



FACTORS PRECIPITATING HEART FAILURE IN PATIENTS WITH RHEUMATIC HEART DISEASE IN TERTIARY CARE TEACHING HOSPITAL.

General Medicine

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ABSTRACT

Introduction: Streptococcus pyogenes group A beta-hemolytic produces rheumatic heart disease, a chronic condition. In countries with low and intermediate incomes, it significantly increases morbidity and mortality. **Aims and objectives:** To assess the precipitating causes for Frank congestive cardiac failure in patients with established RHD and evaluate the diagnostic problems of fresh rheumatic activity versus infective endocarditis. **Methodology:** This was a hospital-based prospective, observational study conducted on 150 patients with RHD with cardiac failure admitted to the tertiary care centre in the hospital in the department of general medicine. **Results:** In patients (≤ 20 years) Fresh Rheumatic Activity (FRA) was the single most important factor in 85.7%, followed by infection (47.8%) while in patients > 20 years, infective endocarditis (92.9%), strenuous physical activity (84.2%) and irregular treatment (72.4%), were a few of the more common factors responsible for precipitation of CCF as compared with patients ≤ 20 years of age. **Conclusion:** FRA and infective endocarditis were the most common precipitating factors in patients ≤ 20 years and > 20 years respectively.

KEYWORDS

Rheumatic Heart Disease, Fresh Rheumatic Activity, Infective Endocarditis

INTRODUCTION

Chronic rheumatic heart disease is brought on by group A beta-hemolytic Streptococcus pyogenes and develops years after acute rheumatic fever. Around the world, it results in 250,000 young individuals dying each year. Rheumatic heart disease affects roughly 15 million people worldwide.¹ The frequency is higher in children between the ages of 5 and 15 and in underdeveloped or developing nations where pharyngitis is uncommonly treated with antibiotics and where compliance is low.²

Congestive heart failure caused by valve involvement is the persistent symptom of rheumatic heart disease. The mitral valve is typically impacted, leading to mitral stenosis or mitral regurgitation. Depending on the level of valvulitis and myocarditis present, rheumatic fever can produce acute symptoms of pericarditis and congestive heart failure. In acute rheumatic fever, migratory polyarthritides is the most prevalent symptom. Along with a rash that starts on the trunk and spreads to the limbs, subcutaneous nodules also appear across the bones and tendons. Erythema marginatum is the name given to the rash, which has a distinctive erythematous ring around a pale core. St. Vitus' dance, also known as Sydenham's chorea, is characterized by involuntary, swift movements of the arms and facial muscles. The majority of the time, rheumatic heart disease is dormant or quiet until late age, when cardiac issues appear. The most frequent side effects are atrial fibrillation due to untreated severe valvular disease, infectious endocarditis, an embolic event, heart failure and pulmonary hypertension.³

Patients with a known diagnosis of rheumatic fever should be closely monitored by primary care doctors and practitioners, and this should be stressed. Patients should be closely monitored, have thorough physicals and histories taken, and have transthoracic echocardiograms in order to prevent rheumatic heart disease. RHD is still an untreated cardiovascular disease that significantly affects morbidity and mortality in low- and middle-income countries.

Hence the present study was conducted at our tertiary care centre to assess the precipitating causes for Frank congestive cardiac failure in patients with established RHD and evaluate the diagnostic problems of fresh rheumatic activity RA versus infective endocarditis.

MATERIAL AND METHODS

A hospital based prospective, observational study was conducted on 150 patients with RHD with cardiac failure admitted to the tertiary care centre in the hospital in the department of general medicine. These patients had an onset or aggravation of heart failure in the last 30 days. The study was carried out after receiving proper approval from the

institutional ethics committee and review board, as well as the patients' written informed consent.

The sample size was calculated using the formula $N = (Z^2 \times P \times (1 - P)) / d^2$, with 95% confidence limits and precision error of estimation at 4%.

$N = (3.84 \times 0.05 \times 0.95) / 0.0016 = 134$. Hence 150 patients were enrolled in the study

Inclusion Criteria

- Adults in the age group of 18-60
- All patients with RHD with cardiac failure admitted to the hospital whom onset or aggravation of heart failure in the last 30 days

Exclusion Criteria:

- Pregnant women and minors
- Patients suffering from congenital heart disease, ischemic heart disease, valvular heart disease, hypertension, diabetes mellitus
- Patients incapable of giving consent (psychiatric patients)
- Persons unwilling to undergo the study (who refused to consent)

A complete medical history was taken, including the age at which the RA began, whether morning stiffness was present and for how long, chest symptoms, a list of the painful joints, whether there were any other systemic diseases present, and any extra-articular signs of the RA. A neurological, respiratory, gastrointestinal, and cardiovascular examination was performed. Stienbrocker's scale was used to record the patients' functional status.

All joints were thoroughly examined for signs of activity, and estimates for the number of sensitive joints and swollen joints were made. Fuch's et al.⁴ described a simplified 28 joint articular index that was used to evaluate disease activity. In addition, measurements of the ESR, Rheumatoid factor (IgG), hemoglobin, blood urea, serum creatinine, and blood sugar were made.

M-mode, two-dimensional, and Doppler echocardiography were done using a Hewlett Packard Sonos 2500 scanning device with the patient lying supine and to the patient's left. All research participants had a 12-lead ECG. All patients and controls underwent routine PA view chest X-rays.

OBSERVATIONS AND RESULTS

The data was obtained and analysed using appropriate statistical software, including but not restricted to MS Excel, SPSS ver. 20 was

used for statistical analysis.

Distribution Of Patients According To Age

Majority of the patients (32%) were in the age group of 11-20 years followed by 28% in the age group of 21-30 years, 20% in the age group of 31-40 years, 10% in the age group of 41-50 years, 4.8% in the age group of 1-10 years, 4% in the age group of 51-60 years and 0.6% in the age groups of 61-70 years and 71-80 years.

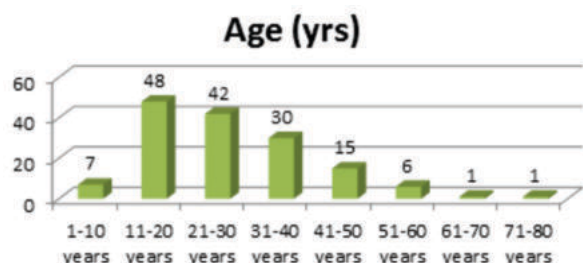


Figure 1: Distribution of patients according to Age

Distribution Of Patients According To Sex

59 (39.3%) patients were male while 91 (60.7%) patients were female in our study group. The M:F ratio was 1:1.54.

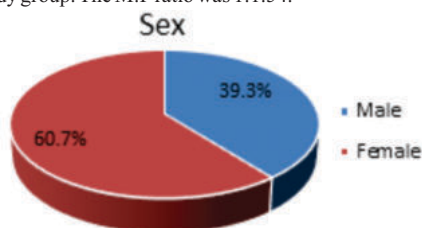


Figure 2: Distribution of patients according to Sex

Table 1: Distribution of patients according to Presenting Symptoms

Presenting Symptoms	N	%
Breathlessness	150	100%
Cough with expectoration	145	96.7%
Swelling over legs	141	94%
Palpitation	140	93.3%
Chest pain	118	78.7%
Orthopnea	105	70%
Pain in abdomen	89	56.3%
Fever	77	51.3%
Pain in joint	35	23.3%
Vomiting	17	11.3%
Neurological complaint	13	8.7%
Hemoptysis	10	6.7%
Abnormal movements	2	1.3%
Others	32	21.3%

The most common symptom was breathlessness (100%) followed by cough with expectoration (96.7%), swelling over legs (94%), palpitation (93.3%), chest pain (78.7%), orthopnea (70%), pain in abdomen (56.3%), fever (51.3%), pain in joint (23.3%), vomiting (11.3%), neurological complaint (8.7%), hemoptysis (6.7%) and abnormal movements (1.3%). 32 (21.3%) patients had others symptoms.

Table 2: Distribution of patients according to Past History

Past History	N	%
Breathlessness	145	96.7%
Arthritis	140	93.3%
Palpitation	137	91.3%
Fever	131	87.3%
Oedema over feet	115	76.7%
Previous admission	103	68.7%
Sore throat	91	60.7%
Rheumatic chorea	4	2.7%
Tonsillectomy	2	1.3%

145 (96.7%) and 140 (93.3%) patients had past history of breathlessness and arthritis respectively while 137 (91.3%) and 131

(87.3%) patients had past history of palpitation and fever respectively. 115 (76.7%) and 103 (68.7%) patients had past history of oedema over feet and previous admission respectively while 91 (60.7%), 4 (2.7%) and 2 (1.3%) patients had past history of sore throat, rheumatic chorea and tonsillectomy respectively.

Distribution Of Patients According To Associated Diseases

5 (3.3%) patients had uraemia while 2 (1.2%) and 1 (0.6%) patient had cirrhosis of liver and pericardial effusion respectively.

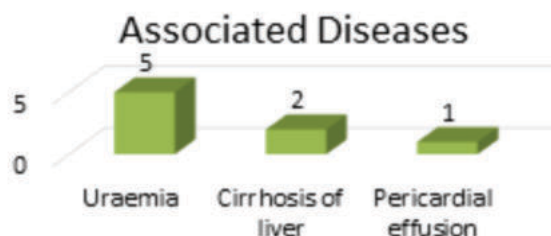


Figure 3: Distribution of patients according to Associated Diseases

Table 3: Distribution of patients according to Type of Valvular Lesion

Type of Valvular Lesion	N	%
Mitral stenosis	79	52.8%
Mitral stenosis + Mitral incompetence	34	22.8%
Mitral + Aortic valve disease	32	21.4%
Mitral incompetence	3	1.8%
Aortic incompetence	1	0.6%
Aortic incompetence + Aortic stenosis	1	0.6%
Total	150	100%

The most common valve involved in valvular lesion was mitral stenosis (52.8%) followed by mitral stenosis with mitral incompetence (22.8%), mitral + aortic valve disease (21.4%), mitral incompetence (1.8%), aortic incompetence (0.6%) and aortic incompetence + aortic stenosis (0.6%).

Table 4: Distribution of patients according to Precipitating Factors for Congestive Cardiac Failure (CCF)

Precipitating Factors		≤20 years		>20 years		Total		p Value
		N	%	N	%	N	%	
Pulmonary infection (n=30; 20%)	Bronchitis	11	47.8%	12	52.2%	23	15.3%	>0.05
	Pneumonia	1	25%	3	75%	4	2.7%	
	Pulmonary TB	0	-	3	100%	3	1.8%	
Other infections (n=15; 10%)	Enteric	1	50%	1	50%	2	1.3%	>0.05
	Malaria	4	44.4%	5	55.6%	9	6%	
	UTI	1	25%	3	75%	4	2.7%	
Fresh Rheumatic Activity (FRA)		30	85.7%	5	14.3%	35	23.3%	<0.05
Infective Endocarditis		1	7.1%	13	92.9%	14	9.3%	<0.05
Tachyarrhythmias		15	36.6%	26	63.4%	41	27.3%	<0.05
Pulmonary embolism		0	-	3	100%	3	1.8%	<0.05
Thyrotoxicosis		0	-	4	100%	4	2.7%	<0.05
Eosinophilia		0	-	2	100%	2	1.3%	<0.05
Prosthetic valve dysfunction		0	-	2	100%	2	1.3%	<0.05
Pregnancy		2	28.6%	5	71.4%	7	4.7%	<0.05
Excessive physical activity		6	15.8%	32	84.2%	38	25.3%	<0.05
Irregular/Inadequate anti failure treatment		22	28.9%	54	71.1%	76	50.7%	<0.05
No salt restriction		14	14%	86%	100	66.7%	<0.05	

100 (66.7%) patients did not take salt restricted diet while 76 (50.7%) patients were taking irregular and inadequate anti failure treatment. 41 (27.3%) patients had tachyarrhythmia and 38 (25.3%) patients developed CCF after strenuous physical activity. It was observed in younger patients (≤20 years) that Fresh Rheumatic Activity (FRA) was the single most important factor in 85.7% patients responsible for precipitating CCF in established cases of RHD followed by infection (47.8%), tachyarrhythmia (36.6%), irregular and inadequate treatment (28.9%) and pregnancy (28.6%) compared to patients with age more than 20 years. In patients >20 years, infective endocarditis (92.9%),

strenuous physical activity (84.2%), irregular treatment (72.4%), tachyarrhythmia (63.4%), infection (52.2%), other infections like enteric fever (50%), malaria (55.6%), UTI (75%), pulmonary embolism (100%), thyrotoxicosis (100%), eosinophilia (100%), prosthetic valve dysfunction (100%), pregnancy (71.4%) and no salt restriction in diet (86%) were responsible for precipitation of CCF as compared with patients ≤ 20 years of age. Fresh Rheumatic Activity (FRA) was seen in only 5 (14.3%) patients which indicates its uncommon occurrence after the age of 20 years.

Table 5: Clinical profile of patients with FRA (n=35)

Clinical profile	N	%
Fever	35	100%
Past history of ARF	35	100%
ESR>20mm fall in 1st hour	35	100%
Hb<10 gms%	35	100%
TLC>11000/cmm	33	94.3%
Arthralgia	25	71.4%
Carditis	21	60%
Palpable spleen	15	42.8%
Arrhythmia	11	31.4%
Prolonged PR interval	10	28.6%
Arthritis	8	22.8%
Chorea	2	1.3%

Out of 35 patients with Fresh Rheumatic Activity (FRA), 30 (85.7%) patients were ≤ 20 years of age. 35 (100%) patients had fever, past history of ARF and were found to be anemic with ESR>20mm fall in 1st hour. 33 (94.3%) patients had TLC>11000/cmm while 25 (71.4%) and 21 (60%) patients had arthralgia and carditis respectively. 15 (42.8%) and 11 (31.4%) patients had palpable spleen and arrhythmia respectively while 10 (28.6%), 8 (22.8%) and 2 (1.3%) patients had prolonged PR interval, arthritis and chorea respectively.

Table 6: Correlation of Recurrence of Rheumatic Heart Disease to Prophylactic Penicillin and Anti-failure Therapy (n=35)

Category	≤ 20 years		>20 years		Total	
	N	%	N	%	N	%
Patient taking regular penicillin prophylaxis	7	100%	0	-	7	20%
Patient taking irregular penicillin prophylaxis	15	88.2%	2	11.8%	17	48.6%
Patient not taking therapy	8	72.7%	3	27.3%	11	31.4%

It was observed that 7 (20%) patients below the age of ≤ 20 years with FRA were taking regular penicillin prophylaxis. Among 17 (48.6%) patients with FRA taking irregular penicillin prophylaxis, 15 (88.2%) and 2 (11.8%) patients were at the age of ≤ 20 years and >20 years respectively.

Among 11 (31.4%) patients with FRA not taking therapy, 8 (72.7%) and 3 (27.3%) patients were at the age of ≤ 20 years and >20 years respectively. The correlation of recurrence of rheumatic heart disease to prophylactic penicillin and anti-failure therapy noted lesser incidence of rheumatic activities in patients on regular penicillin prophylaxis.

Clinical profile of patients with Infective Endocarditis (n=14)

Out of 14 patients with infective endocarditis, 13 (92.9%) patients were >20 years of age. 14 (100%) patients had unexplained fever >7 days, pallor and palpable spleen. 9 (64.3%) patients each had absent pulsations and negative blood culture while 7 (50%) patients each had clubbing and hematuria.

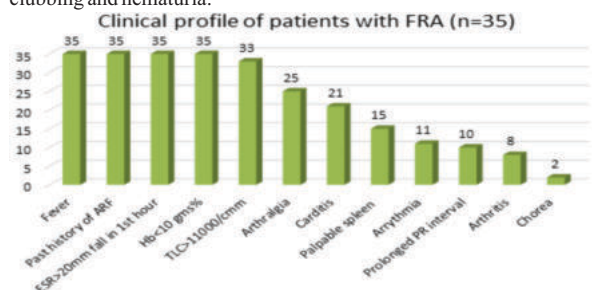


Figure 4: Clinical profile of patients with Infective Endocarditis (n=14)

DISCUSSION

In order to determine the causes of cardiac failure in individuals with confirmed instances of rheumatic heart disease, a prospective, observational study was carried out at a hospital with 150 patients. Most industrialized, high-income countries and many other regions of the world with improved human development indices and healthcare systems have seen a substantial drop in rheumatic heart disease (RHD). Rural poor and marginalized communities continue to experience the disease and have limited or no access to basic healthcare^{5,6}

In the present study, majority of the patients (32%) were in the age group of 11-20 years followed by 28% in the age group of 21-30 years. (Figure 1) A female predominance (60.7%) was observed. With the male: female ratio being 1:1.54. (Figure 2) This was in concordance to results obtained in studies by Cannon J et al⁷, Mathur KS et al⁸, and Okello E et al⁹. Roy SB et al¹⁰ studied prevalence of rheumatic fever and rheumatic heart disease reported RHD was found to be 2.2/1000 in 5 to 30-year-old subjects. In a study by Berry JN¹¹, RHD was discovered in 1.23 per 1000 males and 2.07 per 1000 females across all age categories in a study of the metropolitan population.

The most common symptom in our study was breathlessness (150%) followed by cough with expectoration (96.7%), swelling over legs (94%), and palpitation (93.3%). (Table 1). This was comparable to the study of Okello E et al⁹ who found cardiovascular symptoms, including palpitations, fatigue, chest pain, oedema and syncope in 85.1% of the patients.

For the diagnosis of RHD, a thorough physical examination, auscultation, study of the patient's history and current symptoms, and search for heart failure symptoms are essential¹². It was observed in the present study that 145 (96.7%) and 140 (93.3%) patients had past history of breathlessness and arthritis respectively while 137 (91.3%) and 131 (87.3%) patients had past history of palpitation and fever respectively. (Table 2) Similar findings were made by Okello E et al⁹ in their study, which included 350 patients, of which 41 already had a diagnosis of RHD, and 309 who were given a confirmed RHD diagnosis for the first time.

It was observed in our study that 5 (3.3%) patients had uraemia while 2 (1.2%) and 1 (0.6%) patient had cirrhosis of liver and pericardial effusion respectively. (Figure 3) In the cross-sectional investigation by Okello E et al⁹, 49% (152/309) of the newly diagnosed RHD subjects had problems. The most frequent complication was heart failure (46.9%), which was followed by pulmonary hypertension (32.7%) and atrial fibrillation (13.9%). In the present study, the most common valve involved in valvular lesion was mitral stenosis (52.8%) followed by mitral stenosis with mitral incompetence (22.8%) (Table 3). Similar observations were noted in the studies of Okello E et al⁹ and Sliwa K et al¹³ who mitral regurgitation as the most common valvular lesion.

In our study, it was observed in younger patients (≤ 20 years) that Fresh Rheumatic Activity (FRA) was the single most important factor in 85.7% patients responsible for precipitating CCF in established cases of RHD followed by infection (47.8%). While in patients >20 years, infective endocarditis (92.9%), strenuous physical activity (84.2%) and irregular treatment (72.4%), were a few of the more common factors responsible for precipitation of CCF as compared with patients ≤ 20 years of age. FRA was seen in only 5 (14.3%) patients which indicates its uncommon occurrence after the age of 20 years. This is similar to the studies of Okello E et al⁹, Agarwal BL et al¹⁴, Vaishnava S et al¹⁵ and Oran B et al¹⁶. (Table 4)

According to a cross-sectional study by Okello et al⁹, Atrial fibrillation was shown to be the most frequent complication associated with congestive heart failure (81.4% CHF vs 18.6% no CHF), followed by acute rheumatic fever recurrence (71.4% CHF vs 28.6% no CHF), and infective endocarditis (78.6% CHF vs 21.4% no CHF). Agarwal BL et al¹⁴ and Vaishnava S et al¹⁵ observed virulence of RF is related to its capacity to cause cardiac damage.

It was observed in our study that out of 35 patients with Fresh Rheumatic Activity (FRA), all had fever, had a past history of ARF, were found to be anemic with ESR>20mm fall in 1st hour. 94.3% and 71.4% had TLC>11000/cmm and arthralgia respectively. (Table 5). In the present study, 7 (20%) patients below the age of ≤ 20 years with FRA were taking regular penicillin prophylaxis. Among the irregularly

consuming penicillin prophylaxis patients, 88.2% and 11.8% were at the age of ≤ 20 years and >20 years respectively. Among those with FRA not taking therapy, 72.7% were ≤ 20 years. (Table 6) The correlation of recurrence of rheumatic heart disease to prophylactic penicillin and anti-failure therapy noted lesser incidence of rheumatic activities in patients on regular penicillin prophylaxis.

It's crucial to be aware that oral penicillin could not work to prevent RF¹⁷ Even in households with educated members, compliance with a 10-day oral therapy is uncertain. Therefore, it is crucial to take injectable penicillin to stop RF. 400,000 units of procaine penicillin administered twice daily for ten days is the recommended penicillin dosage.¹⁸ Identification of people who have RF or RHD is necessary for secondary prevention, and once they have been diagnosed, the patient needs to receive injections of benzathine penicillin once every two to three weeks, depending on their age, size, and muscle mass. Because RF has a propensity for recurrence in people who have already had it, penicillin prophylaxis is essential. Every additional attack worsens the condition by causing more damage to the valve tissue. Secondary prevention can lessen the initial damage but cannot stop recurrences.¹⁹

In our study, out of 14 patients with infective endocarditis, 13 (92.9%) patients were >20 years of age. 14 (100%) patients had unexplained fever >7 days, pallor and palpable spleen. 9 (64.3%) patients each had absent pulsations and negative blood culture while 7 (50%) patients each had clubbing and hematuria. (Figure 4)

Improved ARF detection and quick treatment beginning may delay the development of RHD, which is why these measures are highly desirable. Although fever is non-specific, up to one-third of ARF patients cannot recall ever having a sore throat.

CONCLUSION

We conducted a study with 150 patients to assess the factors precipitating cardiac failure in patients with established cases of rheumatic heart disease (RHD). We noted that the incidence of RHD in 2nd, 3rd and 4th decade of life was 32%, 28% and 20% respectively and incidence was found to be higher in females than males with M:F ratio of 1: 1.6. In valvular lesion, commonest valve involved was mitral valve with MS in 52% cases. Heart failure was more common in patients with old age, who consumed more salt, patients with anemia, tachyarrhythmia, poor drug compliance, infection and pregnancy. In patients (≤ 20 years) Fresh Rheumatic Activity (FRA) was the single most important factor in 85.7%, followed by infection (47.8%) while in patients >20 years, infective endocarditis (92.9%), strenuous physical activity (84.2%) and irregular treatment (72.4%), were a few of the more common factors responsible for precipitation of CCF as compared with patients ≤ 20 years of age.

Conflict Of Interest

The Authors have no conflicts of interest that are directly relevant to the content of this clinic-pathological case

Financial Resources

There are no financial resources to fund this study\

Informed Consent

Informed Consent was obtained from the patient.

Author's Contribution

All the authors contributed equally to the case report.

Data And Materials Availability

All data associated with this study done at PCMC'S PGI YCM hospital are present in the paper.

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