Research Article

Clinical Spectrum of Rheumatic Heart Disease in Pediatric & Adolescent Patients Attending B.S.M.C.H, Bankura: A Rural Tertiary Medical Center in India.

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Abstract

RHD is a major complication of Rheumatic fever, affecting children & young adults in there most productive years of life, despite found decreasing in the developed world, it is still a major cause of acquired cardiovascular mortality & morbidity in our country. In this study, the sample was selected randomly from pediatric & adolescent RHD patients aged up to 18yrs if they fulfill the inclusion criteria. All the102 children were first clinically evaluated as per case record form, then undergone serial relevant investigation. Echocardiography (2D, M-MODE, &COLOUR-DOPPLER) was done.

Results showed a slight male preponderance among the patients, the mean age of patients was 11.43 ± 3.58yrs, the majority of the 85.29% were from rural areas & belong to low socioeconomic class, history of rheumatic fever in past was present in 38.23% patients.

The most common mode of presentation was heart failure seen in 31.37% of patients, a significant proportion of patients had a recurrence of rheumatic fever (18.62%), mostly those who were noncompliant to penicillin prophylaxis, pulmonary hypertension was found in 14.7% of patients. Incidence of other complications such as stroke, infective endocarditis, arrhythmia was low as expected in this age group (upto18yrs), due to the temporal delay in the development of complications of RHD.

Isolated mitral valve involvement especially isolated mitral regurgitation was the commonest pattern of involvement. The most common presenting symptom was dyspnoea present in 86.27% followed by palpitation, fatigue, chest pain, edema.

Dyspnoea of the majority of patients was NYHA Class I &II of the studied population, 62.74% received regular prophylaxis & 37.25% of patients had irregular or no prophylaxis. The incidence of heart failure, pulmonary arterial hypertension & recurrence of rheumatic fever was much higher in the latter group.

***Keywords**: Rheumatic Heart Disease (RHD), Acute Rheumatic Fever, Valvular Heart Disease, Infective Endocarditis (IE), Mitral Regurgitation (MR), Mitral Stenosis (MS)*

Abbreviations

RHD - Rheumatic Heart Disease.

IE- Infective Endocarditis, ARF-Acute Rheumatic Fever.

MR - Mitral Regurgitation.

MS- Mitral Stenosis.

AR - Aortic Regurgitation.

AS- Aortic Stenosis.

ICMR –Indian Council of Medical Research.

ASO –Anti Streptolysin O.

CRP- C-Reactive Protein.

ESR- Erythrocyte Sedimentation Rate.

NYHA- New York Heart Association.

WHO - World Health Organization.

Introduction

Rheumatic heart disease (RHD) is a major cardiac problem worldwide. Though Rheumatic fever and Rheumatic heart disease have decreased in developed countries, it's still very common in India and many developing countries with it's most devastating effects on children and young adults in their most productive years. Acute Rheumatic fever is an immunologically mediated disease following infection with group A beta-hemolytic streptococci, and cardiac manifestations of the disease are known as Rheumatic heart disease.

Rheumatic heart disease is the most serious complication of rheumatic fever. Acute rheumatic fever follows 0.3% of cases of group A beta-hemolytic streptococcal pharyngitis in children. As many as 39% of patients with acute rheumatic fever may develop varying degrees of pan carditis with associated valve insufficiency, heart failure, pericarditis, and even death. With chronic rheumatic heart disease, patients develop valve stenosis with varying degrees of regurgitation, atrial dilation, arrhythmias, and ventricular dysfunction. Chronic rheumatic heart disease remains the leading cause of mitral valve stenosis and valve replacement in adults **(**1,2**)**.

There have been many surveys in India regarding the prevalence of rheumatic heart disease in various parts of the country3-6. Even at the beginning of the 21st century **(**3**)**, the problem of RHD in India has remained the same. ICMR's multi-centric 'Jai Vigyan Mission Mode Project on RF/RHD' was undertaken from 2000 to 2010 to estimate the prevalence of RF/RHD in 176904 school children in the age group of 5 to 14 y at various center in India The prevalence of RHD ranged from 0.13 to1.5 per 1000 in school children in the age group 5 to 9 y and 0.13 to 1.1 per 1000 in the age group of 10 to 14 y. There is an apparent decline in RHD prevalence in this study (2000–2010) from the earlier ICMR studies conducted in the 1970s and 80s **(**4,5,6**)**.

A study by Carpentis et al estimated that up to 15.6 million people are affected by RHD worldwide **(**7**)**. Each year, there are approximately 470,000 new cases diagnosed and 233,000

deaths attributed to RHD **(**1**)**. There have not been many studies on determining the clinical profile and prevalence of different types of RHD in India, especially in Eastern India. So, we undertook this study.

Aims & Objectives

1. To know the profile of various types of valvular involvement in patients with RHD in pediatric & adolescent age group.

2. To determine the spectrum of complications of RHD such as heart failure, arrhythmias, chamber dilation, thrombo-embolic manifestation, pulmonary hypertension, & death, etc. among those having RHD.

Materials and Methods

A cross-sectional observational study of 102 Children & adolescents were selected randomly from those attending RHD CLINIC & admitted in the Department of cardiology & Department of Pediatric Medicine with a various spectrum of manifestation due to RHD, Bankura Sammilani Medical College & Hospital. The study period extended from February 2013 to July 2014 for 16 months. A predesigned proforma (Annexure I) was used as a study tool for documentation of clinical history, clinical examination& various investigations (Echo –doppler study, ECG, Chest Xray, Complete Hemogram. ASO titer, CRP, ESR, Throat swab culture) for Diagnosis and evaluation of RHD & its various complications.

Echocardiography was done in our cardiology department by Siemens Acuson cv70 echocardiography machine. The other relevant investigations were done in the respective department of Bankura Sammilani Medical College &Hospital. Written consent was obtained from parents to participate in the study. Ethical clearance from the Institutional Ethics Committee was obtained before starting the study (Annexure-II). The following Inclusion and exclusion criteria were used for the study.

A) Inclusion criteria:

- Age upto18 years.
- Having a record of a hospital with an echocardiographic diagnosis of RHD.
- Patients having clinical evidence of RHD, later proved by echocardiography.

- Record of having undergone surgery or balloon valvotomy for RHD.

B) Exclusion Criteria:

- Age >18 years.
- Patients of valvular heart disease of non-RHD etiology.
- Patients not giving consent.

Statistical Analysis

All the accumulated data was analyzed with the help of Microsoft mathematics software and Medical software.

Results

Among the 102 patients studied, 55 were males and 47 were females, male: female ratio being 1.17: 1.

Table 1: Demographic Distribution of Patients

Population	**Male**	**Female**	
Urban	9	6	**15**
Rural	46	41	**87**
Total	**55**	**47**	**102**

From **Table 1**: we can see that most of the RHD patients, 85.29% (n=87) came from Rural area with poor socio-economic background and rest 14.7% (n=15) were from urban population. The mean age of the patients was 11.43 ± 3.58 years. The youngest patient was 7 years old and the eldest was 18 year old. Mean age of male patients was 11.87 ± 3.76 and mean age female patients was 10.91 ± 3.31. Females were younger than males.

Table2. Showing distribution of patients according to socio-economic status

Socio-economic class	Number	%
Upper	none	NA
Upper middle	**2**	1.96%
Lower middle	**12**	11.74%
Upper lower	**23**	22.55%
Lower	**65**	63.72%

Table 2: shows that mostly the patients of RHD belonged to lower class 63.72% (n=65) & upper lower class 22.55% (n=23). two patients belonged to upper middle class & 12 were from lower middle class, here no patient from upper class could be shown in this study.

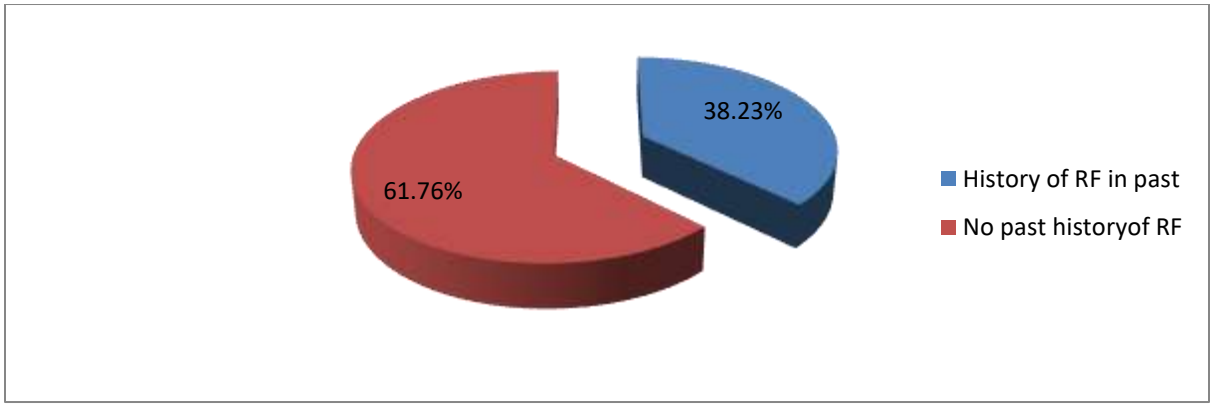


Diagram 1. Pie chart showing percentage of patients with history of rheumatic fever in past

The above diagram shows that 38.23% (n=39) patient had past history of rheumatic fever.

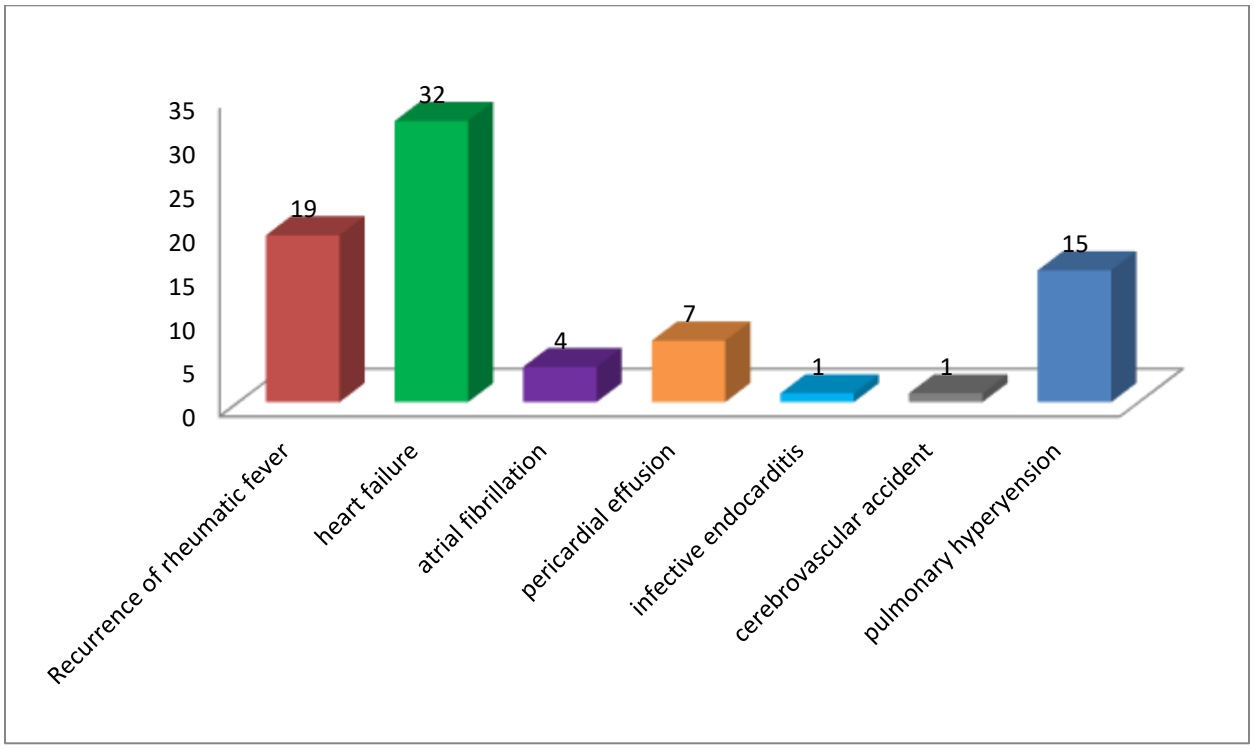


Diagram 2. showing mode of presentation of RHD in study population

The above bar diagram shows the various mode of presentation of patients ,most common mode of presentation was heart failure which was present in 32 (31.37%)patients, 2nd most common presentation was recurrence of rheumatic fever present in 19(18.62%) patients, pericardial effusion was presents in 7(6.86%) patients, atrial fibrillation in 4(3.92%) patients, cardio-embolic stroke & chorea was seen in 1(0.98%) each, & 15(14.7%) patient had pulmonary hypertension.

Table 3: Distribution of valvular involvement in study population

Valvular involvement	**Male**	**Female**	**Total (%)**
Isolated MR	29	28	57(55.88%)
Isolated MS	6	2	8(7.84%)
MS with MR	6	7	13(12.74%)
Isolated AR	2	2	4(3.9%)

AR with MR	7	8	15(14.7%)
AR with MS	4	0	4(3.9%)
MR with MS with AR	1	0	1(0.98%)
	55	47	102

We can see from **Table 3** that out of 102 patients studied Mitral valve involvement (isolated or in combination) was present in 98 (96.07%) patients. While the aortic valve was affected in 24 (23.53%) patients. Out of 102 cases, isolated mitral valve involvement was seen in 78(76.47%). The most common type of mitral valve involvement was isolated Mitral Regurgitation (MR). isolated MR was seen in 57 patients (55.88% of the total study population). The second most common of valvular involvement after Isolated Mitral Regurgitation was Mitral Regurgitation with Aortic Regurgitation. Isolated Mitral Stenosis (MS) was seen in 8 patients (7.84% of the total study population). A combination of Mitral stenosis with Mitral regurgitation was found in 13 (12.74% of the total population) patients.

MR with AR was found in 15 patients out of a total 102 study population (14.7%). Isolated AR was found in 4 patients & one patient had a combination of mitral regurgitation & stenosis with aortic regurgitation. And we didn't find any patient who had Aortic Stenosis or had rheumatic involvement of Tricuspid and Pulmonary valves. Among the patients with Mitral Regurgitation (n=86) (isolated or in combination with a stenotic lesion or aortic valve involvement), 17 patients had Mild Mitral Regurgitation, 45 patients had moderate Mitral Regurgitation and 24 had Severe Mitral Regurgitation.

Among the patients with Mitral Stenosis (isolated or in combination with mitral or aortic regurgitation) 12 patients had mild MS, 11 had moderate MS and 3 had Severe MS (out of total 26 patients with MS).

The most common presenting symptom of the RHD study population was dyspnea in 88 (86.27%) patients. According to the NYHA functional grading of dyspnea, 41 had NYHA grade I, 27 had grade II, and 17 had grade III and 3 had grade IV symptoms. The grade III and IV cases received inpatient treatment. The second most common cardiac manifestation among the study population was palpitation 75 patients. Fatigue was present in 48 & chest pain in 30 patients. Edema was present in 18 patients.

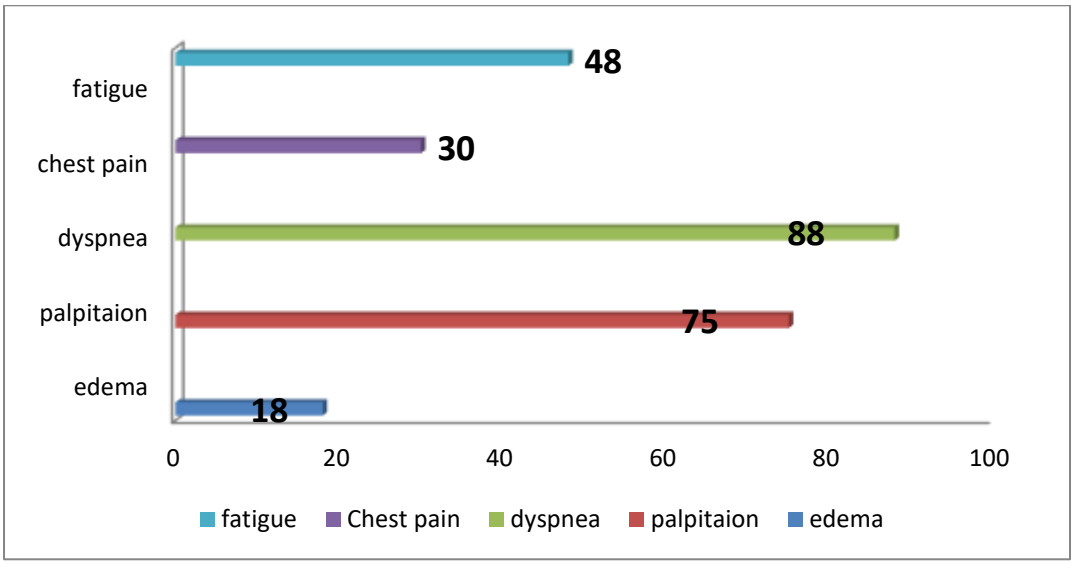


Diagram 3. showing prevalence of cardiac symptoms among the study population

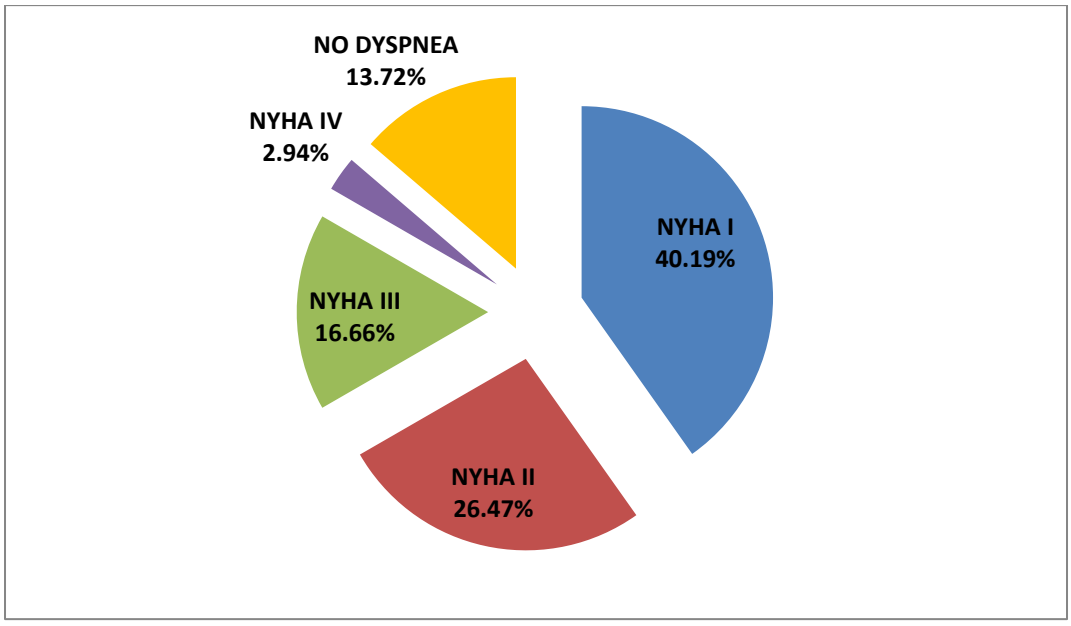
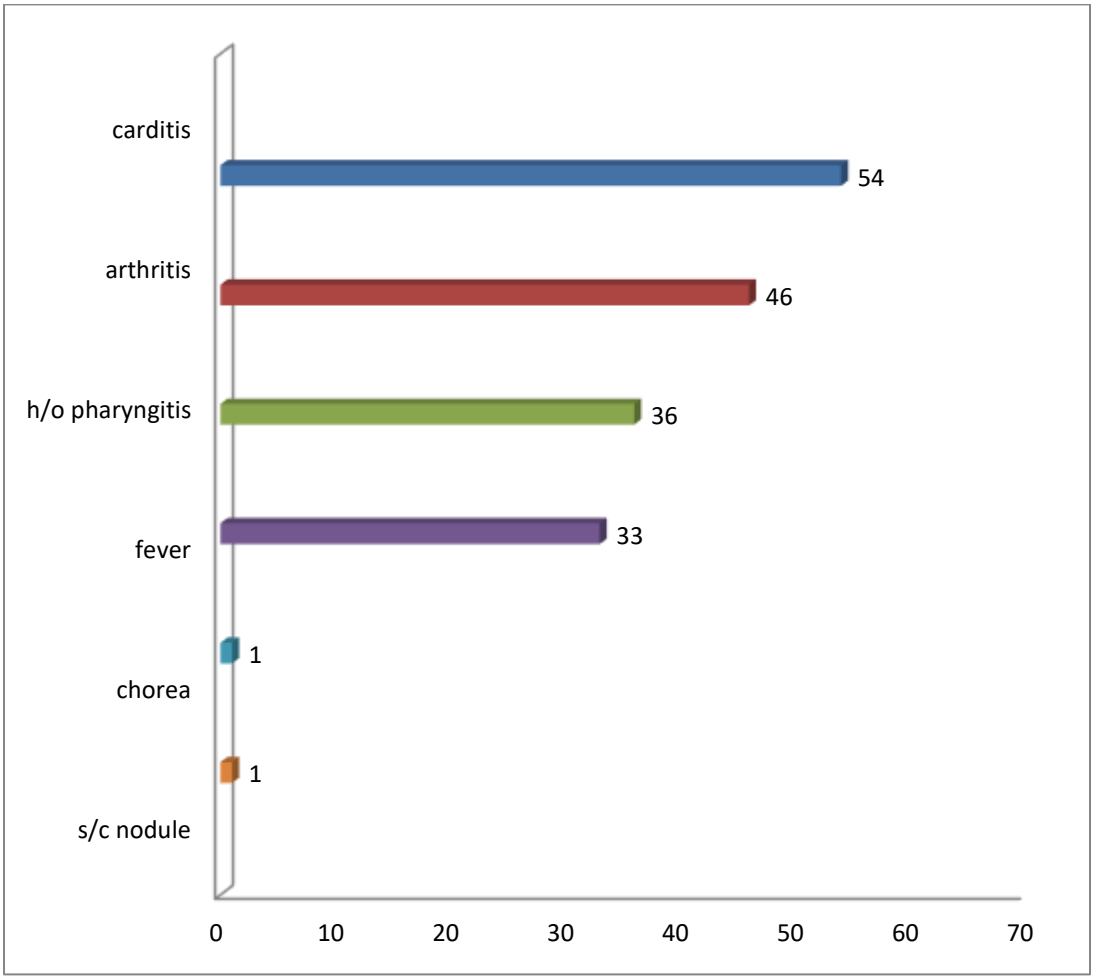


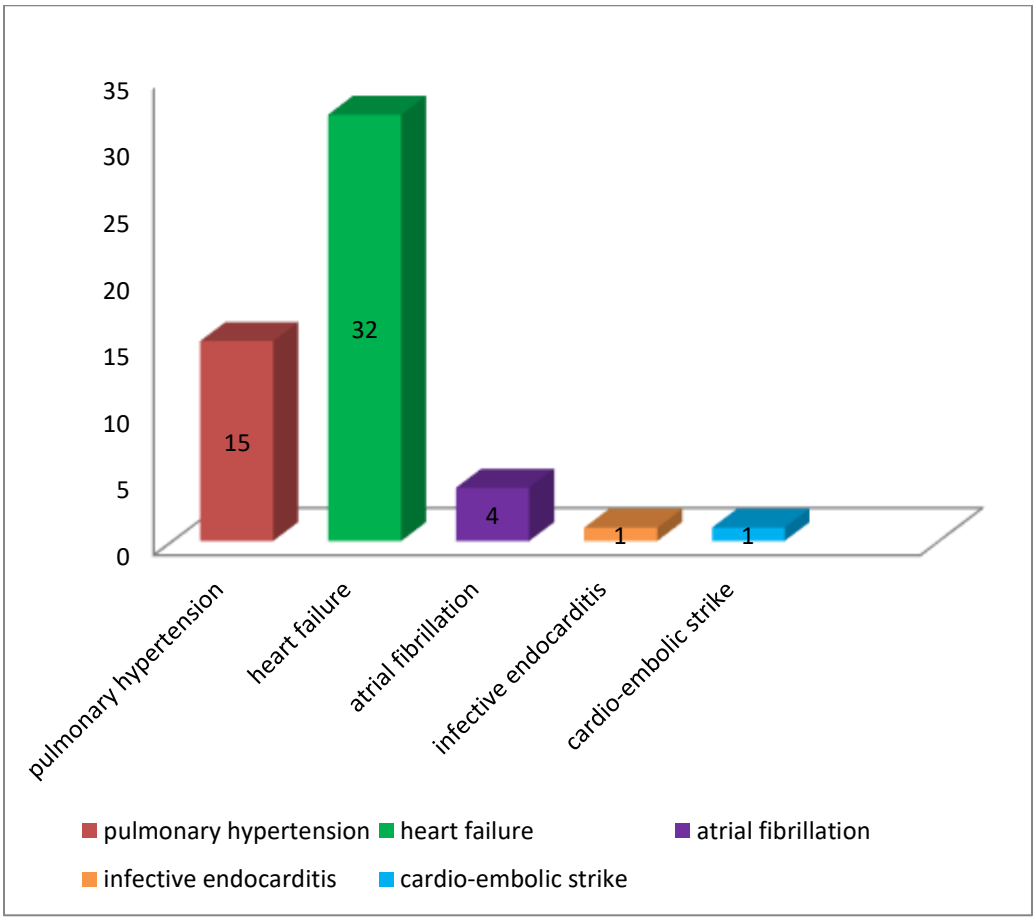
Diagram 4. NYHA dyspnea grades among the study population

Among the major symptoms of acute or recurrent rheumatic fever; carditis was the most common one seen in 54 patients, arthritis was present in 46, Chorea was seen in a single patient. Also, subcutaneous nodule was present in one patient. And among the minor symptoms; there was a high incidence of a previous history of a throat infection in 36 patients while 33 gave a history of fever.



Bar Diagram 5. showing incidence of symptoms of ARF among the study population

Among the various complications of Rheumatic Heart Disease, pulmonary hypertension was present in 15 patients, mostly in elder patients; while 32 developed congestive cardiac failure, the only a single patient had infective endocarditis, 4 had atrial fibrillation and one patient had cardio-embolic stroke.



Bar diagram 6. showing various complications of RHD in study population

Regular Benzathine penicillin prophylaxis was received by 64(62.74%) cases, whereas another 20(19.6%) took the injections in an irregular manner and the rest 18(17.64%) didn't receive any penicillin prophylaxis.

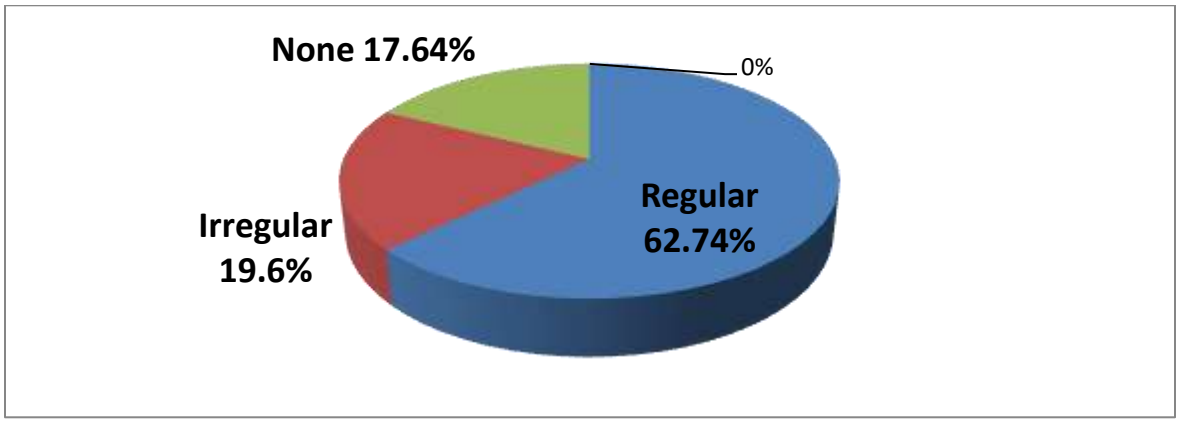


Diagram 7. showing penicillin prophylaxis among study population

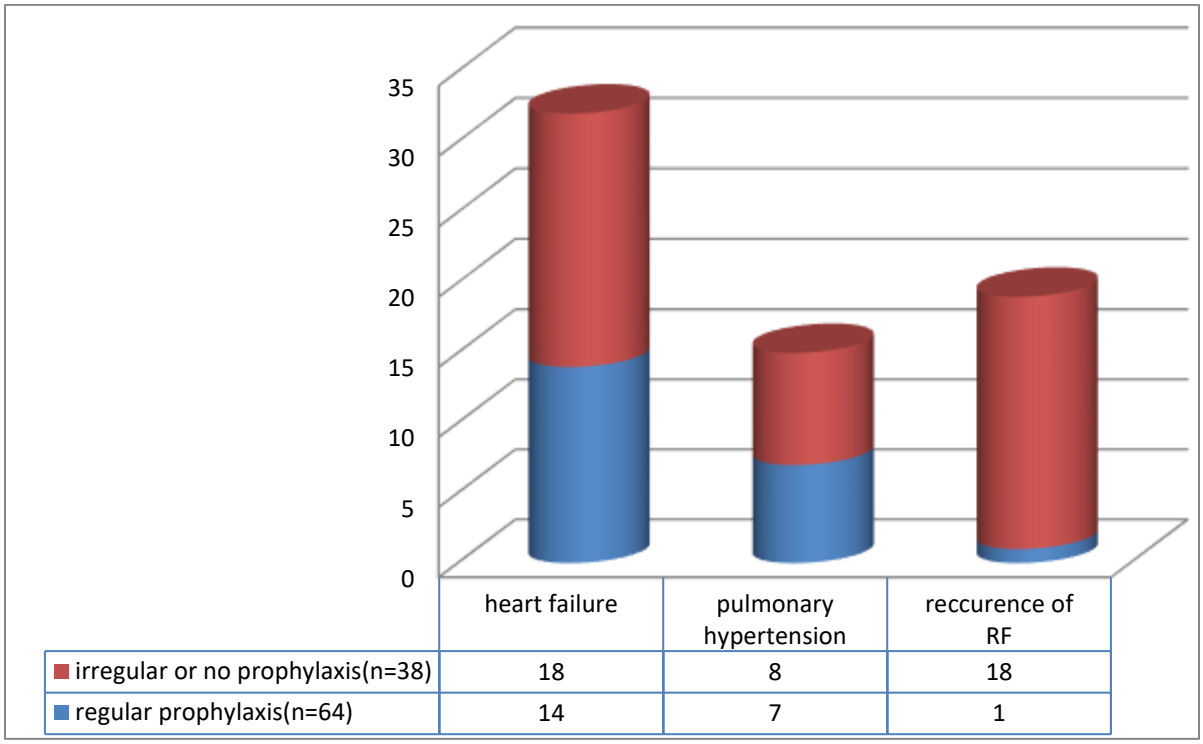


Diagram 8. Showing comparison of incidence of complication, between group receiving regular prophylaxis vs irregular or no prophylaxis

Diagram 8 shows that out of those receiving irregular or no prophylaxis (total=38), 18(47.36%) had heart failure, 8(21.05%) had pulmonary hypertension&18(47.36%) had a recurrence of

rheumatic fever which was much higher than in the patients receiving regular prophylaxis (n=64) in this group 14(21.87%)had heart failure,7(10.93%) had pulmonary hypertension & only 1(0.98%)had a recurrence of rheumatic fever.

Discussion

Rheumatic heart disease (RHD) has virtually disappeared from the western world; however, it continues to be a public health problem in India and several other developing countries. It is a disease of poverty and is associated with overcrowding, poor living conditions, poor sanitation, and inadequate access to healthcare. The disease affects children and young adolescents causing progressive damage to cardiac valves. According to the World Health Organization (WHO), rheumatic fever (RF)/RHD affects about 15.6 million people worldwide, with 282,000 new cases and 233,000 deaths each year. **(**1**)** Death results from complications associated with disease such as heart failure, infective endocarditis, cardioembolic stroke, atrial fibrillation, pulmonary hypertension.

Age of Presentation of RHD Patients & Socio-Economic Factors

In the present study mean age of the patients was 11.43±3.58, The mean age of patients in a study was done in Turkey by Ozer OS.et al **(**8**)** was 11.2 years which was similar to our findings. This can be explained high incidence of group A Streptococcal in school-going children between the ages group of 5yr-15yr and schools are often overcrowded and badly ventilated increasing the spread of Streptococcal infection. In this study, most of the patients 86% belonged to the lower & upper lower class, which was similar to studies by Arora R. et al **(**9**)** in New Delhi & Khatoon M. et al **(**10**)** in Bangladesh. Our study also showed that most of the patients, 85.29% were from rural areas, which is similar to the work of Radwan A. et al **(**11**)**. This can be explained by the presence of most of the risk factors in poor rural families such as overcrowding, intercurrent infection, protein-energy malnutrition, & poor awareness about the disease.

Pattern of Valvular Involvement

Among the cardiac valvular lesions, the mitral valve was found to be the most commonly affected, this was consistent with most other studies **(**11-13**)**. The most common valvular pattern was isolated mitral regurgitation, 55.88%(n=57) the 2nd most common was mitral regurgitation with aortic regurgitation 14.7%(n=15) followed by mitral regurgitation with mitral stenosis 12.74% (n=13) these results were similar to the study by Zhang W.et al **(**14**)** showing Pure mitral regurgitation was the commonest valvular disease (40.2%), followed by mitral regurgitation plus

aortic regurgitation (29%). This higher incidence of isolated mitral regurgitation in the present may be explained by the fact that the study population here was patients upto18 years.

Mode of Presentation & Complications Of RHD:

The most common mode of presentation was heart failure present in 31.37% (n=32) patients which is similar to findings of Radwan A. et al **(**11**)** showing 31.1% & 36.54% in the study by Ravisha MS. et al **(**13**)**. 2nd most common presentation was recurrence of rheumatic fever present in18.62% (19) patients in this study, which varied among studies,4.3% in the study by Radwan A. et al **(**11**)**, 9.6% in the study by Melka et al 15& 40.7% in the study by Ravisha MS. et al **(**13**)**. In this study, this was seen that the recurrence of rheumatic fever was significantly higher among those who were receiving irregular or no prophylaxis than in those receiving regular prophylaxis. It has been found that patients who were compliant and who took regular penicillin prophylaxis rarely had a recurrence of RF. In this study, 14.7% of patients had pulmonary arterial hypertension, which was lower than that found in other studies, a study by Akinwusi OP. et al **(**16**)** showing 36.4%, & Ogah OS et al **(**17) showing 54.2%.

Infective endocarditis was present in 0.98% (n=1) patients in the present study, lower than other studies, 4.6%, 5.54% respectively in studies by Radwan A. et al **(**11**)** & Akinwusi OP et al **(**16**)**. Atrial fibrillation was present in 3.92%, which was lower than the other studies,15.9%, 22.2%, 27.3% atrial fibrillation in studies by Ogah OS.et al **(**17**),** Radwan A. et al **(**11**)** & Akinwusi OP.et al **(**16**)** respectively. Pericardial effusion was present at 6.86% in this study lower than that in studies by Bitar FF.et al **(**18**)** finding 11% pericardial effusion. Stroke was present in 0.98% in the present study slightly lower than that found in a study by Ogah OS.et al **(**17**)** where 2.8% of patients had a stroke & much lower than that present in a study by Akinwusi OP.et al **(**16**)** where 18.2% patients had a stroke. The lower occurrence of complications in this study may be because this study included only those patients who were up to 18yrs of age & not the older patients, & overall complications were expected to be low in this particular age group due to temporal delay in the development of complication in RHD patients.

Symptoms of RHD:

Most common presenting symptom of the RHD patients in the present study was dyspnoea which was present in 86.27%(n=88) this was similar to that shown by other studies, 75% of patients had dyspnoea in a study by ZhangW.et al **(**14**)** &77.3% in the study by Thakur JS. et al **(**19**)**, another study by Ogah OS.et al **(**17**)** showing 100% of patients having dyspnoea. NYHA

(NEWYORK HEART ASSOCIATION) Grades of dyspnoea among total patients in this study as follows:

class I = 40.19%, class II = 26.47% class III =16.66%, class IV=2.94%

this was similar to findings of a study by Thakur JS. et al19 showing :

class I=38.2%, class II=38.2%, class III=20.6%, class IV=2.9%,

but another study by ZhangW.et al **(**14**)** showing more, 43% had class III & class IV.

All the patients in the present study with class III & class IV required admission. The next most common symptom was palpitation present in 73.53% of patients in this study. Whereas studies by Thakur JS. et al **(**19**)** & ZhangW.et al **(**14**)** showed 34.1% & 95.4% patients having palpitation respectively. Other symptoms like edema in 17.64% of patients similar to that shown by Zhang W.et al **(**14**)** showing14.6%, fatigue in 47.05% similar to that shown in a study by Ogah OS.et al **(**17**)** showing 50.4%, chest pain in 29.41% of patients much lesser than that shown by Zhang W.et al **(**14**)** showing 76.4%.

Major Features of Rheumatic Fever

Among the major features of rheumatic fever most common was carditis present in 52.94%(n=54) which is similar to studies by Ravisha MS. et al **(**13**)** showing 42% patients with carditis. The next most common feature was arthritis present in 45.1%(n=46), patients, this was similar to that found in a study by KhatoonM.et al10 & Ravisha MS. et al **(**13**)** showing 64% & 42% patients with arthritis respectively. Chorea was found in 0.98% (n=1) of patients in the present study which is lower than other studies JosephN.et al **(**12**)** & Ravisha MS. et al **(**13**)** showing 13.7% & 18.8% patients with chorea respectively. The lower occurrence of complications in this study maybe because this study included only those patients who were up to 18yrs of age & not the older patients, & overall complications were expected to be low in this particular age group due to temporal delay in the development of complications in RHD patients.

Penicillin Prophylaxis

In this study, 62.74% (n=64) patients received regular prophylaxis which was similar to the study by Thakur JS. et al **(**19**)** where 61.4% of patients were receiving regular prophylaxis. It was found that the occurrence of major complication such as heart failure, pulmonary hypertension&

recurrence of rheumatic fever was higher among who were receiving irregular or no prophylaxis than in those receiving regular prophylaxis.

Conclusion

Although complication of rheumatic heart disease is expected to be low in pediatric & adolescent (up to 18 yrs), this study shows that a significant number of patients of RHD in this age group had to attend hospital for various reasons like Heart failure, recurrence of rheumatic fever, dyspnoea, palpitation, fatigue, etc. The demographic profile reveals that it is still prevalent in rural areas & low socio-economic class & noncompliance to penicillin prophylaxis is a major precipitating factor besides poor hygiene, overcrowding & poor nutritional status. Isolated mitral valve involvement especially isolated mitral regurgitation was the commonest valvular involvement in this study, while tricuspid & pulmonary valve involvement are rare & not found in this study. So, some relatively cheap measures like adherence to penicillin prophylaxis, improvement of hygiene & nutritional status, in all diagnosed cases of RHD & rheumatic fever will significantly reduce the morbidity & mortality in this condition.

Acknowledgments

None

Conflicts of Interest

There are no conflicts of interest.

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