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Paediatric heart failure in Uyo: A retrospective analysis

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Abstract: *Background/Aim*
Paediatric heart failure is a condition that continues to present challenges in management in our environment especially in its treatment and outcomes hence the aim of this study.
Materials and Methods: A retrospective analysis of the case notes of all children who were diagnosed and managed for heart failure from January 2019 – October 2021 was undertaken. Data obtained included age, sex, presenting features, primary diagnosis, treatment modalities, duration of hospital stay and outcomes.
Results: A total of 2226 children were admitted over the study period with 67 children diagnosed with heart failure giving a prevalence rate of 3% although only 47 case notes could be retrieved giving a case retrieval rate of 70%. There were 26 (55.3%) males and 21 (44.7%) females (M:F ratio1.2:1). Mean age of patients was 32.6 months (±52.23) with 28

(59.6%) of them being infants. Bronchopneumonia was the commonest cause of heart failure 31 (65.9%) either singly or in combination with acyanotic congenital heart disease followed by severe anaemia in 14 (29.8%). Average duration of hospital stay was 6.9days (±5.08) and average cost of admission was N13,266. Twenty-three patients were discharged (48.9%), while 10 (21.3%) left against medical advice, 2 absconded (4.3%) while 12 (25.3%) died.
Conclusion: Heart failure remains an important cause of morbidity and mortality in children in our environment arising from largely preventable causes. Urgent steps such as patient care giver education, immunization and screening for congenital heart disease are needed to reduce its effect on children in our environment.

Key words: Paediatric, Heart failure, Diagnoses, Outcomes

Introduction

Paediatric heart failure is a constellation of symptoms and signs arising because of an inability of the heart to meet the metabolic demands of the body despite adequate venous filling pressures. It is a syndrome complex that is associated with circulatory, neurohormonal and molecular abnormalities.[1] It is a subject that although widely studied, continues to present challenges in management especially in children with difficulties still existing in drug therapy because of the variation that exists not only in drug pharmacokinetics and pharmacodynamics as children grow from birth to adolescence but also in the causes of heart failure in children.[2]

In Nigeria, the prevalence of paediatric heart failure is known to vary widely with rates ranging between 3%-15.5% with most of the studies being hospital based.[3–8] Globally, the incidence and prevalence of heart failure is difficult to ascertain owing to the lack of a consensus

definition for heart failure however, a recent study by Shaddy et al gave incidence rates ranging between 0.87/100,000 (UK and Ireland), 7.4/100,000 (Taiwan), and 83.3/100,000 (Spain).[9]
The aetiology of heart failure also differs between lower and higher income countries with congenital heart disease and cardiomyopathy predominating in higher income countries while infective causes such as Bronchopneumonia and severe anaemia usually secondary to Malaria and undernutrition are commoner in lower income countries.[9] These findings have been corroborated by several studies in different parts of Nigeria.[3–6,8] In terms of outcomes, case fatality rate for paediatric heart failure remains significantly high with rates ranging between 5.8-21.5%.[5–7,10]
Because of the importance of this clinical syndrome, it has become imperative to characterize the epidemiology of paediatric heart failure in our environment where there exists a knowledge gap about the prevalence of this condition, common causes, clinical presentation,

treatment, and outcomes hence the aim of this study.

Materials and Methods
Study design

This was a descriptive study with a retrospective analysis of the case notes of all children who were diagnosed and managed for heart failure in the children's emergency unit of the department of Paediatrics over a twenty one month period spanning January 2019 – October 2021.

Data collection

Data collected included primary demographic characteristics such as age and sex, common presenting symptoms and signs, primary diagnoses, treatment modalities, duration and cost of hospital stay and outcomes. Data was entered into an excel spreadsheet and subsequently exported into SPSS version 22 for analysis.

Data analysis

Data was analyzed using SPSS version 22. Frequency tables were constructed for numerical data with measures of central tendency and dispersion calculated while categorical data were analyzed using Chi square and Pearson's moment correlation where appropriate with level of statistical significance set at P   0.05.

Ethical considerations

Data was stored in a pass worded laptop computer with erasing of personal patient identifiers such as their names, addresses and phone numbers. Ethical approval was obtained from the hospital's health and ethical research committee.
Definition of Terms

Heart Failure

Diagnosis of heart failure was based on the presence of any three of the following clinical criteria which must include tender hepatomegaly:
-Tachycardia for age
-Tachypnoea for age
-Tender hepatomegaly
-Displaced cardiac apex-beyond 4th left intercostal space

in infants, 5th left intercostal space in older children.

Severe Anaemia

Packed cell volume   18%.
NB: There was no information on the socioeconomic status of the patients pls as this was not one of the aims of the study.

Results

A total of 2,226 children were admitted over the study period with 67 children diagnosed with heart failure giving a prevalence rate of 3% although only 47 case notes could be retrieved giving a case retrieval rate of 70%. Children enrolled in the study were aged between 1month to 17years with a mean age of 32.6months ±52.23(SD). Over half of the study population were infants with a predominance of males (M:F ratio1.2:1)- see Table 1.

Table 1: Characteristics of study participants

Variable	Number of patients (%)
Age group (months)	
0 – 12 (infants)	28 (59.6)
13 – 60 (under five)	10 (21.3)
>60 (older children)	9 (19.1)
Gender	
Male	26 (55.3)
Female	21 (44.7)

Table 2: Common presenting symptoms and signs

Variable	Present (%)	Absent (%)
Fever	41 (87.2)	6 (12.8)
Cough	37 (78.7)	10 (21.3)
Fast breathing	34 (74.5)	13 (25.5)
Tachypnoea	45 (95.7)	2 (4.3)
Tachycardia	46 (97.9)	1 (2.1)
Tender hepatomegaly	43 (91.5)	4 (8.5)

Bronchopneumonia was the commonest cause of heart failure 31 (65.9%) either singly or in combination with acyanotic congenital heart disease and Trisomy 21 followed by severe anaemia in 14 (29.8%). Bronchopneumonia was also the most common cause of heart failure in infants followed by those with background congenital heart disease - see Table 3.

Table 3: Causes of heart failure by age group

Age group (months)	Bronchopneumonia (%)	Bronchopneumonia + *ACHD (%)	Severe Anaemia (%)	Sepsis (%)	Total	Chi square (x^2)
Infants (0-12)	14 (50)	11 (39.2)	2 (7.1)	1 (3.6)	28	0.001
Under 5 (13-60)	4 (40)	0	6 (60)	0	10	(p-value sig)
Older children (> 60)	0 (0)	2 (22.2)	6 (66.7)	1(11.1)	9	
Total	18 (38.3)	13 (27.7)	14 (29.8)	2 (4.3)	47	

*ACHD: Acyanotic congenital heart disease

Only 7 patients (14.9%) had chest x-rays done as recorded in the patients' folders and their findings indicated Bronchopneumonia while only 4 patients (8.5%) had an echocardiogram done in the index admission.

Table 4: Treatment modalities of study participants

Treatment Modalities	Number of Patients (%)
Captopril	23 (48.9)
Enalapril	2 (4.3)
Digoxin	16 (34)
Diuretics	41 (87.2)
Antibiotics	44 (93.6)
Blood transfusion	13 (27.7)

Table 5: Duration of hospital stay versus diagnosis

Duration of hospital stay	Severe anaemia (%)	Bronchopneumonia (%)	Bronchopneumonia/ *ACHD (%)	Sepsis (%)	Total (%)	Chi square (x^2)
0-24 hours	6 (46.2)	3 (16.7)	0 (0.0)	0 (0.0)	9 (20.0)	17.85(p-value 0.037 significant)
25-72 hours	2 (15.4)	1 (5.6)	2 (15.4)	1 (100.0)	6 (13.3)	
73-168 hours	1 (7.7)	2 (11.1)	3 (23.1)	0 (0.0)	6 (13.3)	
>168 hours	4 (30.8)	12 (66.7)	8 (61.5)	0 (0.0)	24(53.3)	
Total	13 (100)	18 (100.0)	13(100)	1 (100)	45(100)	

*ACHD: Acyanotic congenital heart disease
  Data was missing for two patients hence 45 were analysed.

The average cost of admission was N13,266 with a minimum cost of N1200 and a maximum of N37,000 only.

Table 6: Outcomes

Outcome	Number of patients (%)
Discharged	23 (48.9)
Death	12 (25.5)
Left against medical advice (LAMA)	10 (21.3)
Absconded	2 (4.3)

Table 7: Analysis of outcome versus diagnosis

Outcome	Severe Anaemia (%)	Broncho-pneumonia (%)	Bronchopneumonia/ *ACHD (%)	Sepsis	Total	Chi square (x^2)
Absconded	2 (14.3)	0 (0.0)	0 (0.0)	0 (0.0)	2	22.71(p-value 0.007) significant
Death	7 (58.3)	2 (16.7)	2 (16.7)	1 (8.3)	12	
Discharged	4 (17.4)	14 (60.9)	5 (21.7)	0 (0.0)	23	
LAMA	1 (10.0)	2 (20.0)	6 (60.0)	1(10.0)	10	
Total	14 (29.8)	18 (38.3)	13 (27.7)	2 (4.3)	47	

*ACHD: Acyanotic congenital heart disease

Average duration of hospital stay was 6.9days (±5.08) with a minimum stay of 3 hours and a maximum of 20 days. Duration of hospital stay was significantly associated with diagnosis with 46.2% of those admitted for severe anaemia either dying(5 patients) or leaving against medical advice (1 patient) within the first 24hours of admission while those with Bronchopneumonia (singly or with underlying congenital heart disease) stayed for longer periods (>1 week-168 hours)-see table 5.

Patients with severe anaemia were more likely to die (58.3%) while those with Bronchopneumonia with background congenital heart disease were more likely to discharge themselves against medical advice (60.0%)-see table 7.

Discussion

Heart failure in the paediatric age group continues to present a conundrum in management especially in low- and middle-income countries where the spectrum of available treatment modalities are limited.
The prevalence rate of 3% obtained in this study represents the low end of the spectrum of values obtained from different studies in different parts of the country.[3–8]

This may be due to the retrospective nature of the study and inability to retrieve the data of some of the cases that were seen. This, however, does not deduct from the importance of this condition as other studies done in Nigeria and sub-Saharan Africa have also demonstrated similar prevalence rates of 2.73% and 2.9% respectively.[11-12]

Infants predominantly were the most likely to present in heart failure as seen in this study with slightly more males than females. This fact has been corroborated by other studies and may be adduced to the fact that infants are more likely to have acute lower respiratory tract in-

fections and congenital heart disease as the predisposing factor in their development of heart failure with a significant association demonstrated between age group and cause of heart failure.[11,13] Fever, cough and fast breathing were the commonest presenting symptoms while tachycardia, tachypnoea and tender hepatomegaly in descending order of incidence were observed in the study population. The clinical presentation of heart failure in children is known to differ from that of adults depending on the child's age and especially in infants which may be nonspecific.[13-14]

It was noted in this study that only very few patients were able to do baseline chest x-rays and echocardiograms during the index admission as an aid to diagnosis. This has also been observed in another study done in Kenya where in only 38% of the study populace was a diagnosis made based on symptoms and signs combined with echocardiography (echo) and electrocardiography (ECG).[15] Thus, most of the diagnoses of heart failure were clinical.

Bronchopneumonia was the commonest cause of heart failure in children in this study either as a primary disease or with background congenital heart disease. This is in keeping with findings in other Nigerian and African studies when compared to those in higher income countries where the predominant causes of heart failure are cardiomyopathy and congenital heart disease. [9] Severe anaemia was the second most common cause of heart failure in this study. Although data was scanty as to the probable cause of the anaemia, few were noted to be as a result of Sickle cell haemoglobinopathy.

Over half of the study participants were treated with Angiotensin converting enzyme inhibitors (ACEI), followed by an inotrope-Digoxin with most being also treated with diuretics and antibiotics. Because the causes of heart failure in children differs significantly from that in adults, extrapolation of treatment modalities from adults to children is not ideal especially with the varying pharmacokinetics and pharmacodynamics of drugs observed from birth through adolescence.[2] In this study, use of antibiotics played a major role because of the predominance of acute lower respiratory tract infections and sepsis as causes of heart failure.

Paediatric heart failure, especially in conjunction with congenital heart disease are associated with repeated hospitalizations and prolonged hospital stays leading to an increase in resource utilization.[16-17] In this study, average duration of hospital stay was one week with a significant association between duration of hospital stay and diagnosis with those with Bronchopneumonia either in isolation or with background congenital heart disease being more likely to stay for a longer duration. With the finding by some researchers that the average cost of admission constituted 44% of the current monthly minimum wage in the country coupled with their other finding that 81% of caregivers of children with congenital heart disease which is one of the causes of heart failure in this study, paid for healthcare via out-of-pocket

expenses and experienced catastrophic health expenditure as a result.[17] This may likely be a contributory factor to the high rate of discharge against medical advice noted in patients with Bronchopneumonia and background congenital heart disease that was seen in this study.[18]

Case fatality rate in this study was high with about one quarter of the children dying from heart failure and with over half of the deaths occurring in those with severe anaemia. Case fatality rate for heart failure varied across different studies from 5.8-21.5%.[5–7,10] Factors responsible for this high rate were not explored in this study, however, suffice it to say that perhaps those with severe anaemia came in for admission in dire critical condition. Also, economic considerations might have played a major role with over a quarter of the study participants being discharged against medical advice and with many of them unable to do baseline investigations as noted earlier.

Conclusion

Paediatric heart failure which constituted 3% of paediatric emergency admissions in this study remains a major cause of morbidity and mortality in our environment especially in infants. Acute lower respiratory tract infections and background congenital heart disease were major causes of this condition which are largely preventable. Urgent steps such as care giver education on the importance of breastfeeding, immunization and early presentation in hospital, and newborn screening for congenital heart disease will help to mitigate the scourge of this condition. Also, health insurance as an aid to reducing out of pocket expenditure on healthcare will help to ensure quality healthcare for these children.

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