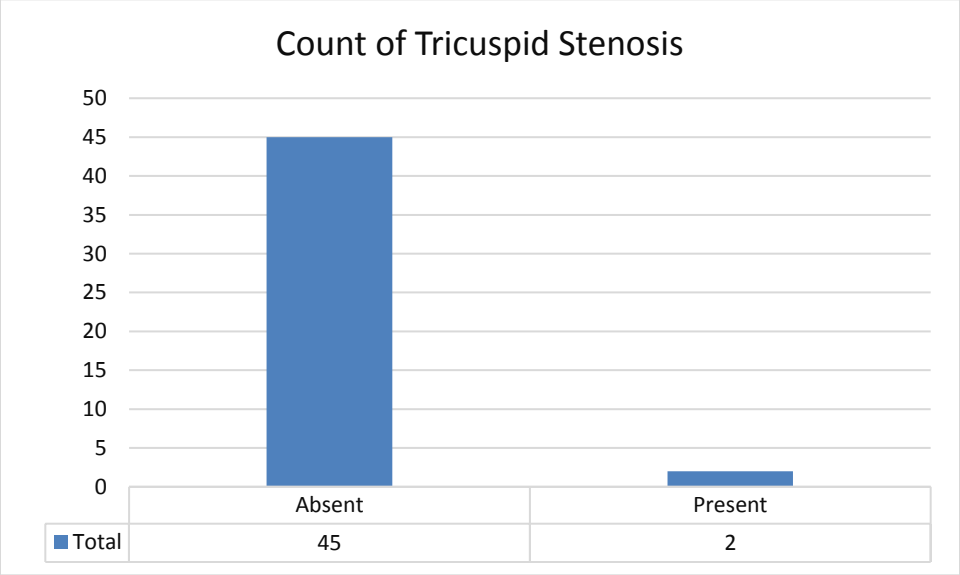
- A total of 47 subjects were assessed using echocardiography for the detection of aortic regurgitation. Echocardiographic findings revealed that 31 patients had aortic regurgitation, whereas 16 patients were free of the disease. These results indicate a relatively high frequency of aortic regurgitation within the studied population.



Graph 6: Frequency distribution of aortic regurgitation

- A total of 47 subjects were assessed using echocardiography for the detection of tricuspid stenosis. Echocardiographic findings revealed that 2 patients had tricuspid stenosis, whereas 45 patients were free of the disease. These findings indicate a low frequency of tricuspid stenosis in the studied population.



Graph 7: Frequency distribution of tricuspid stenosis

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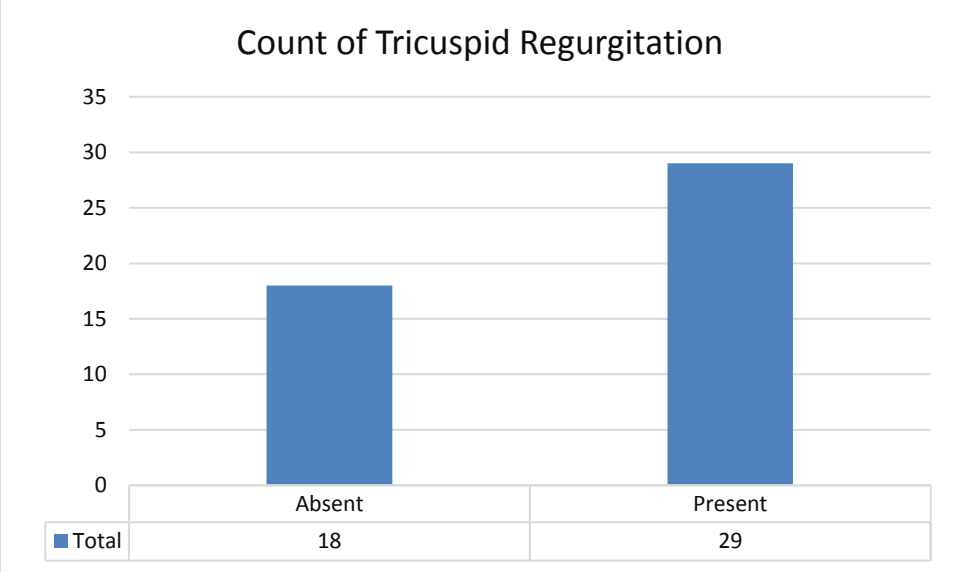
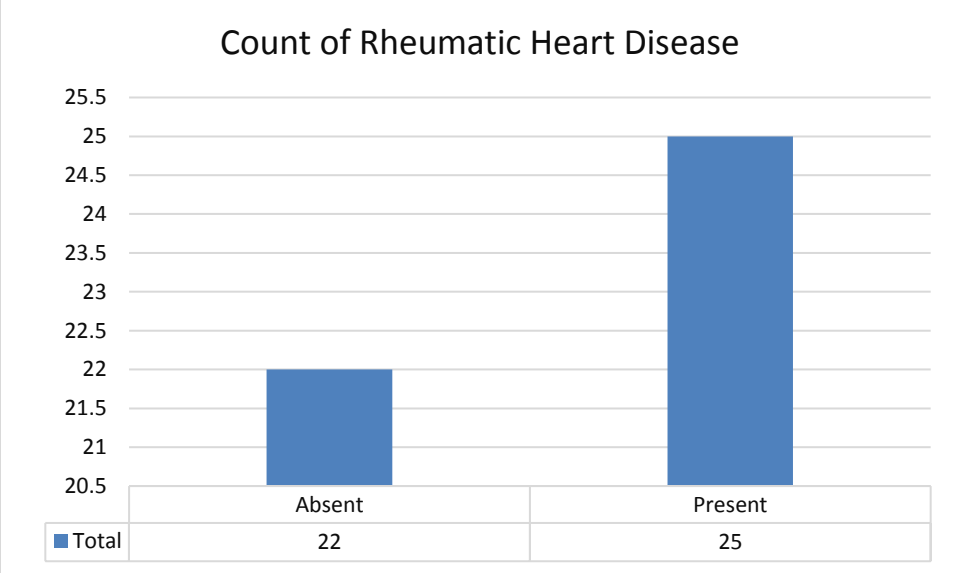
- A total of 47 subjects were assessed using echocardiography for the detection of tricuspid regurgitation. Echocardiographic findings revealed that 29 patients had tricuspid regurgitation, whereas 18 patients showed no evidence of the disease. These results indicate a considerable frequency of tricuspid regurgitation within the studied population.



Graph 8: Frequency distribution of tricuspid regurgitation

- A total of 47 subjects were assessed using echocardiography for the detection of rheumatic heart disease. Echocardiographic findings revealed that 25 patients were diagnosed with rheumatic heart disease, whereas 22 patients had no detectable evidence of the disease. These results demonstrate a substantial prevalence of rheumatic heart disease among the studied population.



Graph 9: Frequency distribution of rheumatic heart disease

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Overall, these findings indicate that valvular lesions are a frequent echocardiographic finding among patients with rheumatic heart disease, with regurgitant lesions particularly mitral and aortic regurgitation occurring far more commonly than stenotic lesions in this population. The relatively high prevalence of rheumatic heart disease (53.2%) alongside detectable valvular abnormalities (34.0%) underscores the continued burden of rheumatic valvular pathology in this cohort and reinforces the central role of Doppler echocardiography as an accessible, non-invasive tool for its detection and characterization.

DISCUSSION:

Rheumatic heart disease is the most common form of heart disease around the world. Rheumatic fever and rheumatic heart disease are significant public health problem around the world. Incidence and prevalence of rheumatic fever and heart disease is increasing day by day[16]. It is estimated that there are over 15 million cases of RHD worldwide, with 282,000 deaths annually. Most recent data using echocardiography to screen for RHD in developing nations have led to marked increase in the recognized prevalence in these regions[17][18] Echocardiography is used to detect rheumatic heart disease which results from an abnormal autoimmune response to group A Streptococcal infection in genetically susceptible host[19][20]. Rheumatic fever is the precursor of rheumatic heart disease that is the permanent damage to the heart following rheumatic fever[21][22]. A study conducted by Temesgen (2020) titled *"Clinical Echocardiographic Characteristics and Management Practices in Patients with Rheumatic Valvular Heart Disease"* highlighted the importance of echocardiography in the diagnosis, monitoring, and management of rheumatic heart disease (RHD). In comparison, the present study included 47 patients, of whom 25 (53.2%) were diagnosed with rheumatic heart disease and 16 (34.0%) had valvular lesions. These findings support the role of echocardiography as a valuable imaging modality for identifying rheumatic and valvular cardiac abnormalities, consistent with the observations reported by Temesgen [23]. A study was conducted by Dr. Pratik (2022) titled *"Changing Trends of Infective Endocarditis"*, reported that multivalvular lesions are more common than single-valve lesions in patients with rheumatic heart disease. The study also highlighted the importance of timely diagnosis and appropriate medical and surgical management to reduce long-term complications. Similarly, in the present study, 25 out of 47 patients were diagnosed with rheumatic heart disease and 16 patients had valvular lesions. These findings support the significance of early detection of valvular involvement, emphasizing the role of echocardiography in the diagnosis and management of rheumatic heart disease[24][25]. A study was conducted by Octavia (2020) titled *"Clinical Profile and Management of Rheumatic Heart Disease in Children and Young Adults"*, reported that rheumatic valvular heart disease remains a major contributor to valvular abnormalities and that multiple valve involvement is linked to a poorer clinical outcome. In the current study, rheumatic heart disease was observed in 25 of the 47 patients, while valvular lesions were identified in 16 patients. The presence of a considerable number of rheumatic and valvular cases in our study reflects the ongoing clinical significance of rheumatic heart disease and supports the need for accurate diagnosis and regular assessment of valvular involvement[17] [26]. Secondary mitral regurgitation and tricuspid regurgitation also develop in patients with aortic valvular disease and right ventricular volume and pressure overload[27]. In the present study, a consecutive sample of 47 subjects who fulfil the criteria was taken to determine “Echocardiographic detection of valvular lesions in rheumatic heart disease”. Out of 47 subjects, 65.9% of them have valvular lesion and 46.8% have RHD. 95.7% have MS, 36.1% have MR, 93.6% have AS, 34.0% have AR, 95.7% have TS, 38.2% have TR. Echocardiography is a simple, low-cost procedure which is very helpful in patients with RHD[28]. According to our study which has no age limit, the incidence of valvular lesion in patients with rheumatic heart disease and rheumatic fever is increased[29][30]. Rheumatic fever is the main cause of rheumatic heart disease. It is an autoimmune reaction that occurs after poorly

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treated throat infection that is caused by group A beta homolytic streptococci[31]. During rheumatic fever, the body's immune response effect heart valves and heart tissues[32]. Multiple episodes of rheumatic fever cause inflammation, calcification, scarring and deformity of the valves[33]. With time, this damage results in chronic valvular lesions such as stenosis or regurgitation most commonly affecting mitral and aortic valve, which defines rheumatic fever[34][35].

CONCLUSION:

Doppler echocardiography plays a crucial role in the detection and characterization of valvular lesions in patients with rheumatic heart disease. In the current study, 16 patients exhibited valvular abnormalities, predominantly mitral regurgitation and aortic regurgitation. The findings demonstrate the value of Doppler echocardiography as a reliable diagnostic tool for assessing valvular involvement and guiding clinical management in patients with rheumatic heart disease.

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