

Aetiology of Congestive Heart Failure Among Paediatric Emergency Unit Admissions in a Tertiary Health Facility in Nigeria

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Abstract

Congestive heart failure is a cardiac emergency that is seen commonly among children with varying acute illnesses in the emergency room. Identifying the common illnesses that can present with congestive heart failure in a given environment would be a first step towards improved outcome. This study aim to determine the aetiologies and outcome of congestive heart failure among children admitted into the Emergency Paediatric Unit of Benue State University Teaching Hospital using a prospective study design. Children aged 1 month to 15 years old admitted into the emergency unit over a one year period with features of heart failure were recruited after identifying the causes of the heart failure with appropriate laboratory and imaging investigations. The data were analysed with Excel spreadsheet. Pneumonia was the most common cause of heart failure occurring in 9 (31.0%) children followed by anaemia, rheumatic fever/rheumatic heart disease and congenital heart disease in 7 (24.1%), 6 (20.7%), and 4 (13.8%) children respectively. Pneumonia was the major cause of congestive heart failure among the children, especially the infants and rheumatic fever/rheumatic heart disease remains an important contributor to morbidity in this study.

Keywords

Aetiology, Congestive, Children, Emergency, Heart Failure, Nigeria

1. Introduction

Congestive heart failure (CHF) is a clinical syndrome in which the heart is unable to pump enough blood to the body to meet its needs [1]. It is a common clinical presentation responsible for varying morbidity and mortality among children in the Emergency room, and it is of serious public health concern for many reasons [2, 3]. Heart failure has been reported to account for 10-33% of cardiac admissions from two prospective European studies carried out over a 10 year period each [3]. In Nigeria, varying prevalences have been

reported, ranging from 2.73% to 16.7% [4-7].

The causes of congestive heart failure in children differ significantly from those in adults [3], [8]. It varies between developed and developing countries and among the various age-group that constitute childhood. In developed countries, the leading causes of heart failure in children are primary Cardiomyopathies and congenital heart diseases (CHD) [9] whereas among the developing countries infectious diseases constitute the leading underlying causes [4-7, 10]. These infectious diseases like acute lower respiratory tract infection (ALRTI), severe anaemia and sepsis broadly belong to the non-cardiac causes of heart failure [3].

Congestive heart failure is a cardiac emergency [11] and identifying the cause in children in an environment with very few cardiac centres is an important first step in determining the outcome for such patient. Those requiring surgical intervention could readily be referred to available equipped centres after the initial resuscitation while managing appropriately those in whom the underlying cause are amenable to medical intervention, thus reducing morbidity and mortality.

To the best of the authors' knowledge, no documented work has been done in Makurdi hence this study was designed to determine the causes and outcome of congestive heart failure among children admitted into the Emergency Paediatric unit (EPU) of the Benue State University Teaching Hospital (BSUTH), Makurdi, Nigeria.

2. Methodology

This was a prospective study involving children between the ages of 1 month to 15 years who presented with heart failure in the EPU of the Benue State University Teaching Hospital (BSUTH) Makurdi, Nigeria. Consecutive recruitment of patients was carried out over a one year period between 1st July 2016 and 30th June 2017.

Heart failure was defined by the presence of three out of the four cardinal features of heart failure. The first stated criterion was inclusive, and the criteria are as follows:

Tender hepatomegaly of at least 3 cm below the costal margin [12].

Tachycardia at rest with the pulse rate above upper limit of normal for age. That is, a rate of above 160 beats/min in infancy, >140 beats/min in children >1-2 years, >120 beats/min in those >2-4 years and >100 beats/min in those above 4 years of age. In the presence of fever, an increase of 10 beats/min with every 1° rise in temperature above normal was allowed [12]

Tachypnoea at rest with respiratory rate of above 50 cycles/min in infancy and above 40 cycles/min in older children [12].

Cardiomegaly, defined as displaced apex beat laterally beyond the mid-clavicular line or 4th intercostal space in children below 5 years and lateral displacement beyond the mid-clavicular line or 5th intercostal space in those 5 years and above [12].

Detailed history and physical examination of the patients were carried out and the following information obtained; name, age, sex, and cause of heart failure after appropriate investigations. Laboratory tests done included packed cell

volume, electrolytes, urea & creatinine, malaria parasite and urinalysis. Chest radiograph was done for patients with suspected pneumonia and structural heart defects. The investigation for the structural heart defects was completed with electrocardiography and echocardiography while patients with severe anaemia had additional investigation of haemoglobin electrophoresis.

All the patients were managed appropriately according to the hospital protocols and guidelines.

Written informed consent was obtained from the care-givers and assent from patients as appropriate before recruitment into the study. Ethical clearance was obtained from the BSUTH ethical committee.

Data analysis was done using Excel spreadsheet and result expressed in percentages and mean.

3. Results

A total of 424 children were admitted into the Emergency Paediatric Unit within the period of the study with twenty-nine (6.8%) diagnosed to have congestive heart failure. There were 10 (34.5%) males and 19 (65.5%) females with a M:F of 1:1.9. The age ranges from 1 month to 15 years with a mean of 53.47±60.76 (in months). Table 1 depicts the age and sex distribution of the patients.

Table 1. Age and Sex distribution.

Age group	Male	Female	Total (%)
1-12 months	6	8	14 (48.3)
>1-5 years	1	3	4 (13.8)
>5-10 years	1	6	7 (24.1)
>10-15 years	2	2	4 (13.8)
Total	10	19	29 (100)

Table 2 shows the causes of heart failure among the study subjects. Pneumonia was the most common cause of heart failure accounting for 31.03% of cases. Anaemia, rheumatic fever/rheumatic heart disease, and congenital heart disease accounted for 24.14%, 20.69% and 13.79% of the underlying causes respectively. All the cases of congestive heart failure due to pneumonia were in the infants with an almost equal sex distribution. Malaria was found to be the cause of anaemia in 85.71% of the 7 children with congestive heart failure secondary to anaemia with haematocrit ranges of 6%-18%. Rheumatic fever/rheumatic heart disease as an underlying cause of congestive heart failure was equally distributed between the age group of >5-10 years and >10-15 years with the females bearing almost all the burden.

Table 2. Causes of heart failure by Age group.

Causes	Age groups				Total (%)
	1-12 months	>1-5 years	>5-10 years	>10-15 years	
Pneumonia	9	0	0	0	9 (31.03)
Anaemia	0	4	3	0	7 (24.14)
Rheumatic fever/RHD*	0	0	3	3	6 (20.69)
Congenital heart disease	4	0	0	0	4 (13.79)
Sepsis	1	0	0	0	1 (3.45)

Causes	Age groups				Total (%)
	1-12 months	>1-5 years	>5-10 years	>10-15 years	
Chronic kidney disease	0	0	0	1	1 (3.45)
Pulmonary tuberculosis	0	0	1	0	1 (3.45)
Total	14	4	7	4	29 (100)

*RHD (Rheumatic heart disease)

Of the four patients who had congenital heart disease as the cause of their heart failure, the defects were all acyanotic heart defects (3 Ventricular septal defect [VSD] and 1 Patent ductus arteriosus [PDA]); and it was among the infants.

The outcome in these patients showed that majority (75.9%) were discharged home having improved on admission however, a significant number (17.2%) signed against medical advise (DAMA: Discharge against medical advise). Two (6.9%) of the patients were referred to other centres. No mortality was recorded in the course of admission.

4. Discussion

Congestive heart failure is a common cardiac emergency among children in the emergency room with varying causes among the different age groups. In developing country like Nigeria, the more commonly encountered causes are those of non-cardiac origins which when appropriately identified and managed can impact significantly on morbidity and mortality in these patients.

The cases of congestive heart failure seen in this study accounted for 6.8% of the total admissions in the emergency paediatric unit. This figure is comparable with the 5.8%, 7.02% and 9.0% reported from Western Nigeria [5, 6, 14], but lower than the 16.7% reported from Bayelsa [7]. It is difficult to easily advance the likely reason(s) for the lower prevalence in this study compared with the reported prevalence from Bayelsa as both studies were conducted among in-patients at the emergency ward with comparable age range and over same duration. The only plausible explanation could be the difference in location.

The common causes of heart failure identified in this study is similar to what have been documented by other authors [4-6, 13, 14] but slightly at variance with the findings by Duru et al. from Bayelsa where sepsis was reported as the 2nd most common cause of heart failure [7]. Pneumonia being a cause of heart failure almost exclusively among the 1-12 months old age-group can be attributed to the increased susceptibility of their heart as well as the resulting pulmonary hypertension. The compensatory mechanism of the heart to increased volume or pressure load is less effective in infants and their hearts are less compliant [14-16].

Congestive heart failure has been identified as a common presenting problem in children with congenital heart disease in infancy [2-4, 11, 13] and this is in tandem with the finding in the present study where all the cases of CHD were among the age group of 1-12 months. Just as reported by previous authors [4, 5, 7, 10, 13], ventricular septal defects was the most common CHD cause of heart failure in this study with one case of Patent ductus arteriosus. It is possible that other

critical congenital heart defects that causes heart failure in newborn period were not identified because that age group was excluded or that it might have resulted in mortality of such patients before reaching infancy.

Rheumatic fever/rheumatic heart disease was responsible for heart failure in a significant proportion of the children within the age bracket of 5-15 years and with female preponderance (M:F 1:2). This is similar to previous findings from the Northern part of Nigeria [17], [18] but at variance with the findings from Bayelsa [7] and Lagos [4] where one and no case of RHD was recorded respectively. RHD is a disease that is associated with poverty and overcrowding, factors that favour the spread of Group A beta-haemolytic Streptococcus, the organism responsible for the initial pharyngitis which later give rise to rheumatic fever as a sequel [19]. The peak incidence of rheumatic fever is between the age of 5-15 years, rare before 3 years and after 21 years of age. These are the period of highest susceptibility to Group A beta-haemolytic streptococcal pharyngitis [19]. These factors associated with the occurrence of rheumatic heart disease are still very prevalent in the study area.

The patients who were discharged home had resolution of their heart failure features before discharge except for those with structural heart defects as the cause of the failure. Those group were discharged on anti-failure drugs and followed-up in clinic. The child with PDA was referred to University of Nigeria Teaching Hospital (UNTH), Enugu for correction of the defect while the patient with CKD was referred to Jos University Teaching Hospital (JUTH), Jos for dialysis.

Among the patients whose caregivers signed against medical advice (DAMA) from the hospital, the reasons were varied but most prominent was financial constraint. Other authors [20, 21] have also documented financial constraint as the most common reason for DAMA among paediatric patients from other part of the country. Bioku et al. [22] noted that paediatric patients have the highest rate of DAMA compared with adults and financial constraint was the top reason cited.

5. Conclusion

Pneumonia, anaemia and rheumatic heart disease are the major underlying causes responsible for congestive heart failure among the study population. These are preventable infectious entities that require increased concerted efforts directed at measures that would reduce their incidence especially the rheumatic fever/rheumatic heart disease. Majority of the children recovered with prudent treatment of the infection and correction of anaemia.

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