

## Etiology of Congestive Heart Failure in Children

ASHBAH ISLAM<sup>1</sup>, AYESHA HAFEEZ<sup>2</sup>, TAHIRA ASLAM<sup>3</sup>, MUHAMMAD ANWAR<sup>4</sup>, SHAZIA SIDDIQUE<sup>5</sup>, ARSHAD RAFIQUE<sup>6</sup>

<sup>1</sup>Consultant Pediatrician, Kulsum International Hospital, Islamabad

<sup>2</sup>Consultant Pediatrician, THQ Chunian

<sup>3</sup>Senior Registrar, Department of Paediatrics, Children Hospital, Lahore

<sup>4</sup>Associate Professor, Department of Paediatrics, Rashid Lateef Medical College, Lahore

<sup>5</sup>Senior Registrar, Department of Medicine, Jinnah Hospital, Lahore

<sup>6</sup>Associate Professor, Department of Paediatric Medicine, Avicenna Medical College, Lahore

Correspondence to: Ashbah Islam, Email: [ashbah\\_islam@yahoo.com](mailto:ashbah_islam@yahoo.com), Cell: +92 333 4839689

### ABSTRACT

**Objective:** To determine the frequency of common causes of congestive heart failure among children in a tertiary care hospital.

**Study Design:** Cross-sectional study

**Place and Duration of Study:** Department of Paediatrics Medicine, Services Hospital, Lahore from 1<sup>st</sup> January 2018 to 30<sup>th</sup> June 2018.

**Methodology:** Ninety children were enrolled. Demographic information like name, age, gender, weight of child was noted. Complete blood count, echocardiography and chest X-ray were done. Children underwent assessment for presence of causes of congestive heart failure.

**Results:** Fifty six (62.22%) were between 2-30 months of age whereas 34 (37.78%) were between 31-60 months of age with mean age 29.4±12.47 months. There were 40 (44.44%) males and 50 (55.56%) females. The causes of CCF were acute myocarditis in 39 (43.33%), congenital heart disease in 31 (34.44%) and severe anemia in 20 (22.33%).

**Conclusion:** Acute myocarditis is one of the common causes of congestive heart failure in children after severe anemia and congenital heart disease.

**Keywords:** Congestive heart failure, Common causes, Acute myocarditis, Congenital heart disease, Severe anemia

### INTRODUCTION

Congestive heart failure (CHF) is a common problem faced by many children especially before 5 years of age. Its frequency is higher among boys as compared to girls and also badly impact on socio-economy of the country.<sup>1,2</sup> Different etiological factors are observed in developed and developing countries. Any sort of infection, rheumatic and congenital heart diseases and anemia are predominant in developing countries while cardiomyopathy and congenital heart disease are commonly observed in developed parts of the world.<sup>3</sup>

Ventricular septal defect is commonly noticed in infants aged about 6-8 weeks. This is the basic defect commonly encountered in children which leads to pulmonary resistance. Other left to right shunts like patent ductus arteriosus presents similarly. In children, CHF may be caused by left-sided obstructive disease (valvar or subvalvar aortic stenosis or coarctation), myocardial dysfunction (myocarditis or cardiomyopathy), hypertension, renal failure, or more rarely arrhythmias or myocardial ischemia.<sup>4</sup>

Echocardiography is indicated in any child with unexpected CHF to determine and evaluate potential cardio-vascular diseases, cardiomyopathy and cardiac function. Chest radiograph is also proved to be a potential indicator of CHF along with physical examination and medical history.<sup>4,5</sup>

Timely and accurate diagnosis of congenital heart diseases lowers the associated risk of mortality and morbidity. Acute heart failure can be defined as conditions that affect the heart and its linked blood vessels that can be happened due to rheumatic heart diseases, bacterial endocarditis, cardiomyopathy and pericarditis.<sup>6</sup> Timely diagnoses, proper management and awareness regarding diseases condition can considerably lower the magnitude of mortality risk in children.<sup>7</sup>

In a study, the prevalence of CHF was 33.4% in children.<sup>8</sup> The main of congestive cardiac failure (CCF) are acute myocarditis (45.45%), congenital heart disease (27.27%) and severe anemia (18.18%).<sup>9</sup>

Rationale of study is to assess the cases of CHF in children presenting in a tertiary care hospital because of CCF is more common in children under 5 years of age and it is treatable and can be diagnosed by echocardiography. Therefore, it is essential to be pro-active in the care of children at risk of CCF. Thus, frequent studies on CCF are desirable to monitor the trend in the etiology and clinical presentation of this very important disease. While there is much data on cardiac problem of adults, there is a

limited literature data available to evaluate the magnitude of the cardiac problems in children in Pakistan.

### MATERIALS AND METHODS

This cross-sectional study was conducted at Department of Paediatric Medicine, Services Hospital, Lahore from 1<sup>st</sup> January 2018 to 30<sup>th</sup> June 2018 and 90 cases were enrolled. All children of age 2 to 60 months, either genders, symptoms and signs suggestive of congestive cardiac failure with duration of 8 hours or less were included. Patients who expired or left against medical advice (LAMA) during study before diagnosis was established were excluded. Demographic detailed (name, age, gender, weight of child) was noted. Erythrocyte-sedimentation rate (ESR), complete blood count, echocardiography and chest X-ray was done. Children underwent assessment for presence of causes of CHF. The data was entered and analysed through SPSS-20.

### RESULTS

Fifty six (62.22%) children were between 2-30 months of age whereas 34 (37.78%) were between 31-60 months of age with mean was 29.4±12.47 months. There were 40 (44.44%) males and 50 (55.56%) females. Mean weight of the patients was calculated as 17.41±4.85 kgs (Table 1). The causes of CCF were acute myocarditis 39 (43.33%), congenital heart disease 31 (34.44%) and severe anemia was 20 (22.33%) [Table 2].

Table 1: Demographic information of the children (n=90)

Variable	No.	%
Age (months)		
2- 30	56	62.22
31 – 60	34	37.78
Gender		
Male	40	44.44
Female	50	55.56
Weight (kg)	17.41±4.85	

Table 2: Common causes of congestive heart failure in children presenting with CHF in a tertiary care hospital (n=90)

Common cause	No.	%
Acute myocarditis	39	43.33
Congenital heart disease	31	34.44
Severe anemia	20	22.23

## DISCUSSION

Congestive heart failure (CHF) refers to a clinical state of systemic and pulmonary congestion resulting from inability of the heart to pump as much blood as required for the adequate metabolism of the body. The clinical picture of CHF results from a combination of "relatively low output" and compensatory responses to increase it. Child care is mandatory for those children who are prone towards CCF. In the present study, 56 (62.22%) children between 2-30 months of age whereas 34 (37.78%) between 31-60 months of age with mean age was 29.4±12.47 months, 40 (44.44%) were male and 50 (55.56%) were females. The causes of CCF were acute myocarditis in 39 (43.33%), congenital heart disease in 31 (34.44%) and severe anemia in 20 (22.33%). Result of present study was in accordance with another study where CCF are acute myocarditis (45.45%), congenital heart disease (27.27%) and severe anemia (18.18%).<sup>9</sup>

Myocarditis is an inflammatory heart disease, which is basically inflammation of myocardium.<sup>10,11</sup> Diagnosis can be made on the basis of criteria defined by World Health Organization (WHO)<sup>12</sup> and it is a common cause of mortality in children.<sup>13</sup> Various factors can be linked with acute myocarditis including protozoa, viruses, fungi, bacteria, drugs, hypersensitivity reactions, metabolic abnormalities and auto-immune diseases.<sup>14</sup>

If disease can be combat at first phase, chances to decrease the mortality rate escalates many folds. Pharmacological interventions are used for viral agent eradication which is responsible in certain patients. However, antiviral therapies are very less affective in number of patients and many times generate immune response. Non-specific antiviral procedures and strong immune-suppression should be avoided.<sup>13</sup> Anemia appeared to be another potent cause of heart failure among children. Due to oxygen deficiency in anemic condition, heart underwent into remodeling phase b the activation of sympathetic nervous system. Recently trophic EPO is discovered for the prevention of cardiomyocyte apoptosis and it showed that EPO may be necessary in myocardium due to anemia or even in other circumstances.<sup>15</sup>

The common cause of CHF in children includes acute myocarditis, CHD and severe anemia are the leading causes in the present study. However, it is treatable and can be diagnosed by echocardiography. Henceforth, it is important to properly manage the child who is prone to CCF. There was limited local study we observed in literature which can help us to know the underlying cause of CHF in children. Knowledge of causes of congestive heart failure at this age group may help for management and to outline the best strategies for prevention of acquired cardiac disease and non-cardiac conditions leading to CCF e.g. anemia,

which are frequent in children of developing countries. This study provided the figure of burden of problem in hospitalized patient in our setup.

## CONCLUSION

The acute myocarditis is the leading cause of congestive heart failure in children followed by congenital heart disease and severe anemia.

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