

## Original Articles

# CONGESTIVE HEART FAILURE IN CHILDREN: A SURVEY OF 114 PATIENTS

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### ABSTRACT

During a period of four years between June, 15, 1988 to June, 15, 1992 one hundred and fourteen patients with congestive heart failure (CHF) were admitted to the pediatric department of Taleghani General Hospital. During the above period, 192 patients with heart disease were hospitalized at this department and CHF was the cause of admission in 59.4% of them. Congenital heart disease (CHD) was the most common cause (65 cases, 57%) of heart failure in this group, followed by rheumatic heart disease (RHD) (26 cases, 23%) and cardiomyopathy (CM) (23 cases, 20%). Sixty-five patients (57%) were male and forty-nine (43%) were female (M/F = 1.3/1). The youngest patient was 2 days old while the oldest one had 13 years. The mean age of the patients was 4.5 years. Forty-nine (43%) were under one year of age and the majority (44/49, 90%) suffered from CHD. All the children with RHD were between 6 to 13 years of age. 14 patients (12%) died. CHD was the most common cause of death. The variations in the pattern of heart failure according to different age groups in this study are compatible with those in other developing countries.

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### INTRODUCTION

Congestive heart failure is defined as the pathologic condition in which the heart is unable to pump sufficient blood to meet the metabolic demands of the body. The common causes and time of onset of heart failure vary with age. During adulthood, the principal causes of heart failure in the western world are coronary artery disease and hypertension. Valvular heart disease and other cardiac disorders are relatively uncommon causes.<sup>7,8,17</sup>

In tropical African countries, periportal cardiac failure (PPCF), congestive cardiomyopathy, and rheumatic heart

disease are major problems.<sup>1</sup> In developed countries in the neonatal period and infancy, heart failure is more commonly caused by a structural defect, whereas in the older child either structural or myocardial disease may be found.<sup>2</sup> In a child or adolescent heart failure is often due to acquired disease, or is a complication of open heart surgical procedures. In the acquired category are rheumatic and endomyocardial disease, infective endocarditis, hematologic and nutritional disorders.<sup>3,5</sup>

As far as is known, very few previous works have been done regarding pattern of CHF in children in developing countries. In this descriptive study cardiac case record

analysis was performed and the pattern obtained was compared with reports from other parts of the world.

## METHODS AND MATERIALS

All patients with heart failure admitted to the department of pediatrics of Taleghani General Hospital during a four-year period between 1988 to 1992 formed the subjects of this study. Patients' medical records were studied retrospectively. A detailed history was obtained for each patient to determine the exact mode of onset of illness, its chronological development, the presenting complaints, the probable treatments received, and other pertinent clinical features. The type and severity of cardiac involvement was ascertained on the basis of physical findings, and roentgenologic and electrocardiographic data. Two-dimensional and M-mode echocardiographic examinations were performed on two-thirds of the subjects. 12 patients underwent cardiac catheterization. The reasons for submitting them to the latter were the procurement of information not apparent or available by other noninvasive means, particularly when there was the possibility of surgical treatment. The patients who were readmitted during the period of study were not included again to avoid duplication. All cases were classified according to etiology and age, and the characteristics of each were studied. Congenital heart diseases were defined according to the specific criteria available for their classifications. Cardiac failure of unknown etiology, characterized by dilated ventricles and poor systolic function with or without atrio-ventricular valvular regurgitation was classified as cardiomyopathy. Valvular lesions with a reliable past history of rheumatic fever were diagnosed as "rheumatic heart disease." Acute rheumatic fever (ARF) was defined according to the Jones' criteria.

## RESULTS

The 114 patients with CHF accounted for 50.4% of the 192 children with heart disease admitted in this hospital during the four year period. Fig. 1 presents the causes of cardiac failure in order of their frequency. Table I lists the age and sex distribution of patients.

### *Congenital heart disease (65 patients, 57%):*

The total admission of CHD was 120 patients and CHF was the clinical presentation in sixty-five (54%) of this subgroup. Thirty-nine (60%) were male and twenty-six (40%) were female (M/F = 1.5/1). The patients had mean age of 2.2 years, ranged 2 days to 12 years. Forty-four (68%) were under one year of age. Ventricular septal defect (VSD) was the most common type of CHD, diagnosed in thirty-three (51%) of cases. Fig. 2 shows the various types of CHD in this group. Respiratory infection was the most common complication observed in thirty-four (52%) of the patients. Down's syndrome was diagnosed in nine infants and one-third of them died. There were three patients with dextrocardia, two situs solitus and one situs inversus, all with complex cardiac lesions. There was a 12-year-old boy who presented with CHF six months after Rastelli cardiac operation. Eight patients (12%) died and about half of them were under one year of age.

### *Rheumatic heart disease (26 patients, 23%):*

During the period of study, 44 patients with rheumatic fever were admitted and twenty-six (59%) of them suffered from CHF. Sixteen (61.5%) were male and ten (38.5%) were female. (M/F = 1.6/1). All the children were in the age group of 6 to 13 years with the mean age of 10.2 years. Mitral valve was involved in all cases but one. Fig. 3 presents the pattern of valvular lesions in order of their frequency. Pure mitral regurgitation was present in sixteen (61.5%) cases. One case had pericarditis in addition to CHF. Two patients underwent cardiac surgery for mitral

Table I. Age and sex distribution of patients with CHF

Age group	CHD		RHD		CM		Total	% of Total
	M	F	M	F	M	F		
<1 year	28	16	-	-	2	3	49	43
1-5	7	6	-	-	3	6	22	19.3
6-10	2	2	6	6	3	4	23	20.2
11-15	2	2	10	4	2	-	20	17.5
Total	39	26	16	10	10	13	114	100

CHD = Congenital heart disease, RHD = rheumatic heart disease, CM = cardiomyopathy, M = male, F = Female, CHF = congestive heart failure.

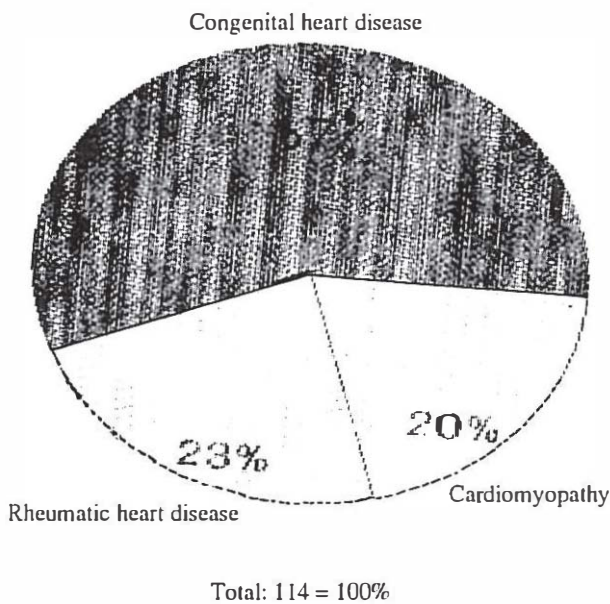


Fig. 1. Causes of cardiac failure.

valve replacement. Two patients who suffered from chronic and progressive multivalvular lesion died, so, the mortality rate was 8%.

*Cardiomyopathy (23 patients, 20%):*

Diagnosis of cardiomyopathy was confirmed by echocardiography in all subjects of this group. Ten (43.5%) were male and thirteen (56.5%) were female (M/F = 0.8/1). Patients' age were between 4 months to 12 years with a mean of 4.8 years. Congestive cardiomyopathy was the most common type which was observed in nineteen (83%) cases. Three infants (13%) had hypertrophic cardiomyopathy which in one case proved to be Pompe disease. There was a six-year-old boy with idiopathic hyper eosinophilic syndrome who presented with CHF due to severe mitral and tricuspid regurgitation. Four patients (17.4%) died.

**DISCUSSION**

Congenital cardiac defects are usually responsible for heart failure in infancy, although the frequency is difficult to assess. In the New England Regional Infant Cardiac Program, where approximately 350 to 450 high-risk infants were admitted each year, up to 80% had heart failure as a major component of their clinical presentation.<sup>6</sup> Infants under one year of age with cardiac malformations account for 80 to 90 percent of pediatric patients who develop congestive heart failure.<sup>5</sup> After infancy the frequency of heart failure strikingly diminishes. In the present study congenital heart disease (CHD) was the most common cause of CHF (57%) in the whole group and 54% of patients with CHD presented with CHF. Infants under one year of

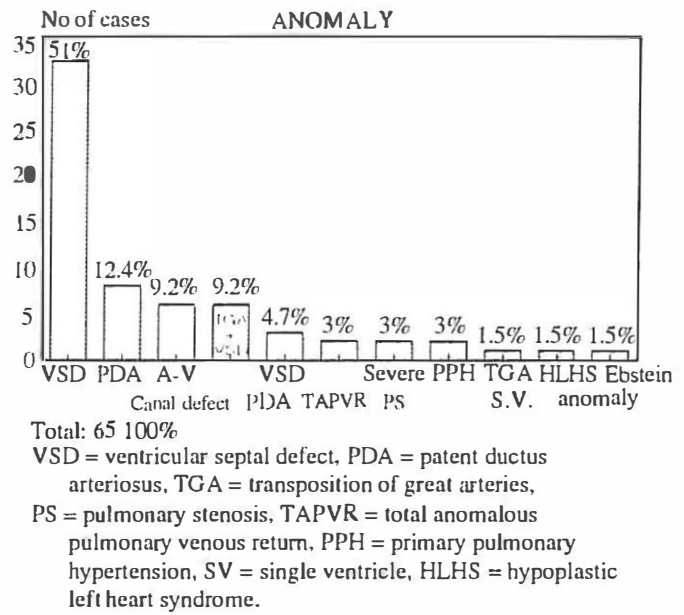
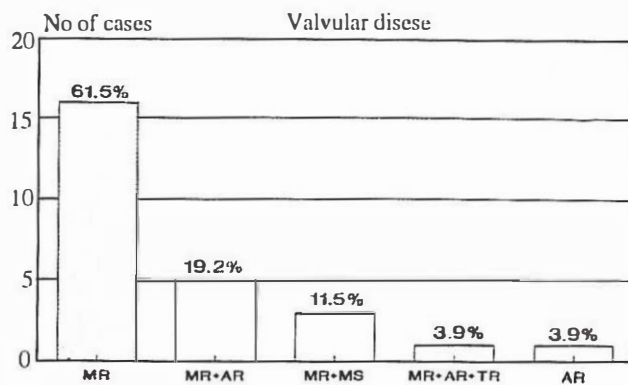


Fig. 2. Type of CHD in order of frequency.

age comprised 68% of cases in CHD group and 43% in the whole subjects. Ventricular septal defect (VSD) which is the most common CHD accounted for 51% of cardiac defects in our survey. Frequent lower respiratory tract infection is one of the most common complications of moderate to large left to right shunts and usually predisposes these infants to manifest CHF. This type of infection in this report was the cause of admission in 52% of cases with CHD.

Acute and chronic rheumatic heart disease is the most common form of acquired heart disease in children. While less common than before in the western countries, in most of the developing countries (where more than two-thirds of the world's children live) it is still the leading cause of morbidity and mortality due to heart disease in children. Additionally, it contributes to a large extent to heart disease among adults.<sup>11</sup> CHF is the least common but most serious manifestation of rheumatic carditis. It is reported in 5 to 10 percent of first attack of rheumatic carditis. It is more common, however, to encounter severe and fatal heart failure as a manifestation of a rheumatic recurrence than of a primary attack.<sup>10,18</sup> Vaishnavi et al.<sup>16</sup> from South India described cardiac involvement in 90% and gross CHF in 45% of their patients. Thahernia et al. from Shiraz, Iran, described 83% carditis with 56% CHF in their patients.<sup>13</sup> No attempt has been made in these studies to analyze the clinical profile of acute rheumatic fever in children with first attacks separately from those with recurrent episodes. Sanyal et al. from North India described carditis in 33.7% and CHF in 6% of their patients with the initial attack of acute rheumatic fever during childhood.<sup>12</sup> This study included 44 children with rheumatic fever seen



Total: 26 = 100%

MR = mitral regurgitation, AR = aortic regurgitation, MS = mitral stenosis, TR = tricuspid regurgitation.

Fig. 3. Type of RHD in order of frequency

over a period of four years. There were thirty-five cases of cardiac involvement (79.5%) with twenty-six (74%) suffering from CHF. Six (23%) developed CHF in the first attack and the other twenty (77%) in the second or next attacks. Our results support the view that the prevalence of CHF in the rheumatic recurrence is more than that in first attack.

Cardiomyopathies, or diseases of the myocardium, commonly occur in infants and children. Idiopathic dilated cardiomyopathy (IDC) is usually a disease of infancy with more than 50% of patients presenting before two years of age. The incidence is equal in both sexes, the etiology is unknown. Hypertrophic cardiomyopathy (HCM) is rare in children accounting for 20 to 30% of pediatric primary myocardial disease.<sup>9</sup> The Baltimore-Washington Infant Study (BWIS) enrolled 2659 infants with heart disease between January, 1, 1981 and March, 31, 1987. Fifty six infants (2.1%) had cardiomyopathy in the absence of a structural defect. Clinicopathologic classification showed hypertrophic cardiomyopathy in 26(47.4%) and dilated CM in 17(30.3%) cases.<sup>4</sup> Twenty-four patients (median age 2 years, range less than 1 month to 18 years) with idiopathic dilated CM were identified from Mayo Clinic records dating from 1973 to 1982. The most common presenting symptom was CHF (92%). Fifteen had died (96% one-year survival and 39% five-year survival).<sup>15</sup> In this study all patients presented with CHF, and dilated CM was diagnosed in 86% of them. Idiopathic congestive CM in children and adolescents has a poor prognosis, particularly when the patient presents with heart failure. Intractable heart failure is the most frequent cause of death, although sudden death may also occur.<sup>14</sup> The low rate of mortality in our series is due to lack of adequate long-term follow-up.

This study shows that the causes of CHF in pediatric age

group in most parts of the world especially in developing countries are similar.

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