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Echocardiography Findings In Patient of Rheumatic Heart Disease Presenting In A Tertiary Care Centre in Kumaon Region of Uttarakhand.

Dr.Neelam Semwal[1], Dr.Arun Joshi[2], Dr. S.C.Joshi[3], DR. V.N.Satyawli[4], Dr.Paramjeet Singh[5]

1*PGJR3, Department of Medicine, Government Medical College, Haldwani.

2*MD, Professor, Department of Medicine, Government Medical College, Haldwani.

3*MD, Professor, Department of Medicine, Government Medical College, Haldwani

4*MD, Associate Professor, Department of Medicine, Government Medical College, Haldwani.

5*MD, Associate Professor, Department of medicine, Government Medical College, Haldwani.

Corresponding Author: Dr.Neelam Semwal PGJR3, Department of Medicine, Government Medical College, Haldwani.

Abstract:

Introduction: Rheumatic heart disease (RHD) stems from acute rheumatic fever (ARF) and is preventable, yet it remains a significant health concern, particularly in developing nations. It can lead to disability, diminished quality of life, premature mortality, and imposes a substantial economic burden on nations.

Material & Method: It was a hospital based cross-sectional observational study. Conducted in the Department of General Medicine, Government Medical College and associated Dr Susheela Tiwari Hospital, Haldwani, Nainital. Patients age >16 years were included. 12 lead ECG and 2D ECHO with Colour Doppler was done for all participants.

Result: Total of 112 patients diagnosed with RHD were included in our study. RHD was more common in females 63 patients (56.2%) Majority of patients were in age group of 21-30 years with 45 patients (40.17%) Mitral valve lesion was the predominant rheumatic valvulopathy seen in 105 patients (93.75%), most patients had a multivalve lesion (82.14%), MS+MR+TR was the most common combination (24.1%).Mitral stenosis (either as isolated lesion or in combination) was the predominant mitral valve lesion(73.2%), majority of patient 94 (83.9%) had pulmonary arterial hypertension.

Conclusion: Majority of the patients had severe valvular lesion and pulmonary hypertension at the time of presentation**.** Echocardiography is essential for diagnosing and monitoring rheumatic heart disease, guiding timely interventions and improving patient outcomes.

Keywords: Echocardiography, rheumatic heart disease, valvular lesion, Uttarakhand.

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INTRODUCTION

Rheumatic Heart Disease (RHD) stands as a significant global health burden, particularly in regions with limited access to healthcare resources. This condition arises from untreated or inadequately managed rheumatic fever, an inflammatory response to group A streptococcal infection. Despite advances in medical science, RHD continues to affect millions of individuals worldwide, predominantly children and young adults, with serious implications for morbidity and mortality.

Rheumatic heart disease (RHD) stems from acute rheumatic fever (ARF) and is preventable, yet it remains a significant health concern, particularly in developing nations.[1,2] It can lead to disability, diminished quality of life, premature mortality, and imposes a substantial economic burden on nations. A systematic review and meta-analysis of active surveillance studies revealed that the prevalence of RHD was approximately 2.9 per 1,000 individuals (95% CI: 1.7–5.0) through cardiac auscultation and 12.9 per 1,000 individuals (95% CI: 8.9–18.6) via echocardiography.[3]

Rheumatic fever (RF), typically affecting school-age children, is preceded by an infection from group A streptococcus (GAS), manifesting in various symptoms. However, many communities, particularly in developing countries, perceive strep throat, the precursor to RHD, as a mild, self-limiting illness. Consequently, health-seeking behaviours and adherence to primary or secondary prevention measures for RHD remain low in these regions.[4,5]

Valvular heart disease represents the most common manifestation of Rheumatic Heart Disease (RHD), characterized by scarring and irreversible damage to the heart valves, resulting in both stenosis and regurgitation. The heart's compensatory mechanisms to combat these conditions often lead to congestive heart failure and, ultimately, death, underscoring RHD as a severe public health concern. Globally, over 30 million individuals are believed to suffer from RHD, contributing to an estimated 305,000 deaths and 11.5 million disabilities.[6]

The World Heart Federation (WHF) set a target of reducing premature deaths from ARF and RHD by 25% among individuals under 25 by 2025. Early detection of RHD is crucial for initiating prophylactic measures to prevent progression to advanced stages[7].

Echocardiography has emerged as a pivotal diagnostic tool in the assessment and management of RHD. Its non-invasive nature, versatility, and ability to provide detailed anatomical and functional information make it indispensable in the clinical evaluation of patients with suspected or confirmed RHD[8].

While echo serves as a crucial non-invasive tool for valve assessment, it's vital to integrate clinical data with 2D echo and Doppler findings to guide patient management decisions. Real-time 3-dimensional echo (RT3DE) offers advantages over 2D echo due to its ability to provide multiple imaging perspectives. However, it's important to note that factors like heart loading conditions, irregular heart rhythm, and reduced cardiac output can affect valve flows and gradients, complicating valve abnormality assessment[9].

MATERIALS & METHODS

This hospital-based cross-sectional observational study was conducted in the Medicine Department of Dr.Susheela Tiwari Government Hospital. The study was carried out over a

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period of 18 months, starting from the date of approval by the Institutional Ethics Committee (IEC).All the patients age >16 years of RHD in medicine OPD and admitted in Medicine ward were included. Proper history and thorough examination were done. All relevant investigations were done. A chest x ray postero anterior view was done in all patients and Cardio thoracic ratio was noted. 12 lead ECG was done using HP PAGE WRITER 12 LEAD ECG in all the patients to look for rate, rhythm, chamber enlargement / hypertrophy.and 2D ECHO with Colour Doppler was done using TOSHIBA XARIO 200 Machine in Department of General Medicine, Susheela Tiwari Government Hospital, Haldwani and parameters like Left atrial (LA) dimensions, left ventricular ejection fraction (LVEF), left ventricular end diastolic dimension (LVIDD), left ventricular end systolic dimension (LVIDS), valve area for stenotic lesions, pulmonary artery pressure (PASP), for stenotic lesions mean gradient was calculated.

RESULTS

Among 112 patients studied, 49(43.75%) were male and 63(56.25%) were females, female:male ratio being1.28 (fig.1).

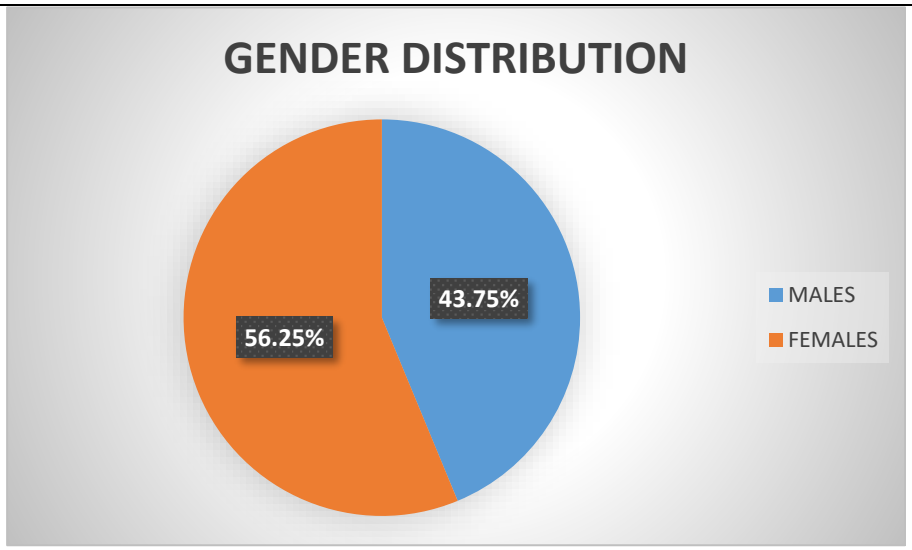

Figure no.1: Pie chart showing gender distribution of study population (n=112).

Among the 112 patients studied, maximum number of patients 45 (40.17%) belonged to 21-30years age group consisting of 19 males and 26 females (table no.1).

Figure no.2: Age distribution of patients

Age group (years)	Male	Female	Total (%)
17 – 20 years	2	4	6 (5.35%)
21 – 30 years	19	26	45 (40.17%)
31 – 40 years	17	21	38 (33.93%)
41 – 50 years	7	9	16 (14.28%)
51 – 60 years	3	3	6 (5.35%)

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61 – 70 years	1	0	1 (0.89%)
Total	49	63	112 (100%)

Uttarakhand has a diverse geographical profile. Hence, we also analyzed the patients on the basis of hilly and plain region.in our study 47 patients (41.96%) came from hilly area while 65 patients (58.03%) were from plain region. On analyzing the patients on the basis of socioeconomic status most of the patients of RHD belonged to lower class 49 patients (43.75%). As in case of RHD past history of rheumatic fever is having significant relevance we also questioned about the history of Rheumatic fever, but only 39 patients (34.8%) had past history of Rheumatic fever. Among 112 patients of RHD 12 patients were having history of valvular surgical intervention, in which 5 patients were post balloon mitral valvuloplasty (BMV), 5patients with single valve replacement (post MVR), 2 patients dual valve replacement (post MVR+AVR).

When we analyzed the presenting symptoms, most common presenting symptoms was dyspnea 78 (69.64%) patients. According to the NYHA functional grading of dyspnea 14 had NYHA grade I, 36 patients had grade II, 18 had grade III symptoms and 10 had grade IV symptoms. The grade III & IV cases received inpatient treatment. Second most common cardiac manifestation among the study population was palpitation in 66 (58.9%) patients. Fatigue was present in 51(45.5%) and chest pain in 38 (33.9%) patients. Edema was present in 22 (19.6%) patients (Fig.3&4).

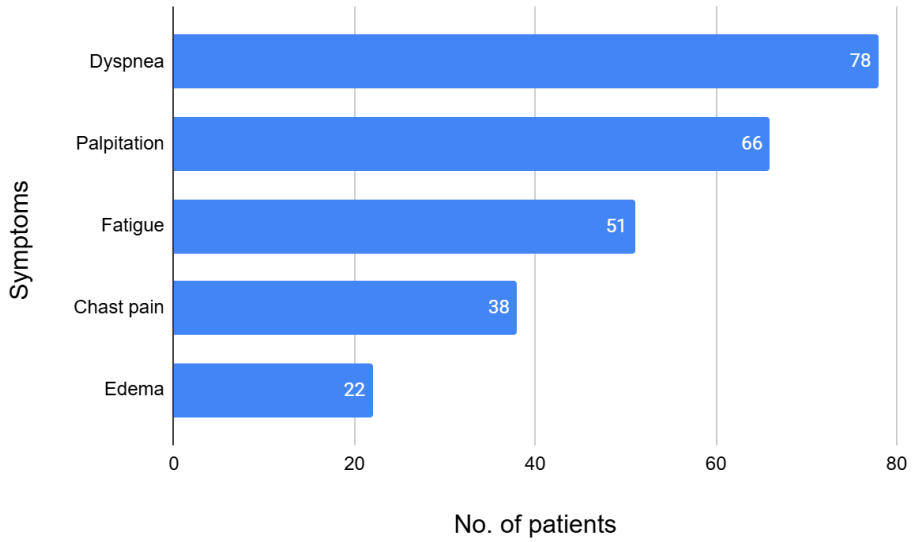

Figure 03: Bar diagram showing presenting symptoms among the study population.

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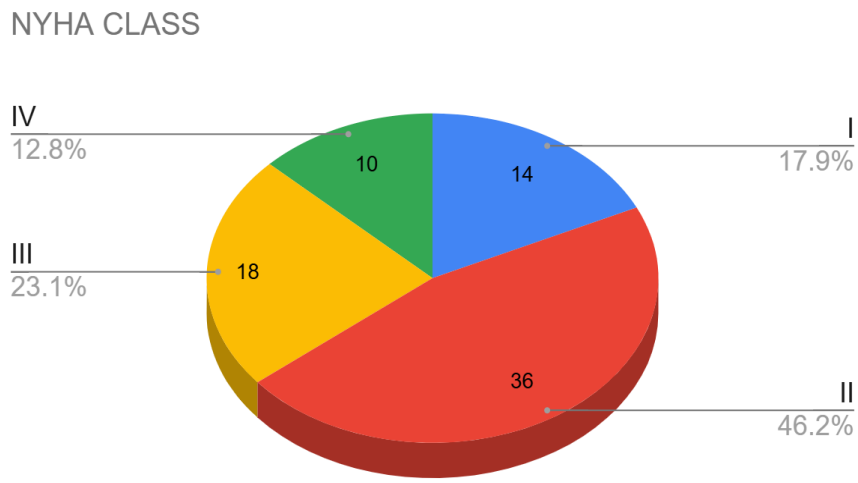

Figure 04: NYHA dyspnea grade among the study population (n=112).

Among the 112 patients on cardiac auscultation pan-systolic murmur heard in 86 patients (76.78%), early to mid diastolic murmur in 22 patients (19.64%) and mid diastolic murmur in 54 patients, mitral opening snap heard in 8 patients, ejection click heard in 10 patients, (fig.5).

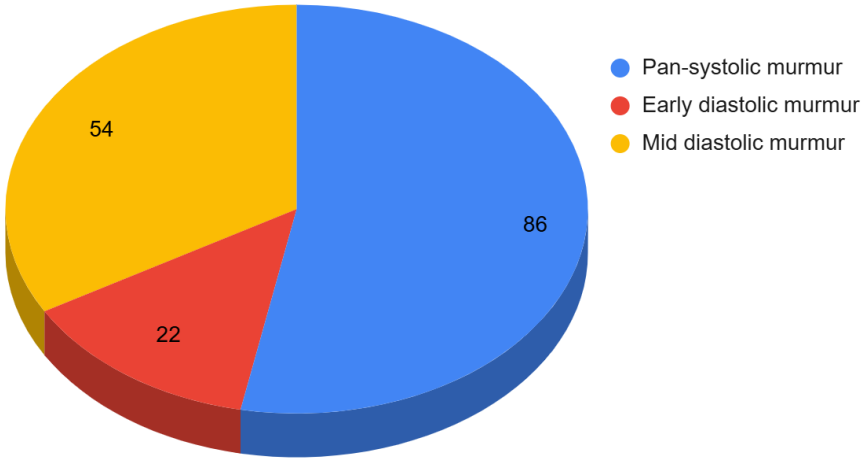

Figure 05: Pie chart showing added heart sounds in study population (n=112).

On performing ECG, majority of the patients were having sinus rhythm 61 (54.46%) followed by atrial fibrillation in 31 patients (27.67%), Sinus rhythm with prolonged PR Interval was in 13 patients (11.60%), QT Prolongation was in 17 (15.17%) patient's ECG & Left Ventricular hypertrophy was seen in 72 (64.2%) patient's ECG (fig.6).

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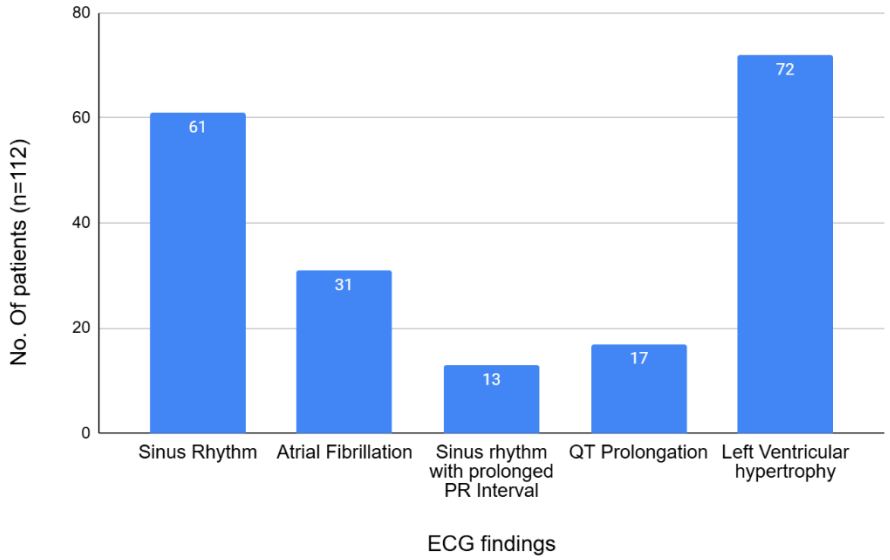

Figure 6: Bar diagram showing ECG findings in study population.

On analyzing valvular involvement in study population, out of 112 patients Mitral valve was the most commonly affected valve (105/112, 93.75%), followed by tricuspid, aortic, and pulmonary valves. Mitral stenosis was seen in 82 patients (73.2%) and mitral regurgitation in 76 patients (67.85%). Tricuspid regurgitation was reported in 61 patients (54.46%), aortic regurgitation (20/112, 17.85%) and aortic stenosis in 2 patients (1.78%). Pulmonary regurgitation was seen in 2patients (1.78%). 5 patients were post BMV in which 3 patients were seen with MR post BMV, post MVR 7 patients were in study group of which 3 patients were seen MR. (fig no.07)

Figure no.07: Showing heart valves involvement in study population

Valvular involvement	**No. Of patient(n=112)**	**Percentage(%)**
MS	82	73.2%
MR	76	67.85%
AR	20	17.85%
AS	2	1.78%
TR	61	54.46%
TS	0	0%
PR	1	0.89%
PS	0	0%
MR Post BMV	3	2.67%
MR Post MVR	3	2.67%

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Frequencies of multivalvular lesions were much higher than those of isolated single-valve disease. Dual-valve lesion was more common in (51/112, 45.53%) patients, followed by triple-valve (43/112, 38.4%), single-valve (8/112, 7.14%), and quadrivalve (4/112, 3.57%) lesions. The most common dual-valve lesion was the combination of MS +TR (16/112, 14.28%)Triple-valve lesion mixed mitral valve (MR +MS) lesion and tricuspid regurgitation were common (27/112, 24.1%). Quadrivalve lesions were presented as a combination of MS+ MR +TR +PR (1/112, 0.89%) and MS+MR+AR+TR (2/112, 1.78%), (figureno.08).

Figure no.08: Showing pattern of valvular involvement in study population

Valvular involvement	**No. Of patients(n=112)**	**Percentage(%)**
Isolated MS	5	4.46%
Isolated MR	2	1.78%
Isolated AR	1	0.89%
MS with MR	14	12.5%
MS with AR	8	8.9%
MS with TR	16	14.28%
MR with TR	13	11.6%
MS with MR and TR	27	24.1%
MR with AR with TR	2	1.78%
MS with MR with AS	2	1.78%
MS with MR with AR	7	6.25%
MS with MR with TR with PR	1	0.89%
MS with MR with AR with TR	2	1.78%

Among the patients with Mitral stenosis (92) (isolated or in combination with regurgitant lesion or aortic valve involvement), 5 patients (4.4%) had mild stenosis, 48 patients (42.85%) had moderate mitral stenosis and 39 patients (34.8%) had severe Mitral stenosis (fig.9).

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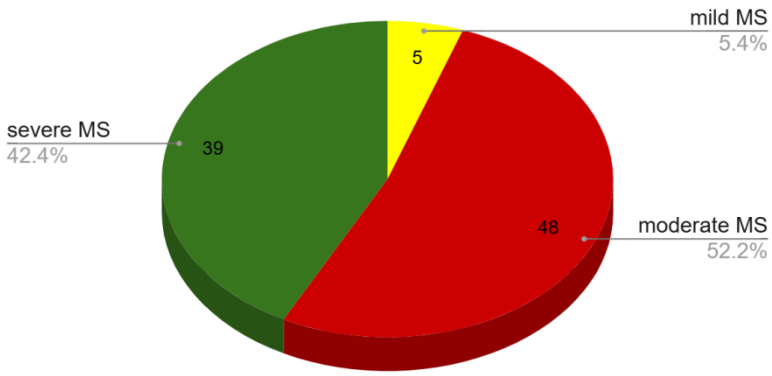

Figure 09: Showing severity of mitral stenosis among the study population (n=101)

When we analyzed the echocardiogrphy findings majority of the patients had Mitral valve area were <1.5cm2 in 54 patients (48.21%)(table no.6).

In our study mean LA size was (5.6±0.5). Majority of patients 48 (42.85%) had LA size in between5 -6cm, followed by 6 -7cm in 34 patients (30.36%), 4-5cm in 27 patients(24.11%) & 7 -8cm in 3 patients (2.67%).

In our study most common complication was pulmonary hypertension 94patients(83.92%), 2nd most common complication was heart failure which was present in 67 patients (59.8%), atrial fibrillation in 31 patients (27.68%), pericardial effusion in 3 patients (2.67%), cardioembolic stroke in 2 patients(1.78%), left atrial appendage clot 4 patients (3.57%) (fig.10)

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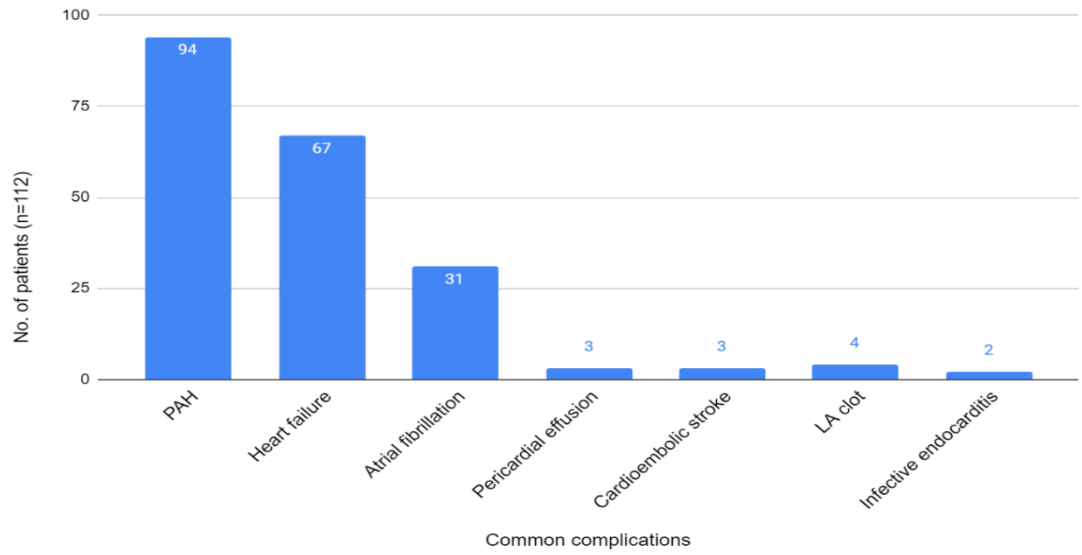

Figure 10. Bar diagram showing complications of RHD in study population.

When we enquired about penicillin prophylaxis regular Benzathine penicillin prophylaxis was received by 18 patients where as another 33 patients took the injection in an irregular manner and the rest 61 patients did not received any penicillin prophylaxis.

DISCUSSION

The study carried out offers significant insights into the clinical characteristics of patients who appear at a tertiary care centre in the Kumaon area of Uttarakhand with RHD.Total of 112 patients diagnosed with RHD were included in our study. RHD was seen more common in females 63 patients (56.2%) compared to males 49 patients (43.8%), with female:male ratio of (1.3:1). A study by S. Lalita et al[10] 53% were females and 47% were males & female: male ratio 1.13:1. Majority of patients in our study were in age group of 21-30 years (45 patients, 40.17%), similar to Shri Krishna Gautam et al[12] (2018) maximum no. of patients were in age group 20-30 years (40.9%).Majority of patients were from non-hilly areas 65 patients (58.03%), which was similar to study by Joseph N et al[13] (2013) 76.3% urban patients and only 23.7% patients from rural areas, but was different from work of Radwan A et al[14]2011. This difference among the studies could be due to draining area of the hospitals, since the present study was carried out in a centre which is situated in a plain / non hilly area so most of our patients were from non hilly areas.Social class assessment revealed that most of the patients belonged to lower class (43.75%) similar to study by Khatoon M et al[15]. This can be explained by presence of most risk factors in poor families such as overcrowding, inter current infection, malnutrition & poor awareness about the disease.Only 39 patients (34.8%) in our study recalled history of rheumatic fever (RF).12 patients of RHD in our study were having history of valvular interventions in past. 5 patients post BMV and 5 patients post MVR and 2 patients post MVR+ AVR. Dyspnea was the most common presenting complaint in 78 patients (69.64%) which was similar to study by Zhsang W et al[16]

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75% patients presented with dyspnea and Thakur JS et al[17] 77.3% patients were presented with dyspnea.

majority of patients were in NYHA class II (46.15%). Study done by Melka A et al[19] the functional classes of patients according to the New York Heart Association's classification were 17%, 25%, 26% and 32% for classes I, II, III and IV, respectively. On cardiac auscultation pan-systolic murmur heard in 86 patients (66.07%), early to mid diastolic murmur in 22 patients (19.64%) and mid diastolic murmur in 54 patients (48.2%). Majority of patients in this study were in sinus rhythm (54.5%) and 31 patients (27.67%) with atrial fibrillation in ECG. Similar to study by Manal Hamed Awad et al[20] majority of patients were having sinus rhythm (81.7%) and only 18.3% patients with atrial fibrillation.

The pattern of association of valve involvement in our study, Mitral valve lesion was the predominant rheumatic valvulopathy seen in 105 patients (93.75%), similar to study done by Rajesh Nepal et al[21] mitral valve involved in (95.6%) & O Lilyasari et al[22] mitral valve involved in (93.6%) of patients.

Regarding single valvular lesion, isolated pure mitral valve lesion (18.75%) was affected more than isolated aortic valve lesion (0.89%), similar to study done by O Lilyasari et al[22] isolated mitral valve lesion (22.22%) more prominent than isolated aortic valve lesion (5.26%). Rheumatic tricuspid valve disease was the second most common in our study populations(62.5%) all cases usually being functional or with the presence of other valve lesions, similar to study done by O Lilyasari et al[22]. most patients had a multivalve lesion (82.14%), indicating the advanced stage of the disease. A similar observation was reported in the study by O Lilyasari et al[22]. In Indonesia, where multivalvular lesions accounted for (75.6%) of the overall study population. This may be because their study and ours were both done at a tertiary referral hospital, where patients had reached the hospital when they were already at advanced stage. In our study among multivalve diseases, dual-valve lesion were seen more commonly 45.5%, of which MS + TR was the most common combination in dual valve lesion. & among trivalve lesion MS+MR+TR was the most common combination (24.1%).

Overall mitral stenosis (either as isolated lesion or in combination) was the predominant mitral valve lesion, affecting 82 (73.2%) of patients, followed by mitral regurgitation 76 patients (67.85%), consistent with a previous study done by Rajesh Nepal et al[21] Mitral stenosis in (84.6%) patients followed by mitral regurgitation (69.6%). Overall, MS was found to be present in almost every combination of multivalvular lesion in our study. Tricuspid regurgitation was observed in 61 patients (54.46%), but almost always in combination with mitral valve or in a lower occurrence aortic valve lesions. In study done by O Lilyasari et al[22] 65.49% patients were having Tricuspid regurgitation.

Aortic regurgitation were seen in 20 patients (17.85%) & aortic stenosis in 2 patients (1.78%). A study by Vyas Pooja et al[11] 29.7% patients had rheumatic AR and 0.7% had AS, O Lilyasari et al[22] 34.68% cases of aortic regurgitation that was slightly more common in children than in young adult. Overall, aortic regurgitation was present more commonly than aortic stenosis, with no case of aortic stenosis recorded in children. Pulmonary regurgitation

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was seen in 1 patients in our study in combination with mitral valve. In study by Laudari S et al[23] reported pulmonary valve involvement combined with other valves in 2.55% of cases.

In our study Average LA size was found significantly higher in patients with MS and MR. Majority of patients 48 (42.85%) had LA size in between5 -6cm, followed by 6 -7cm in 34 patients (30.36%), 4-5cm in 27 patients(24.11%) & 7 -8cm in 3 patients (2.67%). In study done by S Lalita et al[10] 51.5% were 4-5 cm, 22.2% were 5-6 cm , 6% were 6-7 cm, 3% were 7-9 cm.Mean Mitral valve area in our study was 1.46 ± 0.5 cm2, Tadele et al[18] ,Mean mitral valve area ($n = 126$) was 1.1 ± 0.5 cm2 (range 0.4-2.0 cm2). Mulugeta et al[24] 1.25cm2 was mean mitral valve area.

We studied the complications of RHD in this population and found that majority of 94 (83.9%) patients had pulmonary arterial hypertension And 67 (59.8%) patients presented with heart failure; 31 (27.68%) patients had atrial fibrillation, cardioembolic stroke in 2 (1.78%) and 4 (3.57%) patients had left atrial appendage clot in our study. In study by Vyas Pooja et al[11] 69.03% patients had pulmonary arterial hypertension, 27% presented with heart failure, 4.3% patients had atrial fibrillation,2.4% patients had infective endocarditis and 0.73% had left atrial appendage clot. In our study 12 patients were having history of valve intervention, 5 patients post BMV and 7 patients were post MVR status. 6 patients presented in heart failure, 2 patients with prosthetic valve presented with stroke, 1 patient with prosthetic valve with endocarditis. In our study 18 patients (16.02%) received regular prophylaxis which was lower than the study by Thakur JS et al[17] where 61.4%patients were receiving regular prophylaxis, in study by Ravisha MS et al[25] 42.18% were found to be receiving regular prophylaxis.

CONCLUSION

The prevalence of Rheumatic Heart Disease is still quite common in the Kumaon region of Uttarakhand. Most common age of presentation valvular heart disease was 21-30 years. Females were more affected with rheumatic valvular heart disease than males. Majority of patients were in lower socioeconomic status. Dyspnea was the most common presenting complaint. Pan systolic murmur was reported in majority of patients. The common ECG finding was sinus rhythm. On analyzing the different valvular patterns in echocardiography, indicated that Mitral valve was the most common valve involved followed by Tricuspid valve, aortic valve. Most common in single valve lesion was Isolated Mitral stenosis, MS+TR in dual valve lesion, while the combination of MS+MR+TR were the most common multivalvular lesion. Multivalve lesions indicated an advanced stage of disease. Pulmonary hypertension was the most common complication. Most of the patients were referred to higher center for Surgical intervention, especially in severe cases with low early postoperative mortality. Poor compliance and limited access to secondary prophylaxis remain significant challenges to RF/RHD control, especially in rural areas.Echocardiography should be performed routinely for all patients with rheumatic heart disease, focusing on younger patients, to facilitate diagnosis and treatment before complications develop.

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