Original article

Clinical and Echocardiographic assessment of Patient's with Rheumatic Heart Disease

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Abstract

Introduction: In developed countries rheumatic heart disease (RHD) have become uncommon health problems. On the contrary, in the developing countries like Nepal they remain the leading cause of heart disease in children and young adults augmenting morbidity and mortality. The prevalence of RHD varies considerably through the world. The global average prevalence rate of RHD was 2.2/1000 ranging between 0.1 and 12.6 according to World Health Organization (WHO).

Community based data are not available regarding the prevalence and distribution of RHD whereas recent epidemiological data are limited to school surveys and facility based reports. Because of low enrollment rates and frequent absenteeism, these studies are unlikely to reflect accurately the epidemiology of RHD in Nepal. The aims of this study were to analyze the clinical presentation pattern of the involvement of various valves and complication in established RHD. To assess the accuracy of clinical evaluation of valvular heart disease to compare it with echocardiographic evaluation.

Methods: Fifty consecutives cases of RHD, attending the outpatient department (OPD), of Tribhuvan University Teaching Hospital fulfilling the criteria, formed the material for the present study. Cases were examined in detail with record of physical findings made and cardiovascular examination done in each case. All the cases were scrutinized to detail echocardiographic study using Hitachi EUB 555, 12 lead EKG, chest x-ray and laboratory test. Design of the study was carried out in prospective, cross sectional study.

Results: The distributions of the various valvular lesions were noted singly and in combination. Females were more commonly affected 80% than males 20%. Majority of the patient studied had past history of rheumatic fever (72%). Mitral stenosis (MS) was noted in 38 (76%) clinically and 45 (90%) were diagnosed by echo. Pure MS were found in 4 cases (8%). Mitral Regurgitation (MR) was the second most common lesion clinically, in 29 (58%) and 44 (88%) by echocardiography.

AR had the highest sensitivity 100%, while MS had the lowest specificity 40.0%. MS had 74% accuracy while MR had 60% accuracy rate. In relation to atrial fibrillation (AF) with left atrial (LA) size we found 25 cases of AF with mean LA size of 54.96 ± 4.34mm. There was a significant correlation finding between mitral valve orifice (MVO) size and heart failure in 16 cases. 3 cases out of 12 who had LA thrombus with AF (25%) with RHD had stroke, P value<0.011.

Conclusion: RHD was found to be more common in women while younger populations were the most affected. Atrial fibrillation, pulmonary hypertension, heart failure, LA thrombus and stroke were the commonest complication. The detection of rheumatic valve lesion can be enhanced when clinical evaluations are supplemented by Doppler echocardiographic examination. Hence it is recommended that echocardiography be the standard and be done routinely for the diagnosis of RHD.

Key words: Rheumatic heart disease; Doppler echocardiography; Mitral valve

Introduction

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. With chronic rheumatic heart disease, patients develop valve stenosis with varying degrees of regurgitation, atrial dilation, arrhythmias, and ventricular dysfunction.[1-5] Disease are thought to result from an autoimmune response, but the exact pathogenesis remains unclear. The immune response against streptococcal antigens can lead cross-recognition of heart tissue proteins resulting in rheumatic heart disease (RHD).[6-8] HLA class II alleles have been associated with the development of RF/RHD.[9-11] Tumor necrosis factor (TNF)-alpha is also located in the same chromosomal region of HLA genes and has been investigated in RHD patients from Mexico, Turkey, and Brazil.[12-15] Associations with the TNFA-308 allele were found and probably are related to the development of valvular lesions.[12,13] Data here indicate the complexity of immune reactions leading to autoimmune lesions in RF/RHD.[15-18] In 2005, it was estimated that 15 million individuals suffered from RF and RHD worldwide, with 282,000 new cases and 233,000 deaths per year,[19] and at least 3 million with congestive heart failure (CHF) that required repeated hospitalization[20]. The mortality rate for RHD varied from 0.5 per 100, 000 population in Denmark, to 8.2 per 100 000 population in China,[20] and the estimated annual number of deaths from RHD for 2000 was 332,000 worldwide.[21] According to the World Health Organization (WHO) preprogrammed pilot study report for 16 collaborating countries for the prevention of rheumatic fever and rheumatic heart disease, the global average prevalence rate of rheumatic heart disease was 2.2 per 1000 (range between 0.1 and 12.6).[22] In the Medina district of Saudi Arabia the prevalence of rheumatic heart disease among schoolchildren aged 6-15 years was 2.4 per 1000.[23] In Nepal the prevalence is about 1.2/1000 in urban and 1.4/1000 in rural area.[24,25] Although it is known that hospital morbidity data often give biased information about the magnitude of diseases, they are the only data available in many developing countries. Based on such data, RHD accounts for 12–65% of hospital admissions related to cardiovascular disease.[26]

There are significant advantages in using echocardiography to detect valvulitis, and pathologic valve disease.[27] Foremost, is its superior sensitivity in detecting rheumatic carditis, which should prevent patients with carditis from being misclassified as noncarditic and placed on abbreviated secondary prophylaxis, in line with the more benign prognosis.[28] Even in the Irvington House reports, a number of patients in with no audible murmurs in the first attack of RF developed RHD on follow up. [29,30] Suggesting that carditis was missed by clinical examination, even in the golden era of clinical auscultation. The likelihood of misclassification is higher now, since clinical auscultatory skills of training physicians are suboptimal, at least in countries where RF is declining.[31,32] A second advantage of echocardiography is that it should allow the valve structure to be detected, as well as nonrheumatic causes of valvular dysfunction and may prevent patients from being mislabeled as cases of rheumatic carditis. Furthermore, the 2004 WHO expert consultation reports states that echocardiographycally diagnosed, clinically silent rheumatic valve involvement should be managed as rheumatic heart disease until proved otherwise.[35-33]

Objectives

To study the clinical presentation Pattern, Complication and prevelence of patient with rheumatic heart disease presented in Out Patient Department (OPD), T.U. Teaching Hospital assess the rheumatic heart disease clinically and correlate with echocardiographic findings.

Methods

This was a prospective, cross sectional study carried out in Tribhuvan University Teaching Hospital a tertiary care hospital- Out Patient Department from June 2012 to December 2012, Kathmandu Nepal.

A total of 50 patients seen in the OPD with a primary diagnosis of RHD were studied and examined in detail. A set of baseline investigation needed for the study of rheumatic heart disease were carried on the patient including echocardiography using Hitachi EUB 555 echo Doppler system.

Inclusion criteria

1. Patient attending the OPD of TUTH with history of Rheumatic Heart Disease, 2. Patient Age group from 15 to 45 years, 3. Both sexes male and female

Exclusion criteria

1. Age <14 years, 2. Patient with Acute Rheumatic Fever, 3. Patient with Infective Endocarditis (IE), 4. Associated Renal disease, 5. Left Ventricular Failure, NYHA IV, 6. Post surgical valve replaced cases, 7. Serious co morbid disease.

Investigation

1. Chest X-ray PA- View, 2. 12 lead EKG, 3. Complete Blood Count(CBC), 4. Anti-streptolysin O(ASO)/C reactive protein(CRP), 5. Throat Swab (C/S), 6. E c h o and Color Doppler study.

Aims and outcomes of the study

To study the pattern and prevalence of Rheumatic Heart Disease [RHD] in patient's attending the OPD. Assess the Rheumatic Heart Disease patient clinically and correlate with echocardiographic findings. Assess the Valve involvement and their complication.

Statistical analysis

The prevalence of RHD in the study group will be estimated with 95%CI and Odds ratio calculation for the presence of each categorical variable under study with RHD. Categorical data were compared using the Chi-square test. All the analysis were done using SPSS 11.5 software and testing standard alpha = 0.05 for the Prediction, Specificity, Sensitivity, Positive Predictive Value, Accuracy and Negative Predictive Value.
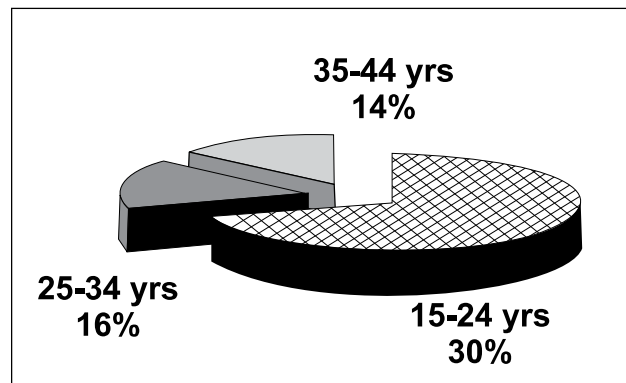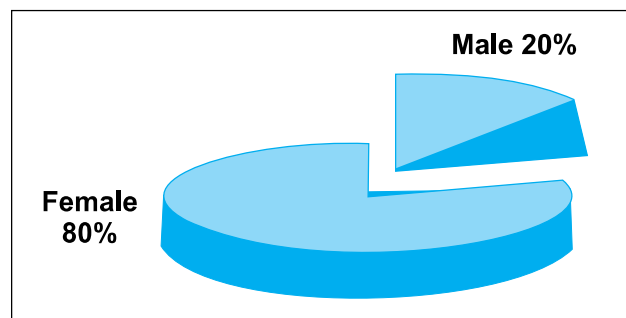
Results

Figure 1. Age distribution (n=50)

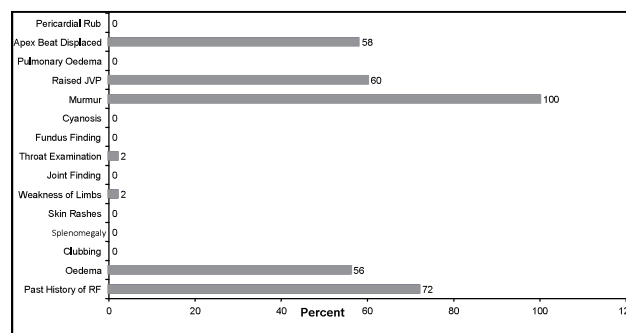

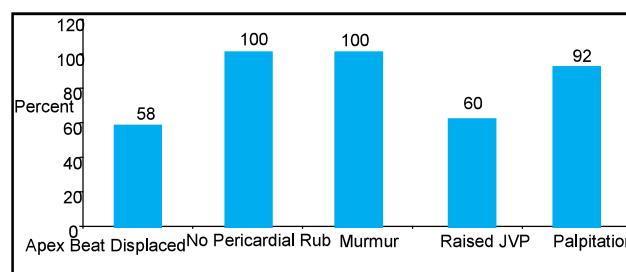**Figure 2. Sex distribution (n=50)**

Figure 3. Clinical findings (n=50)

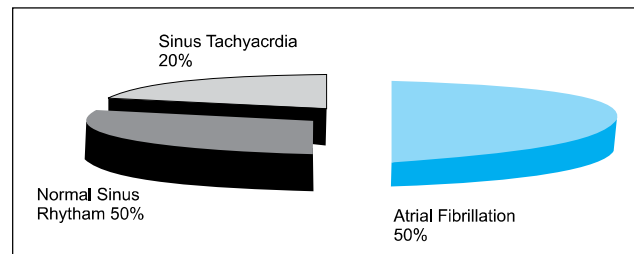**Figure 4. CVS findings (n=50)**

Figure 5. EKG Finding
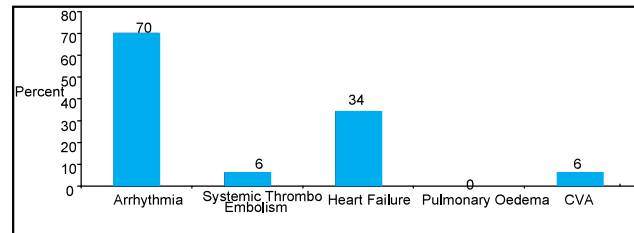
Figure 6. Complications (n=50)
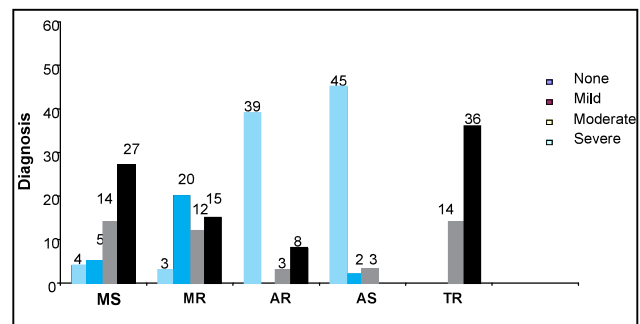
Figure 7. Doppler color study (n=50)

Table 1. Comparison of clinical with echo diagnosis

Clinical diagnosis	ECHO diagnosis				
	MS (n=45)	MR (n=44)	AR (n=11)	AS (n=5)	TR (n=50)
MS (n=38)	35	35	5	2	38
MR (n=29)	26	27	4	2	29
AR (n=12)	8	9	11	5	12
AS (n=4)	3	3	4	4	4
TR (n=23)	23	21	1		23

Table 2. Correlation AF patients with thrombus in Echo diagnosis

Thrombus	ECHO Diagnosis							
	MS+MR+TR	MS+AR+TR	MS+TR	MR+TR	AR+MR+TR	AR+AS+TR	MS+MR+AR+TR	MS+MR+AR+AS+TR
Yes	5	2	1	0	2			2
No	12	0	0	1	0			0
Total	**17**	**2**	**1**	**1**	**2**			**2**

Table 3. Correlation of LA size with thrombus in AF patients

AF	LA	Thrombus		Total
		Yes	No	
No	Moderate (46-55)mm		17	17
	Severe (>55)mm		8	8
	Total		25	25
yes	Mild (41-45)mm	0	1	1
	Moderate (46-55)mm	5	4	9
	Severe (>55)mm	7	8	15
	Total	**12**	**13**	**25**

Table 4. Correlation of stroke with thrombus

Thrombus	Stroke (CVA)		Total	p value
	Yes	No		
Yes	3(25%)	9(75%)	12(100%)	0.011
No	0	38(100%)	38(100%)	

Table 5. Predictors for various valve lesions

Predictors	MS	MR	AS	AR
Sensitivity (95% CI)	77.8% (62.5-88.3)	59.5% (43.3-74.0)	80.0% (29.9-98.9)	100% (67.9-100)
Specificity (95% CI)	40.0% (7.3-83.0)	50.0% (17.4-82.6)	100% (90.2-100)	97.4% (84.9-99.9)
Positive predictive value (95% CI)	92.1% (77.5-97.9)	86.2% (67.4-95.5)	100% (39.6-100)	91.7% (59.8-99.6)
Negative predictive value (95% CI)	16.7% (2.9-49.1)	19.0% (6.3-42.6)	97.8 % (87-99.9)	91.7% (59.8-99.6)
False positive rate	60.0%	42.9%	0%	2.6%
False negative rate	22.2%	39.5%	20.0%	0%
Accuracy rate	74.0%	60.0%	98.0%	98.0%
p value	0.582	0.706	<0.0001	<0.0001
LR positive (95% CI)	1.30 (0.62-2.70)	1.19 (0.57-2.49)		
LR negative (95% CI)	0.56 (0.17-1.85)	0.81 (0.37-1.77)		
Kappa coefficient (95% CI)	0.11 (0.31-0.53)	0.06 (0.25-0.36)	0.88 90.64-1.12)	0.94 (0.83-1.05)
Odds ratio	2.33 (0.17-23.05)	1.47 (0.24-9.02)		

Observation

A total no of 50 patients were enrolled in this prospective, cross sectional study in the OPD of Tribhuvan University Teaching Hospital. Among them 40(80%) patient were female and 10(20%) were male. Age ranged from 15 to 45 years with a mean of 22.7. Maximum number of patient studied in this group were young patient 35(70%) with RHD and these group had the most severe form of MVD and clinical presentation. Bulk of the patient were from the rural areas 34(68%), and the rest from urban Ares 16(32%).

Of the 50 patient studied 36pt (72%) gave past history of rheumatic fever; rest denied having it or did not remembered. Main presentation of the patient were shortness of breath (50, 100%), followed by palpitation (49, 98%), cough (46, 92%), swelling (47, 94%), and Paroxysmal nocturnal dyspnoe (PND) in 31pt (62%). Hemoptysis was presented in 15 cases (30%) of the pt studied.

On examination 28pt (56%) was found to have oedema, 30pt had raised Jugular vein pressure (JVP) (60%), and displaced apex beat in 29pt (58%) with murmur of varying degree, (50, 100%). 25pt (50%) were in AF, 10pt (20%) in sinus tachycardia and the rest 15(30%) were in normal sinus rhythm (NSR). Clinically 38pt (76%) were diagnosed to have MS, MR in 29pt (58%), AR in 12(24%), AS in 4(8%) and TR in 23pt (46%).

The entire 50 study group underwent detailed echo and color Doppler study. The distributions of the various valvular lesions noted singly and in combination. MS was the most common lesion recorded singly or in combination and noted in 45 cases out of 50 cases (90%) Pure MS were found in 4 cases (8%). Thus 7 out of 45 cases were missed on clinical examination. MR was the second most common lesion in 44 out of 50 cases (88%) by echo.15 cases were misdiagnosed and only 1(2.0%) case had pure MR without any other lesion. AR was found 11cases (22%) by echo. No cases were found in isolation and all were associated with Mitral valve disease. AS was seen in 5(10%) by echo. About 23 out of 50 cases (46%) had TR clinically which in echo it was noted to be 50 (100%). Clinical examination made 27 errors and no isolated TR was seen. All the relevant findings were done according to ACC/AHA practice guidelines. In 25 pt with AF echo study detected LA thrombus in 12 pt (24%) of the total group studied. 3pt (6%) was noted to have stroke.

Predictors for each lesion studied are seen in table 5.In relation to Atrial fibrillation with LA size we found 25 cases of Af with mean LA size of 54.96, SD ± 4.34, SE 0.87 and P value <0.079. There was a significant correlation finding between MVO size and heart failure in 16 cases, Mean 1.45, SD ± 0.5, SE 0.12 and P value <0.004. 3 cases out of 12 who had LA thrombus with Af (25%) with RHD was found to have stroke, P value<0.011respectively.

Discussion

Rheumatic Heart Disease is a complication of Rheumatic fever in which the heart valves are damaged. Rheumatic fever/rheumatic heart disease (RF/RHD) is the most common cardiovascular disease in children and young adults and remains a major public health problem in developing countries.[34] The symptoms of rheumatic heart disease vary and are not readily noticeable. When symptoms do appear, they may depend on the extent and location of the heart damage.

In 2005, it was estimated that 15 million individuals suffered from RF and RHD worldwide, and at least 3 million had congestive heart failure (CHF) that required repeated hospitalization.[20] A large proportion of the individuals with CHF required cardiac valve surgery within 5–10 years. The mortality rate for RHD varied from 0.5 per 100,000 populations in Denmark, to 8.2 per 100,000 populations in China [20], and the estimated annual number of deaths from RHD for 2000 was 332000 worldwide.[21] The disability-adjusted life years (DALYs) lost to RHD ranged from 27.4 DALYs per100, 000 populations in the WHO Region of the Americas, to 173.4 per100, 000 populations in the WHO South-East Asia Region. An estimated 6.6 million DALYS are lost per year worldwide (Table 2.2).

The annual incidence of RF in developed countries began to decrease in the 20th century, with a marked decrease after the 1950s; it is now below 1.0 per 100,000.[26] A few studies conducted in developing countries reported incidence rates ranging from 1.0 per 100,000 school-age children in Costa Rica,[35] to 72.2 per 100,000 in French Polynesia, 100 per 100,000 in Sudan, to 150 per 100,000 in China.[26]

Mitral valve is involved most commonly in RHD. This is in agreement with the available literature.[36-38] This study found Mitral valve involvement in 95% of the cases. MS was the commonest lesion (90%) in the study, also shown by various other authors[41-45]. Also, the incidence of juvenile MS is much more common in Nepal as noted in earlier studies[25]. But one earlier study[43] had found only11% incidence. Such great difference could not be explained but a part of it may be due to selection bias and also the fact that the earlier study was done on children younger than 12 years. MR was found in 88% of the cases. Combined Mitral and Aortic valve disease, is the second most common lesion.[44, 45] The incidence of aortic valve disease was found to be low (22%) in our study. Routray has reported combined Mitral and Aortic valve involvement as 27%,[46] which is in agreement with our study. Pure AR is rare and Aortic stenosis (AS) is about10% in the study group. Earlier studies have also shown similar results[41-45]. TR is generally functional, was found to be present in 100% of the cases with Mitral valve disease. This is comparable to earlier reports.[43, 45] Incidence of TR is more than that in the West. Echo and color Doppler are useful tools, as clinical detection of all the murmurs is difficult[3] and Doppler and color flows are

more sensitive and specific in picking up the lesions.[47-50] Doppler has a higher accuracy when compared to clinical evaluation alone[48-50]. While in detection of valve disease, it is of importance, as the prime objective is the assessment of severity, which is a guide to the management of the case[48]. One earlier study failed to reveal any incremental diagnostic echocardiography and Doppler color flow imaging in rheumatic fever without clinical evidence of carditis[51].The sensitivity, specificity and predictive values of various lesions detected clinically, were compared, it can be seen that sensitivity of AR is the highest and TR is the lowest. MS shows the lowest specificity and AS shows the highest specificity. AS had the highest positive predictive value and MS had the lowest negative predictive value. The large difference is due to the observer variability and patient reluctant to get thorough evaluation and undress since bulk of the study group were females, housebound poor access to medical care and presentations were in advance cases. Significant differences (p<0.05) between clinical and echocardiographic examination for various lesions were determined by McNemar's test [48,49]. The left atrial diameter was similar in both sexes but got larger with age and severity of valve size, which shows the worsening disease and hemodynamic changes with time[52-54]. AF was present in 25 cases in whom had more severe form of valve involvement in our study. The study also showed the preponderance of LA thrombus formation more in Mitral valve disease, more with critical MS with AF.The relation was much more correlated when the LA size was larger[53-56]. Mitral valve disease, particularly mitral stenosis is frequently associated with left atrial spontaneous echo contrast. It has been also observed that, the more severe the mitral valve disease, the greater the probability of left atrial spontaneous echo contrast[55-56]. Sensitivity and specificity of AR was very high and comparable to earlier studies. There was a statistically significant difference between echo diagnosis and clinical diagnosis.

Conclusion

RHD is more common in women with younger populations was the most affected and mitral valves are the most commonly affected. Atrial fibrillation, pulmonary hypertension, heart failure, la thrombus and stroke are the commonest complication. The identification of rheumatic valve lesion can be enhanced when clinical evaluations are supplemented by Doppler echocardiographic examination. Hence it is recommended that echocardiography be the gold standard and be done routinely for the diagnosis of RHD as clinical examination alone can miss various lesion, especially when the lesion are mild or when multiple lesion are present.

Conflict of interest: None declared

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