CONGESTIVE CARDIAC FAILURE CASES: CLINICAL PROFILE AND OUTCOME IN A PAEDIATRIC INTENSIVE CARE UNIT

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ABSTRACT

Objective: To study the characteristics of the acute heart failure patients admitted in paediatric intensive care unit of Pak Emirates Military Hospital Rawalpindi and record their outcomes in terms of mortality and discharge.
Study Design: Cross sectional study.
Place and Duration of Study: Pak Emirates Military Hospital Rawalpindi, Paediatric Intensive Care Unit (PICU). Study was conducted, from Sep 2017 to Mar 2017.
Methodology: All consecutive paediatric intensive care unit admissions with diagnosis of acute heart failure were prospectively studied till discharge or death. Following data was collected prospectively: regarding age; gender; diagnosis at the time of admission; the need for mechanical ventilation; paediatric intensive care unit length of stay and the outcome in terms of mortality and discharge. Descriptive statistics were calculated for all variables.
Results: During the study period 59 children were treated for heart failure. Admissions from the emergency department were 64.4%. The median age was 6 months. The leading cause of heart failure came out to be acute viral myocarditis (45.8%) followed by congenital heart diseases (39%). The average length of stay was 4.56 ± 1.62 (range 1 to 10 days). There were 13.6% of the patients who required mechanical ventilation. Out of the total 59 patients, 12 patients (20.3%) expired.
Conclusion: Congestive heart failure cases were found to be similar to the demographics reported earlier from Pakistan and other developing countries that included the Asian and African countries.

Keywords: Acute myocarditis, Congenital heart disease, Congestive cardiac failure, Dilated cardiomyopathy, Intensive care unit.

INTRODUCTION

Heart failure is a constellation of clinical signs and symptoms that results from sub optimal cardiac output due to structural or functional impairment of heart unable to fulfil the metabolic demands of the body[1,2]. Most of the cardiovascular diseases ultimately lead to heart failure[3]. About 7 to 10% of paediatric intensive care unit (PICU) admissions comprise of cardiac causes and most of the cardiac causes ultimately lead to the heart failure[4-6]. Congestive cardiac failure (CCF) accounts for one third of referrals to the cardiology clinic of congenital heart disease (CHD) patients but exact prevalence is not known[1,7]. In any acutely ill child the heart failure needs to be ruled out[3]. Very few studies have identified the causes of heart failure in infancy and paediatric age group in Pakistan[8-10]. While congenital heart diseases are the most common cause of heart failure in children in the western countries, acute myocarditis remains the most important cause of heart failure in developing countries like Pakistan[1]. This study was done to analyze the clinical profile of cases of congestive cardiac failure admitted in PICU of Pak Emirates Military Hospital (PEMH) Rawalpindi, the cause of heart failure and outcome in terms of discharge and mortality.

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METHODOLOGY

The study design was cross sectional study. Ethical approval for this study was sought from ethical committee PEMH Rawalpindi. The sample size was calculated using an online sample size calculator for observational study. In this study out of 531 patients, who were admitted in PICU

10th September 2017 to 10th March 2018, 59 patients were admitted with acute heart failure. These 59 patients admitted consecutively were studied prospectively till discharge or death and their characteristics such as age, gender, emergency admission, length of stay, need of mechanical ventilation were recorded. The patients who died within 6 hours of admission and whose data was missing were excluded from study. The patients who required re-admission, their data on first admission was included only Arbitrary age groups considering similar studies in literature were created; <1 year, 1-5 years and 6-12 years. The patients were followed till discharge or death and outcome was noted. Clinical features included tachypnoea that is respiratory rate greater than normal for age, tachycardia that is heart rate greater than normal for age, cardiomegaly on chest x-ray that is cardiothoracic ratio greater than 60% in children less than 5 years and greater than 50% in children greater than 5 years and tender hepatomegaly that is liver palpable more than 3 centimeters below the right costal margin in midclavicular line[1]. All the patients were managed in PICU as emergencies as per the standard protocol for congestive cardiac failure[1,2]. Descriptive statistics were calculated for all the variables. Data was analyzed using SPSS 24.

RESULTS

Among the 59 children, treated for heart failure, 34 were male and 25 were female giving a male to female ratio of 1.36:1. There were 40 (68%) cases admitted from the emergency department and 19 (32%) cases were shifted from wards due to complications. The age ranged from one day to 12 years. The median age was 6 months with maximum number of patients less than 1 year of age (61%). The leading cause of heart failure came out to be acute viral myocarditis (45.8%) followed by congenital heart diseases (39%). The average length of stay (LOS) was 4.56 ± 1.62 (range 1 to 10 days). There were 13.6% of the patients who required mechanical ventilation. Out of the total 59 patients, 12 patients (20.3%) expired. Among expired, 6 were male and 6 were female and the male to female ratio was 1:1. Maximum number (75%) of deaths were in children less than 1 year of age (n=8). The diagnosis of congenital heart defects was confirmed by echocardiography. Ionotropic support was required by 85% of the cases. Pulmonary hypertension was diagnosed in 2% of the cases (table) (figure).

Table: Characteristics of patients with heart failure.

Gender	
Male	34 (58%)
Female	25 (42%)
Admissions	
Emergency Department	40 (68%)
Wards	19 (32%)
Cause of Heart Failure	
Acute Myocarditis	27 (45.8%)
CHD	23 (39%)
DCM	7 (11.9%)
Severe Anemia	1 (1.7%)
Other	1 (1.7%)
Mean length of stay	4.56 ± 1.62 days
Mechanical Ventilation	13.6%
Vasoactive Drugs	85%
Outcome	
Discharged	47 (79.7%)
Expired	12 (20.3%)

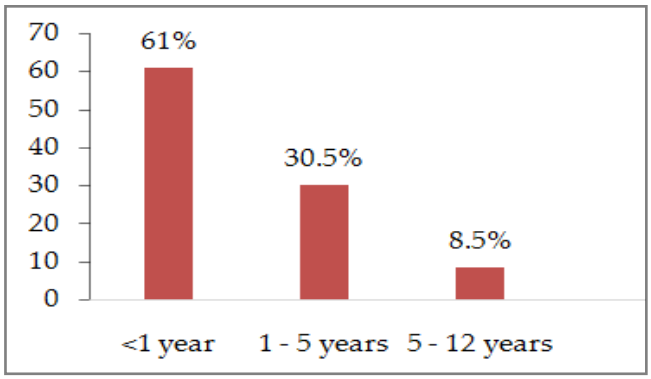

Figure: Distribution of age groups presenting with congestive cardiac failure.

DISCUSSION

Heart failure is a disease with huge magnitude and is an overwhelming problem in the general population[14]. Unfortunately, there are a few studies from Pakistan on heart failure in paediatric population[9-12]. Our study aimed to

analyze the characteristics of children admitted with heart failure in PICU, their diagnosis and outcome in terms of discharge and mortality. During the study period 12% of the total patients were admitted in PICU due to cardiovascular cause which is similar to the frequency of admissions due to heart failure reported earlier from Pakistan (10-12%)[4-6,15].

In our study 61% of the children were less than 1 year of age and earlier studies from Pakistan and other developing countries also report that heart diseases are more frequent in this age group of population[3,9,16]. The median age was 6 months with a range of 15 day old to 11 years. The male to female ratio came out to be 1.36:1 which is comparable to earlier studies from Pakistan as well as other developing countries that show male predominance[3,8,9].

In our study the leading cause of heart failure in all age groups also came out to be acute myocarditis with 45.8% of babies affected by it followed by heart failure secondary to congenital heart disease. Various studies from Pakistan conclude acute myocarditis as leading cause of heart failure in paediatric population[8-12]. Some studies from other developing countries also conclude the same[1,3]. This contrasts with the developed world where congenital heart disease and cardiomyopathies are the leading cause of heart failure[1,3,17,18]. The diagnosis of acute myocarditis was made clinically on a high index of suspicion in acute illness with features of congestive cardiac failure and was confirmed by cardiomegaly on x ray chest, ECG changes; generalized ST-T changes, prolonged QTcinterval of greater than 0.45 and left atrial hypertrophy and echocardiographic evidence of reduced left ventricular function and reduced ejection fraction of 29 ± 8%[11,12]. These findings were also supplemented by elevated troponin-T performed on babies who were suspected to have acute myocarditis[1]. The largest proportion of patients suffering from acute myocarditis were infants less than 1 year of age comprising 55.5%. Our mortality secondary to acute myocarditis was 18%. Earlier study quoted 26% mortality rate from acute myocarditis[12]. A high index of suspicion is very important in early diagnosis and treatment of acute myocarditis and is an important predictor of mortality[1]. This study did not include the heart failure secondary to cardiac surgery which was found to be a very important cause in infants in US which accounted for up to 82% of the cardiac failure cases[19]. There were 20% of the children who were suffering from ventricular dysfunction also had acute lower respiratory tract infection (ALRTI). Heart failure is an important but treatable complication of pneumonia and ALRTI[3,19].

The second most common cause of the heart failure in our study was CHD with percentage of 30.5%. Various other studies from Pakistan and other developing countries also quote the same results[1,10,17]. However in US and European countries, CHD remain the leading cause of heart failure[3,20]. Some studies from Iran also reported CHD as more common cause of heart failure[21,22]. Congenital heart disease was found to be the predominant cause of heart failure in age group 1-5 years with 55.5% of the children in the mentioned age group were affected. This age group is similar to the age group reported in earlier studies[3]. CHD also contributed to the highest mortality rate among the causes of the heart failure with 26% of the children expired which is slightly higher than reported previously[3]. Delays in diagnosis of CHD and failure to intervene at appropriate age contributes to relatively high mortality in CHD cases in developing countries[23]. In our study the commonest cause of heart failure secondary to congenital heart disease was found to be ventricular septal defect (VSD). VSD was found in 40% of the children admitted with heart failure due to congenital heart disease in PICU. Other studies from Pakistan and other countries also demonstrate similar findings with similar percentage[1,3,8]. Other causes of heart failure secondary to congenital heart disease were large atrial septal defects, complex congenital heart disease, transposition of great arteries with ventricular septal defect and critical aortic stenosis. The frequencies of these congenital defects are similar to those reported earlier[1,8].

In our study 10.2% of the patients had acute heart failure secondary to dilated cardiomyopathy. Anearlier study from Pakistan reported similar incidence[12]. Dilated cardiomyopathy has two main forms; familial dilated cardiomyopathy and idiopathic dilated cardiomyopathy and both forms can present with heart failure[24]. Out of the six patients that we encountered in our study, three were in the age groups of 1-5 years and three were in 5-12 years age group. This coincides with the mean age of presentation of dilated cardiomyopathy reported internationally[24].

During the study period almost all the patients admitted with acute heart failure required respiratory support in the form of invasive or noninvasive ventilation in the form of continuous positive airway pressure (CPAP). However, 13.2% of the patients were mechanically ventilated. An important aspect of the management was early initiation of noninvasive ventilation in children with respiratory distress as it is proven that it reduces endotracheal intubation and mechanical ventilation rates[25].

In our study we encountered one case of heart failure secondary to severe anemia. Anemia was later found out to be iron deficiency anemia that presented with acute heart failure due to intercurrent illness that lead to acute decompensation. The hemoglobin was 3.2 mg/dl and packed cell volume was 10.2%. Although we encountered only one case of acute heart failure secondary to severe anemia, this is an important cause of acute heart failure in many developing countries[3]. The mean packed cell volume reported in these studies is 5-17%. Other causes of anemia that can lead to heart failure is thalassemia major and severe malaria both of which are common problems in Pakistan. But unfortunately, no study from Pakistan was found to report the frequency of acute heart failure in these conditions. The heart failure was treated with serial transfusions and heart failure medications and basic supportive care. The patient came out of failure on third day of admission.

In our study we came across couple of unusual case as well. One of the patient was an 8-year-old girl that presented with the features of heart failure. Echocardiography revealed mitral stenosis as well as aortic stenosis. She was later diagnosed as SLE. Another case was heart failure secondary to staphylococcal pericarditis having tamponade effect. Pericardiocentesis was performed thrice under anti staphylococcal antibiotics cover and recovery was uneventful. No case of heart failure secondary to rheumatic fever was encountered during the study period.

Overall mortality remained at 20.3% which is less than previously reported from Pakistan but more as compared to other developing countries[3,11]. This mortality rate translates to 1 in 5 patients admitted to PICU. Mortality in less than 1-year age group was 22.2% similar to the mortality of 1-5-year age group. All the children who expired were less than 5 years of age including infants.

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CONCLUSION

The demographics of congestive heart failure cases in our study were found to be similar to the demographics reported earlier from Pakistan and other developing countries that include the Asian and African countries.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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