

Heart Failure in Children: Co-morbidities and Hospital Outcome

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Abstract

Heart failure in children is a serious condition, causes substantial morbidity and mortality. Sufficient data regarding various aspects of heart failure in children is not available in our country. This cross sectional study was conducted on 101 patients admitted with the diagnosis of heart failure at ICMH, and NICVD from July 2014 to March 2015 with the aim to identify the co-morbidities and hospital outcome of heart failure in infants and children.

In this study most of the patients (53.46%) were infants. Congenital structural heart lesions were found in 67(76.2%) cases. VSD was most common found in 42.5% cases, followed by ASD (31.6%) and PDA (24.7%). Cardiomyopathy (DCM) was diagnosed in 11 (10.9%) cases and 10 patients (9.9%) had valvular defect due to rheumatic recurrence. Anaemia was most common (78.2%) co-morbidity in all age group. Pneumonia was more common (74%) in infants. Total 14 patients (13.9%) died in hospital though getting adequate medical support. This study recommends that diagnosis and treatment of co-morbidities along with appropriate management of acute heart failure is crucial to reduce the mortality and morbidity.

Keywords: Heart failure, co-morbidities, hospital outcome.

INTRODUCTION

Paediatric heart failure is an important cause of childhood mortality and morbidity.¹ Like the other part of the world, Bangladesh is passing through an epidemiological transition.

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Burden of infectious diseases are coming down and non-communicable diseases are on the rise.² The incidence of new onset heart failure was found 0.87 per 100,000 population less than 16 years of age.³

There is high prevalence and importance of comorbidities in congestive heart failure. Anemia is prevalent in all age groups and is associated with a higher hospitalization rate.⁴ Patients with congenital heart disease are prone to malnutrition and growth failure.⁵

In Bangladesh, there is limited study about cardiac diseases in children, and most of them are regarding congenital heart diseases and did not give emphasis on heart failure. As heart failure in children is a serious health concern,⁶ proper recognition, treating the causes and co morbidities can help to reduce the mortality in paediatric age group.

MATERIALS AND METHODS

This was a cross sectional study conducted in patient department of Paediatrics, Institute of Child and Mother Health (ICMH), Matuail, Dhaka-1362 and In patient department of Paediatrics, National Institute of Cardiovascular Diseases (NICVD), Shere-E-Bangla Nagor, Dhaka over a period of one Year 3 months (April 2014 to June 2015).

A total 101 cases were studied who fulfilled the following criteria- Age less than 15 years including neonate and having clinical features¹¹ consistent with heart failure. Total 4 patients were excluded who needed cardiac surgery.

Hospital outcome was measured in 3 category as - Improvement (discharged with advice), No significant improvement (including referred to other hospital for better management, Leave against medical advice), and Death in the hospital. Duration of hospital stay was also recorded. Ancillary tests like the complete blood count, chest X-ray, electrocardiography and echocardiography were done as required for each subject. Other tests necessary for treatment, diagnosis of other comorbidities was also performed as per need of individual patient.

A pre- tested, semi- structured questionnaire was used to collect data. Data analysis was done using SPSS version 22.

A Pearson chi-square test was computed to assess the association of severity of heart failure and hospital outcome. The level of significant was chosen to be <0.05.

Operational Definitions:

Heart Failure: According to Orowrr¹¹ children who satisfied at least three of the following criteria were diagnosed to have heart failure.

- Significant Tachycardia** for age (heart rate >160/min in infancy, >140/ min at 2 years, >120/ min at 4 years and >100/ min above 6 years). In patient with fever, an allowance of 10 beat/min was made for each 1 degree centigrade increase of temperature above normal
- Significant Tachypnea** for age (respiratory rate >60 cycles/min in newborn, >40/ min in <24 months, >30 / min in 2–5 years, >28/ min in 5–10 years, and >25 min/ 1 in >10 years)
- Cardiomegaly** (displaced apex beat with a central trachea or cardiothoracic ratio in chest X-ray >60% in <5 years and >50% in >5 years)

- Tender Hepatomegaly** of at least 3 cm size below the right costal margin.

Co-morbidity: In our study, any medical condition along with heart failure existing simultaneously regardless of their causal relationship in the same patient was considered as co-morbidity.⁸

In this study, co morbidities were diagnosed by presence of both clinical features and relevant radiological features (Consolidation in CXR for pneumonia, pulmonary TB, hyperinflation and hyper translucency for bronchiolitis), and/-or laboratory and biochemical reports (decrease hemoglobin level according to age sex for anaemia, karyotyping for diagnosis of down syndrome, Bone marrow finding for ALL, hematuria and hyperkalemia for AGN).

RESULTS

In this study minimum age of patient was 1.2 months and maximum age was found 148 months. Majority of the patients were infants comprising 53.4% and 30 children (29.7%) were from 13 months to 60 months age group. Only 16.8% were from above 60 months age group. Other socio-demographic characteristics are shown in Table – I.

Table – I: Socio-demographic characteristics of studied children (N=101)

Variables		*Institute - 1 (n=46)	*Institute - 2 (n=55)	Total n=101(100)
*Age in month (M ±SD)	Up to 12 months	32 (69.5)	22 (40.0)	54 (53.4)
	> 12 to 60 months	10 (21.7)	20 (36.3)	30 (29.7)
	> 60 to 180 months	4 (8.6)	13 (23.6)	17 (16.8)
	Total	16.1 (±23.9)	45.5 (±55.8)	32.1(±46.5)
Sex	Male	21 (45.6)	22 (40.0)	43 (42.6)
	Female	25 (54.6)	33 (60.0)	58 (57.4)
Average Monthly family Income **	<8000	8 (17.3)	11 (20.0)	19 (18.8)
	8000-18000	32 (69.5)	37 (67.2)	69 (68.3)
	>18001 – 30000	5 (10.8)	6 (10.9)	11 (10.9)
	30001 – 54000	1 (2.2)	1 (1.8)	2 (1.98)
Residence	Urban	8 (17.3)	9 (16.4)	17 (16.8)
	Rural	33 (71.7)	40 (72.8)	73 (72.3)
	Slum	5 (10.8)	6 (10.9)	11 (10.9)
Total	46 (45.5)	55 (54.5)	101 (100)	

*Values expressed as n(%) in parentheses or M±SD, as appropriate; M, mean; SD, standard deviation,

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According to necessities echocardiogram was done in 88 patients. In other cases the clinical diagnosis was other than heart disease like – Acute leukemia (ALL), Hereditary haemolytic anaemia (HHA), Acute glomerulo- nephritis (AGN) etc.

Congenital structural defect was found in 67(76.2%) cases. VSD was most common – 43 (42.5%) followed by ASD 32(31.6%) and next common was PDA that is 25(24.7%). Cushion defect was found in 8 children whereas patent foramen ovale and single ventricle was present in 3 (2.9%) children separately. But 37 (36.6%) patient had multiple defects (Table-II).

Other than cardiac problems, many children had non-cardiac co morbidities along with heart failure, shown in Table – III. Anaemia was most common (78.2%) co-morbidity in all age group. Pneumonia was more common in infants (74%) than the other age group.

Twelve (12) patient having Down Syndrome and 1 child with Edward syndrome admitted with heart failure. Two infants had pulmonary TB, and 2 adolescent had acute glomerulo-nephritis. Failure to thrive was very common.

Table-II : Distribution of Cardiac Problems of Studied Children (N = 101)

Findings	Age Category			Total n=101 (100)
	Up to 12 m(n=54)	>12 upto 60m(n=30)	>60 m(n=17)	
Congenital Structural defect	42 (77.7)	23 (73.3)	2 (11.7)	67 (66.2)
a) VSD	26 (48.1)	15 (50.0)	2 (11.7)	43 (42.5)
b) ASD	19 (35.1)	13 (43.3)	0	32 (31.6)
c) PDA	20 (37.0)	5 (16.6)	0	25 (24.7)
d) Cushion defect	4 (7.4)	4 (13.3)	0	8 (7.9)
e) Patent foramen Ovale	2 (3.7)	1 (3.3)	0	3 (2.9)
f) Single ventricle	0	3 (9.9)	0	3 (2.9)
g) Co-aorta	1 (1.8)	1 (3.3)	0	2 (1.9)
h) Multiple defect	22 (40.7)	15 (50.0)	0	37 (36.6)
i) Dextrocardia	1 (1.8)	0	0	1 (0.9)
Acquired heart disease	5 (4.9)	6 (5.9)	15 (14.8)	26 (25.7)
a) Valvular defect due to rheumatic recurrence	0	0	10(58.8)	10 (9.9)
b) DCM	3 (5.5)	5 (16.6)	3 (17.6)	11(10.9)
c) Endocarditis (vegetation in chamber)	0	0	2 (11.7)	2(1.9)
d) Myocarditis	0	1 (3.3)	1 (5.8)	2(1.9)
e) Arrythmia	3 (5.5)	0	0	3 (2.9)
Other findings				
a) Pericardial effusion	0	0	3 (17.6)	3(2.9)
b) Shunt	38 (70.3)	19 (63.3)	2 (11.7)	59(58.4)
c) Pulmonary hypertension	26 (48.1)	19 (63.3)	6 (35.2)	51 (50.5)

Table – III : Distribution of Children with Non-Cardiac Co-morbidities (N=101)

Co-morbidities	Age Category			Total n=101(100)
	Up to 12 m (n=54)	>12 up to 60 m (n=30)	>60 m(n=17)	
Pneumonia	40 (74.0)	17 (56.6)	1 (5.8)	58 (57.4)
Anaemia	43 (79.6)	22 (73.3)	14 (82.3)	79 (78.2)
Failure to thrive	26 (48.1)	19 (63.3)		45 (44.5)
Down Syndrome	9 (16.6)	3 (10.0)	0	12 (11.8)
AGN	0	0	2 (11.7)	2 (1.98)
TB	2 (3.7)	0	0	2 (1.98)
a) Hereditary hemolytic anaemia	1 (1.8)	0	0	1 (0.99)
b) ALL	1 (1.8)	0	0	1 (0.99)
c) Bronchiolitis	5 (9.2)	0	0	5 (4.90)

Table -IV: Distribution of Studied Children on the Basis of Cause of Death in the Hospital (N=14)

Comorbidities	Up to 12 m (n=9)	>12 up to 60 m (n=2)	>60 m(n=3)	Total n=14 (100)
Congenital heart disease	6 (66.6)	2 (100)	0	8 (57.1)
Pneumonia	6 (66.6)	2 (100)	0	8 (57.1)
Myocarditis	0	0	1 (33.3)	1 (7.1)
Pulmonary TB	2 (22.2)	0	0	2 (14.3)
AGN	0	0	2 (66.6)	2 (14.3)

Among the total death case, 9 (64.28%) were infant. Congenital cardiac lesions were present in six patients (42.8%), among them 4 patients had multiple defects (Table – IV). Respiratory tract infection including pneumonia (8 cases) and PTB (2 cases) were present in 71.4% children who died. Failure to thrive was very common finding (50%) among the patient who died.

DISCUSSION

In this study, most of the study populations (53.5%) were infants. A similar study conducted in some tertiary paediatric centers at Belgium, Germany and Nigeria also found heart failure occurring during infancy in 58.1%,⁹ 70.6%,¹⁰ and 58.7%,¹¹ cases respectively. Mean age of children in this study was 32.12 months with a SD of 46.5 months which is close to the finding in another study where they got mean age 24±36.1 months.¹¹

This study supports the observation that congenital heart disease is the most common causative factor of HF during infancy and that is 66.2% as a whole and in infants it is 77.7% that is very similar (82.27%) to the finding of Webster et al¹² whereas in the study by Martial M massin⁹ found 51.6% cases of heart failure with congenital heart disease.

Among the various structural cardiac defects VSD was most common (44.9%) followed by ASD (35.9%) and PDA (25.6%). This finding is similar to a multicenter study in our country on congenital heart disease by Hussain et al.¹³ In another study in our country,¹⁴ it was found that among the congenital heart diseases VSD and PDA were most common cause of heart failure needing hospitalization.

In this study it was found that 26 (25.7%) cases had acquired heart disease like - Rheumatic valvular heart disease (9.9%), cardiomyopathy (10.9%), endocarditis (1.9%) and myocarditis (1.9%), which is similar to a study by Martial M massin⁹, where they found 18.5% with acquired heart disease. But rhythm disturbance was much higher (10.4%) in comparison to our (2.9%) finding.

Anaemia was most common (78.2%) in this study which is much higher than the findings by A.F Adekanbi et al¹¹ where they found 46% with severe anaemia followed by lower respiratory tract infection (40.4%) whereas in this study we found pneumonia much higher percentages (57.4%).

In this study total 14 patients died giving a mortality rate 13.86% which is very similar to the outcome of a study conducted at Belgium by M. Martial where they got 14% children having heart failure died.⁹ Among the total death case, 9 (64.28%) were infant. That finding is very similar to the finding of an epidemiological study on congestive heart failure in children in Germany.¹⁰

CONCLUSIONS

Heart failure in infants and children is a very serious disease with a high mortality in our setting. Infants were the majority who suffered largely due to congenital structural heart lesion. Diagnosis and treatment of co-morbidities along with appropriate management of acute heart failure is crucial to reduce the mortality and morbidity.

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