International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Echocardiographic Changes in Rheumatic Heart Disease Patient in Port Sudan

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Abstract: ***Introduction: It is generally known that cardiac auscultation is less sensitive than echocardiography screening, especially in preclinical RHD, for detecting valvular abnormalities. RHD is a social and economic burden on our country. There are no official RHD statistics, particularly in eastern Sudan. Objective: to evaluate the echocardiographic feature of RHD. Methods: The 115 rheumatic heart disease patients who visited the cardiology referral clinic at Digna Price Hospital in Port Sudan, Sudan, between 2018 and 2020 was the subjects of this convenience study. When each of them had received information about the study, they all signed informed consent forms. Among the fundamental facts that were acquired through an interview questionnaire were age, gender, ethnicity, and blood pressure. An ultrasound device called a 2D Mylabe gamma transthorasic was used. Result: The most prevalent valve lesion (67%) was mitral regurgitation (MR), which was of mild severity, the least valve diseased was aortic stenosis (AS), 42.6 percent of patients had just one valve lesion, There was a significant correlation between the presence of aortic regurgitation (AR) and the left ventricular dimension (LVD) (the p value.008), whereas mitral stenosis and mitral regurgitation had no direct impact on left ventricular function (LVF) and ejection fraction. Background: The chronic result of acute rheumatic fever (ARF), rheumatic heart disease (RHD), persists unabatedly in middle - income and low - income nations. The purpose of this study was to evaluate the echocardiographic features of RHD patients. The social and economic burden that RHD places on our nation. Especially in eastern Sudan there are no official data regarding RHD due to a lot of challenges lack of logistics for the screening, and limited healthcare workers to cover a large screening area.***

1. Introduction

Globally, there were 33.4 million cases of rheumatic heart disease in 2015, and 10.5 million years of life were lost to impairment as a result.319, 400 people died as a result of rheumatic heart disease. [(1)] In Africa, valve disease nearly always results from an infectious disease, either directly, as in infective endocarditis, or indirectly, as in acute rheumatic fever, in contrast to affluent countries where it is predominantly a degenerative condition. Still prevalent, acute rheumatic fever and chronic rheumatic valvular disease place a significant load on the system's meager resources for healthcare. . [(2).] RHD was also identified in those with a history of ARF by listening for a cardiac murmur during an auscultation. The detection rates, however, were typically modest. [(3)] Rheumatic valve disease must be diagnosed by echocardiography because it allows for objective monitoring of the degree of valve lesions, LV chamber size, LV function, and an increase in pulmonary artery pressure. [(4)]

By 2025, the World Heart Federation (WHF) hoped to reduce the number of people under the age of 25 who died prematurely from ARF and RHD by 25%. [(5)]

It is well recognized that echocardiography screening, particularly in preclinical RHD, is more sensitive than cardiac auscultation for detecting valvular abnormalities. [(6)]

The more practical and straightforward criterion provided by Nunes et alreduced echocardiogram scoring system for the diagnosis of RHD is appropriate for portable echocardiography use. [(7)]

Numerous research have examined the frequency of RHD and RHD screening, primarily in areas where RHD is more common, like Uganda. [(8, 9),] Sudan [(10),] South Africa [(11),] Ethiopia [(11),] Italy [(12),] Brazil [(13),] Egypt [(14)]

2. Material and Methods

This is a convenience research on 115 patients with rheumatic heart disease who visited the cardiology referral clinic at Digna Price Hospital in Port Sudan, Sudan, between 2018 and 2020. Once the details of the study were given to each of them, signed informed consent was obtained from each of them. Age, gender, ethnicity, and blood pressure were among the basic pieces of information that were gathered through an interview questionnaire. An echocardiogram uses sound waves to show how blood flows through the heart and heart valves, making it the most important diagnostic tool. In this study, a 2D Mylabe gamma transthorasic ultrasound machine was used. First, the patient slid onto the bed on his or her left side, the chest hair was shaved, gel was applied, and the probe that was connected to the machine was placed on the patient's chest over the area of the heart, To demonstrate how blood flows through the heart and heart valves, an echocardiogram uses sound waves. The examination enables medical professionals to observe the heart, including its four chambers, four heart valves, and adjacent blood vessels. Many heart issues, including Chamber size, can be identified via transthorasic echo. These echoes are converted into moving pictures of the heart that can be viewed on a video screen. Muscle wall thickness, blood vessel structure, valve function, blood flow through the heart, blood clots in the heart or blood vessels, and cardiac tumors are among more factors to consider. also assess the left ventricular ejection fraction.

Valves were examined for the presence of focal or diffuse thickening and leaflet prolapse. Leaflet motion was graded as excessive, normal, or restricted according to whether the location of maximal systolic excursion of any portion of the mitral leaflet extended.

Doppler Color Flow Imaging:
With the aid of a conventional velocity color map, Doppler color flow imaging was carried out. Green color was added to regions that showed variation in the Doppler signal, acting as an index of turbulent flow. The shallowest depth and smallest sector angle that could include the regurgitant flow jet were used for each exam. The best gain setting was changed by employing the highest gain level that could be used without introducing signals outside of flow zones or onto tissues from a neighboring chamber. On the ventricular side, Doppler flow above, in, or below the mitral annular plane was systematically analyzed using the cineloop mode.

When color Doppler flow mapping showed reversed flow away from the valve when the valve was closed, that was the indication of valve regurgitation; signals of extremely short duration (100 ms) detected at the moment of valve closure were not considered to be actual regurgitation. The high - velocity turbulent jet has to be confirmed by color - guided pulsed Doppler spectrum analysis and extend beyond the paravalvular region (more than 1 cm) in order to distinguish between abnormal and physiological regurgitation. The mean of three cardiac cycles was calculated after online computerized planimetry of the maximal regurgitant jet regions. Using Helmcke's criteria, the maximal distance of the regurgitant jet from the valve orifice was used to grade the severity of mitral and aortic regurgitation.

Using SPSS version 21 for data collection and analysis, the study was described using frequency, means for several quantifiable factors, and student's t - test. To compare some variables, cross tabulation and the chi square test were employed, odd ratio and regression were used on some data Statistical significance was recognized when the P value was equal to or lower than 0.05.

The Digna Price Hospital provided a letter of authorization for the ethics committee.

3. Results

A total of 115 rheumatic heart disease patient were included. females account 83 (72.2%) of the participants. the mean age of patients was 42.2 ±SD 13.9.

The pathological valve lesions (table 1) mitral regurgitation (MR) was the most common valve lesions (67%), with mild severity (43.5%) (Table 2) followed by mitral stenosis (38%) and tricuspid regurgitation (TR) (30.4%). aortic regurgitation (AR) (25.2%) aortic stenosis (AS) (15%), tricuspid stenosis was the least common valve lesions (4.3%).

Table 1: Patterns of valvular lesions in rheumatics heart disease (N = 115)

Valve lesions	N	(%)
Mitral stenosis (ms)	44	38.3
Mitral regurgitation (MR)	78	67.8
Aortic stenosis (AS)	18	15.7
Aortic regurgitation (AR)	29	25.2
Tricuspid stenosis (TS)	5	4.3
Tricuspid regurgitation (TR)	35	30.4

Table 2: Severity of mitral and aortic regurgitation

Severity	Mild	Moderate	Sever
Mitral regurgitation (MR)	50 (43.5%)	27 (23.5 %)	1 (.9%)
Aortic regurgitation (AR)	14 (12.2 %)	10 (8.7%)	5 (4.3%)

The mean mitral valve area assessed in 44 patients with mitral stenosis was 1.3 cm2 with a standard deviation of (.426). There were 37 females patients, and their mean valve area was 1.38 ±SD.442.

The patient had two or more of the valve diseases listed in the table (3)

Table 3: Lesion on more than one valve:

Sum		
Number diseased valves	Frequent	%
0	11	9.9
1	49	42.6
2	22	19.1
3	17	14.8
4	15	13
5	1	.9
Total	115	100

Ejection fraction (EF) and mitral stenosis were not significantly different in this study (p value.337); the mean EF for the stenosed valve was 56.1% with SD 10.2 and (57.8% with SD 13) for the unaffected valve. Nonetheless, several outlier values were present as shown by the box plot (1)

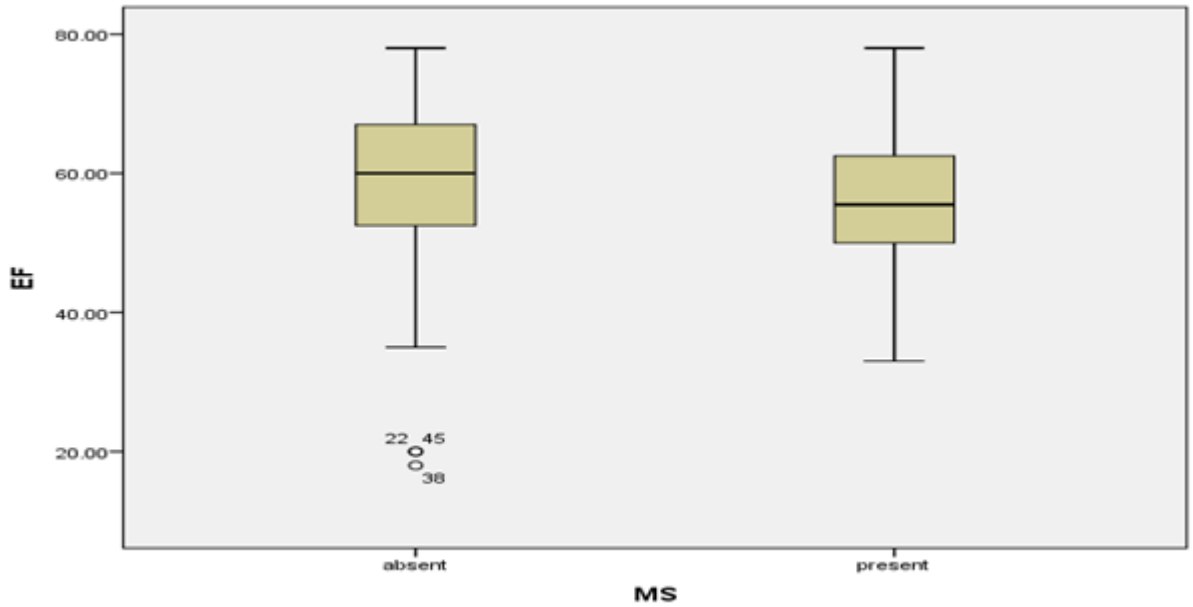

Figure 1: The effect of mitral stenosis (MS) on ejection fraction (EF)

There was pulmonary hypertension (PHTN) in ten patients, 6 of them had mitral stenosis associated with PHTN.

Also Mitral regurgitation (MR) and ejection fraction were not significantly different in this study (p value was.353), and the mean EF on the afflicted valve was (57.6 % SD 12.6) and (56.3% SD 10.8) in the unaffected valve. This relationship is described in box plot (2).

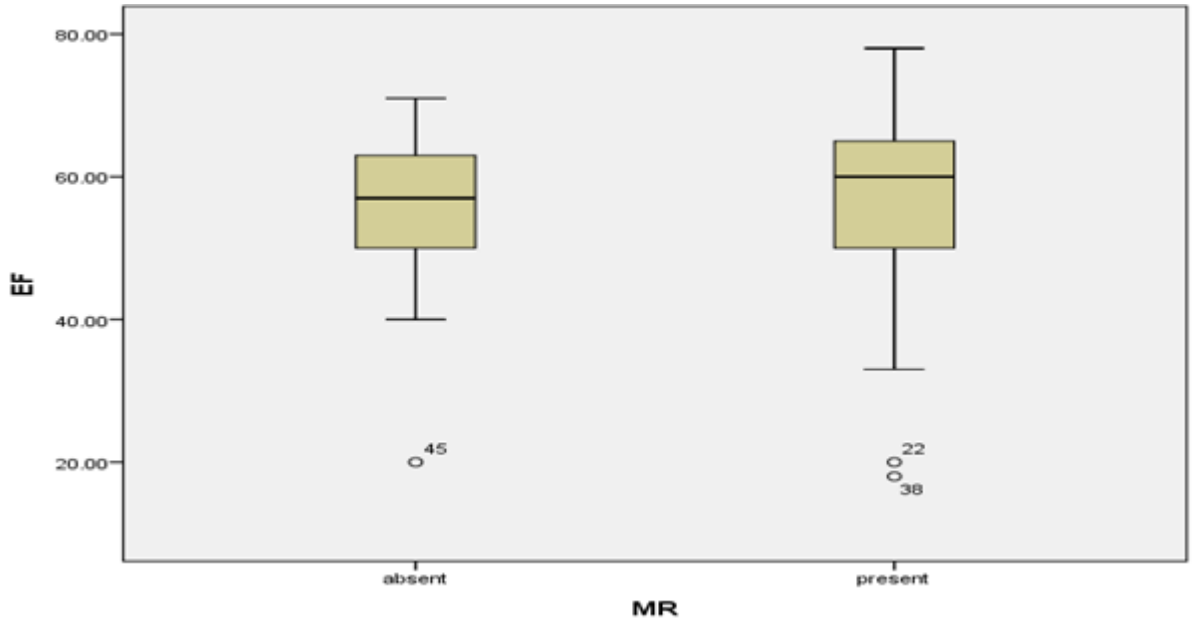

Figure 2: The effect of mitral regurgitation (MR) on ejection fraction (EF)

There was no connection between the existence of (MR) and the left ventricle's functionality (p value.22). The left ventricular dimension (LVD) and the presence of aortic regurgitation (AR) were significantly correlated, with the mean LVD being 51.1 SD 1.9 (t = - 2.686, df = 109, (p value.008) (at 5% significant level).

Simple liner regression for that: LVD = 46.024 + 5.083 AR (p =.008), F = 7.213, and R2 = 0.062.

This indicates that a 1 degree rise in AR severity causes a 5 degree increase in LVD.

The AR odd ratio was 2.24 times as large as the LVF odd ratio. Figure (3).

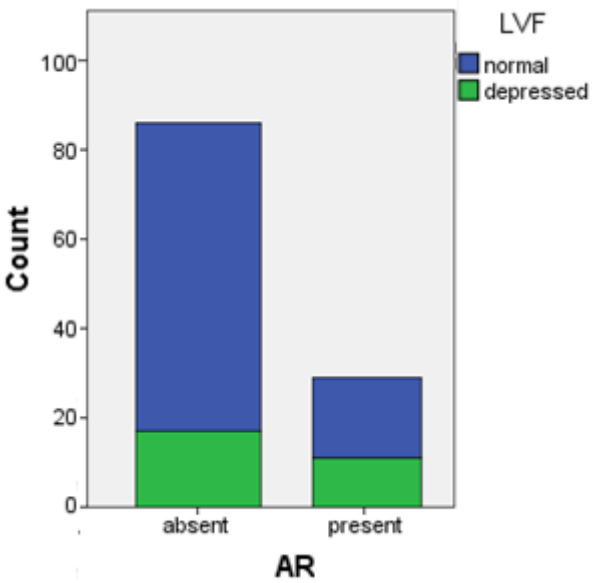

Figure 3: The effect of aortic regurgitation on left ventricular function

Dimensional parameters measurement of left atrial, left ventricular and aortic root diameters were reported (table 4). The mean left atrial diameter was38.9 ±SD 12.5, which is border line compared to stander range, while the mean values of others were within the normal range.

Table 4: Dimension of cardiac chambers and aortic root

	Mean	±SD
Left atrial diameter (cm)	38.9	12.5
Left ventricular diameter (cm)	47.3	8.9
Aortic root	25.5	8.7

Examples of some Echocardiographic valvular lesions figures:

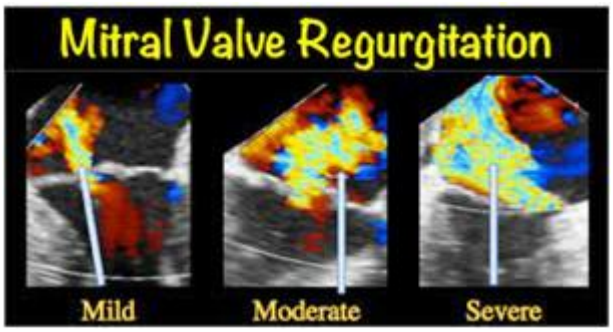

Figure 4: For patient with mitral valve regurgitation

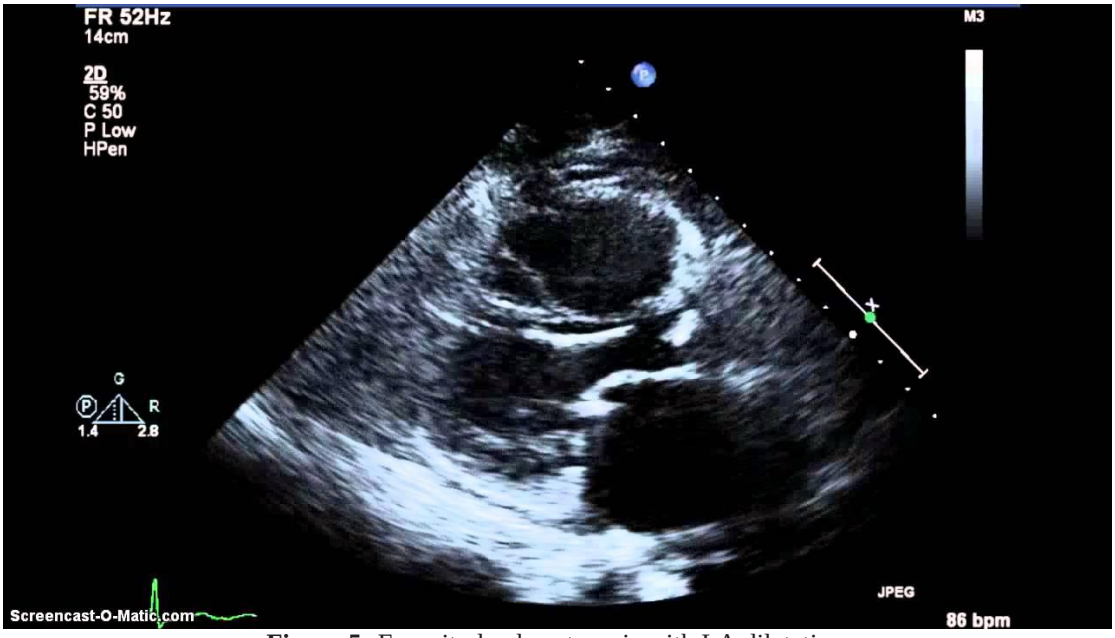

Figure 5: For mitral valve stenosis with LA dilatation

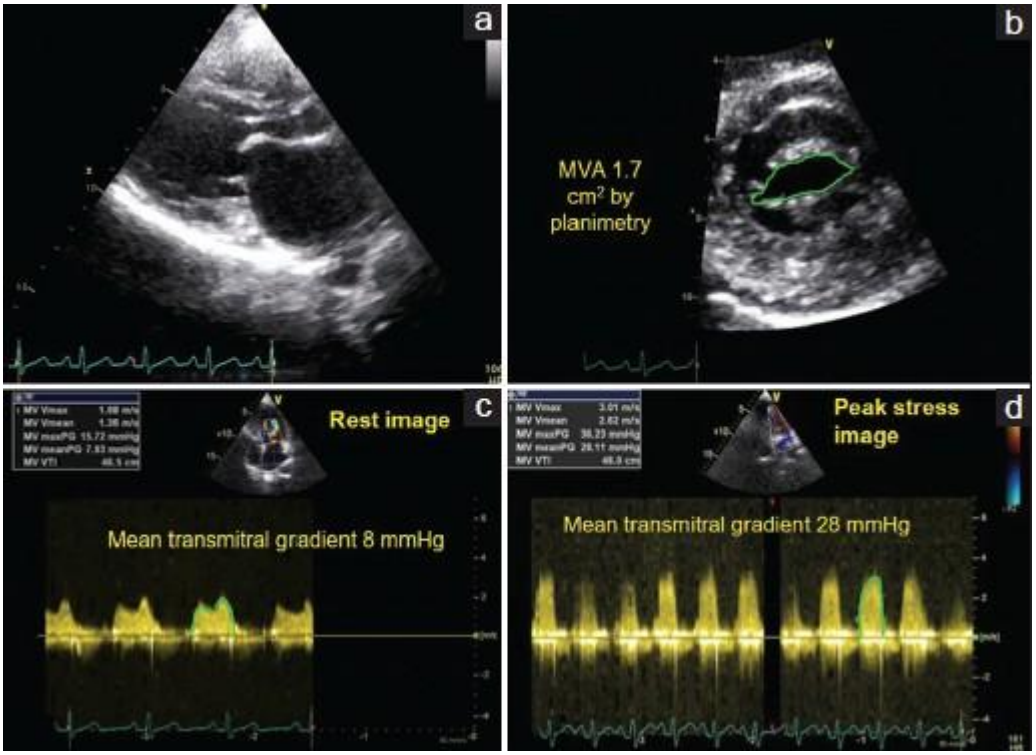

Figure 6: Anterior MV leaflets In long axis view (A), short axis view (b), continuous Doppler tracing of MV inflow to measure the pressure gradient across it (c, d).

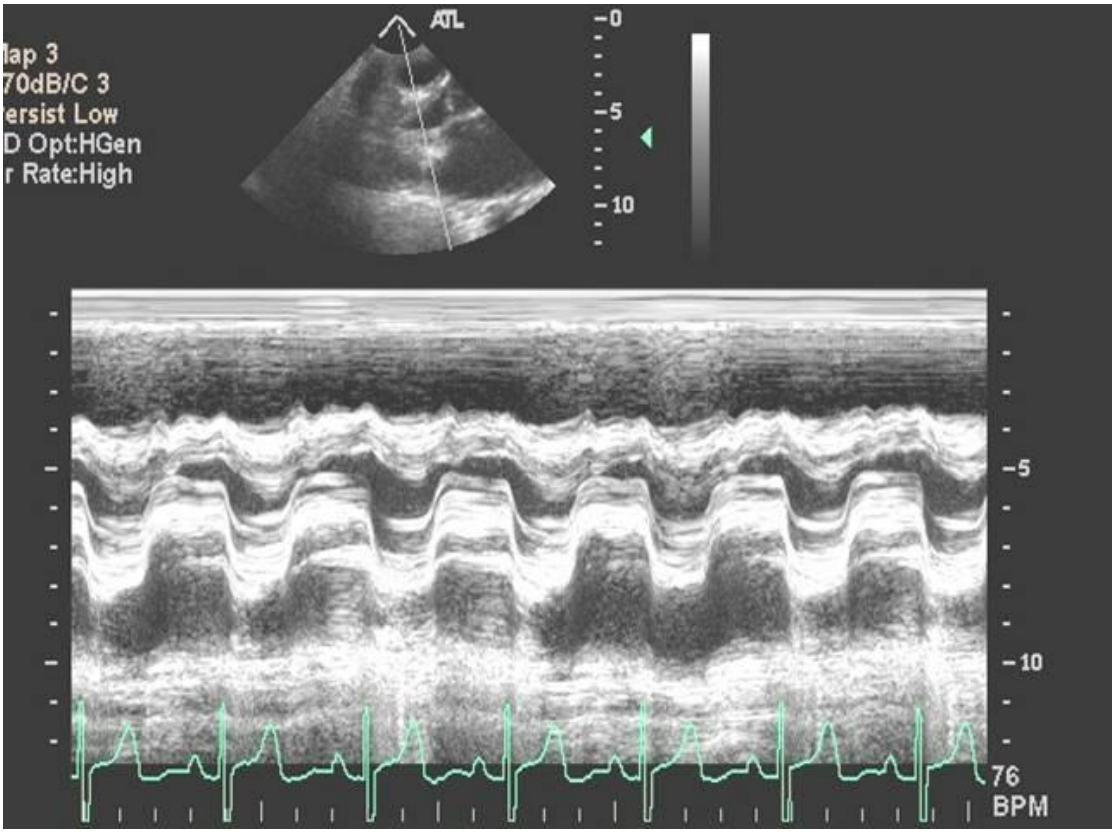

Figure 7: 2D dimension echo mitral stenosis m mode.

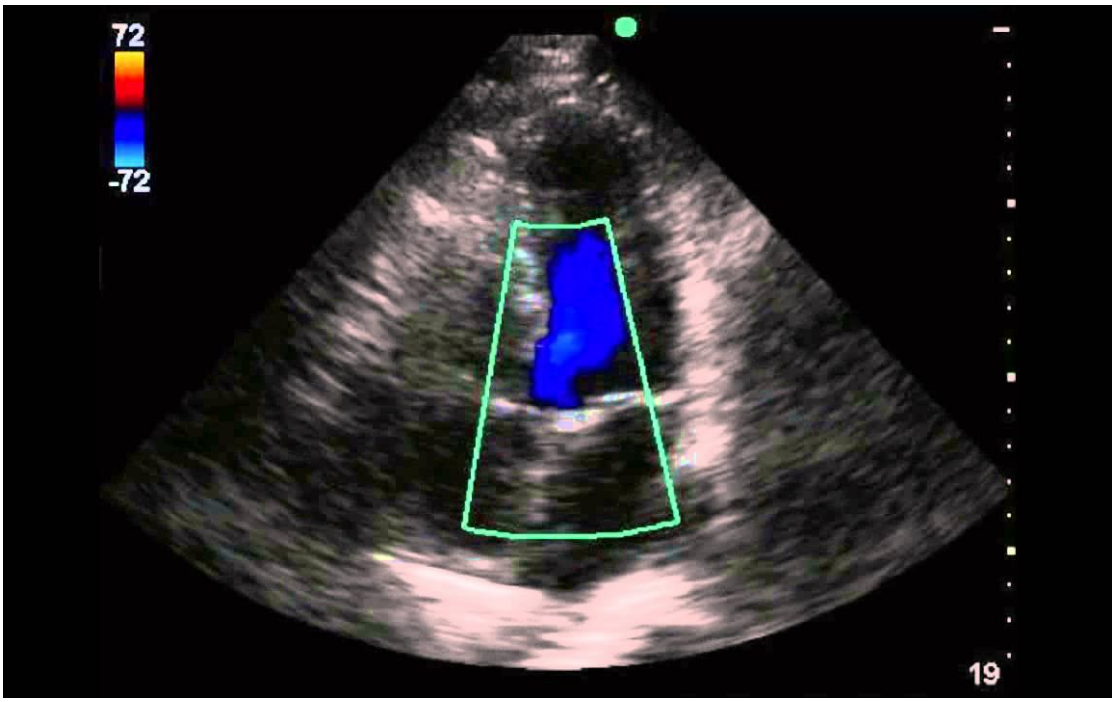

Figure 8: 2D echo of aortic regurgitation (AR)

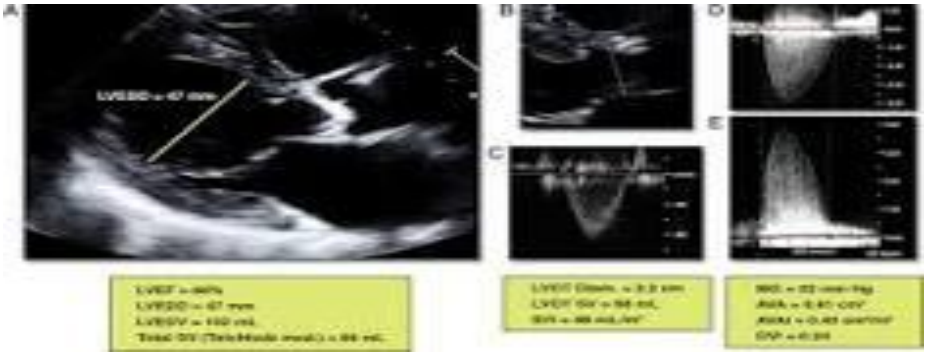

Figure 9: 2D echo of aortic stenosis and gradient

4. Discussion

The patients in this study had a mean age of 42.2 SD 13.9, which was contrary to the REMEDY study's findings (large multicenter study) [16]. Where the median age of RHD patients was 28 years, yet in both investigations, more than half of the patients were female.

This conclusion was echoed by Okello et al [17], Mirabel et al, [18], Sani et al, [19], and Aurakzai et a [20], who stated that mitral regurgitation was the most prevalent echocardiography finding. Mitral regurgitation (MR) was the most documented valve disease, (67.8%), with mild severity. In contrast to Mirabil et al, [18] Okello et al, [17] research, it was discovered that tricuspid stenosis was the least common finding in this study.

7.112 valvular instances were recorded in Indonesia between 2016 and 2019; 40.5% of those cases had rheumatic etiologies. Mitral stenosis was the most prevalent valvular lesion at initial presentation (41.0%), while 6.0% of the RHD cohort from Indonesia had multivalvular lesions, according to a study. [21]

An epidemiological investigation on RHD in Sudan was carried out in 1992, and the results revealed a clinical prevalence of 11 per 1000 schoolchildren in Khartoum [22] as well as other findings. Prior to the establishment of a national program in 2012, Sudan's World Health Organization - based RHD control program had been inactive since it had stopped in 1998. [23, 24] According to a hospital registration, the majority of RHD patients reside in the western and central Sudanese states of Kordofan, Darfur, White Nile, and Gezira. . [25]

The initial investigation of RHD prevalence in Sudan as determined by echodiagnosis Together with this, a control program centered on educating the public and training healthcare workers was started in South Darfur. Three thousand schoolchildren in Khartoum were screened with HHE. RHD was detected in seven cases. Niyala in Darfur 59 patients out of the 1 498 studies tested positive for RHD. [26]

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