

## Studies on Heart Failure in Sagamu

A O OLOWU \*

### Summary

**Olowu AO. Studies on Heart Failure in Sagamu.** *Nigerian Journal of Paediatrics* 1993; 20:29. A prospective study of 137 children with heart failure, has revealed a prevalence of 80.3 percent among infants and children three years old and below; the condition was rather uncommon in the neonatal period, occurring in only 3.6 percent of children in the series. The major manifestations of the disease included refusal of feeds or poor appetite in 74.5 percent, cough in 59.8 percent, difficulty in breathing in 49.6 percent and vomiting in 30.7 percent of the patients; significant tachycardia and tachypnoea and tender hepatomegaly were present in all the patients, while elevated jugular venous pressure (JVP) occurred in 10.9 percent and pitting oedema in 7.3 percent of the patients. In the series, heart failure was commonly secondary to pneumonia in 43.1 percent, severe anaemia in 40.1 percent septicaemia in 21.2 percent and less commonly, to congenital heart disease in only 5.1 percent and bronchiolitis in 5.1 percent of the patients. Mortality rate was 22.6 percent and anaemia, accounting for 38.7 percent of the deaths, was the leading contributory and underlying cause. In the light of the present findings, it is suggested that in every acutely ill infant or child, aged three years and below, with pneumonia, severe anaemia, septicaemia, congenital heart disease or bronchiolitis, evidence for heart failure should be sought for diligently and if present, prompt and appropriate treatment be undertaken.

### Introduction

HEART failure is a clinical term describing a set of symptoms and signs which reflects the inability of the heart to discharge its contents adequately and maintain a cardiac output sufficient for the needs of the tissues in spite of supporting mechanisms and adequate venous return.<sup>1,2</sup> Consequently, in heart failure, there is a reduction in total cardiac output at rest and also

a failure to increase the cardiac output proportionate with activity. As a serious medical emergency, heart failure in every child that is acutely ill, should be treated promptly and adequately.<sup>3</sup> The younger the infant is, the greater the chances of there being an underlying congenital heart disease, while acquired heart disorders predominantly underlie the failure in the older child.<sup>4</sup> Diagnosis of heart failure in infancy and childhood rests mainly on the presence of the cardinal features of tachypnoea, tachycardia, cardiomegaly and tender hepatomegaly.<sup>5</sup> This diagnosis should not be made in the absence of a tender hepatomegaly. The present prospective study concerns children with heart failure who were treated at the Ogun State University

---

Obafemi Awolowo College of Health Sciences, Sagamu

Department of Paediatrics

\* Senior Lecturer

---

Teaching Hospital (OSUTH), over a period of three years and five months. It was hoped that the information obtained from the study would, if necessary, help us to review the adequacy, or otherwise, of our management of children with this problem.

### Patients and Methods

All children admitted into the children's emergency unit of OSUTH with a diagnosis of heart failure were studied over a period of 41 months (June, 1988 and December, 1991). Patients were included in the study, if three (one of which must be criterion four below), or all of the following criteria were present: 1. significant tachycardia, defined as a resting heart rate in the absence of fever, greater than the upper limit of normal for age (160 beats/min in infancy, 140 beats/min at two years, 120 beats/min at four years and 100 beats/min at six years and above); 2. significant tachypnoea, defined as a resting respiratory rate of, or above 60 breaths/min in children less than two months of age, 50 breaths/min for two to 12 months old and 40 breaths/min for children over 12 months of age; 3. cardiomegaly, defined as displaced apex beat in the presence of normally located trachea and/or cardio-thoracic ratio above the upper limit of normal for age; 4. tender hepatomegaly of at least, three centimeters (cm). Each patient received the same treatment for the heart failure and this included nursing in a propped-up position (at an angle of 30°), administration of 30-40 percent oxygen in severe cases; administration of frusemide, 1mg/kg/dose parenterally, or 2mg/kg/day, orally and oral or parenteral digoxin in recommended doses, according to the age of the patient; <sup>6,7</sup> very ill patients were fed through a nasogastric tube. Medically treatable underlying causes, such as pneumonia, septicaemia, anaemia etc, were given appropriate treatment.

Relevant investigations undertaken included serum electrolytes, blood cultures, haemoglobin, WBC and differentials and chest radiographs. Information obtained from each patient included, age, sex, presenting complaints, duration of illness before admission, underlying cause of heart failure, duration of the heart failure, complications, period of hospitalization and the final outcome. The mean and standard deviation of the data were calculated and differences analysed, using the Student's 't' test.

### Results

Over the 41-month period of the study, 137 patients with heart failure were studied. The patients were aged between one day and 13 years (mean age,  $2.20 \pm 2.19$  years). The distribution of the age-groups and sex are shown in Table I.

TABLE I

*Age-groups and Sex Distribution of 137 Patients with Heart Failure*

Age-group (years)	Sex		No of Patients	Percent of Total
	M	F		
<1	39	31	70	51.1
1-2	20	20	40	29.2
3-4	7	3	10	7.3
5-6	1	4	5	3.6
7-8	2	2	4	3.0
≥9	5	3	8	5.8
Total	74	63	137	100.0

It will be observed that 110 (80.3 percent) of the 137 patients were under three years of age. There were five (3.6 percent) neonates in the series. The male: female ratio was 1.2: 1. Refusal to feed or poor appetite was the leading complaint, occurring in 102 (74.5 percent) of the 137 patients (Table II). Other major complaints included cough in 82 patients

TABLE II  
Symptoms and Signs in 137 Children with Heart Failure

Symptom	No of Patients	Percent of Total	Sign	No of Patients	Percent of Total
Refusal of feeds/ poor appetite	102	74.5	Tachycardia	137	100.0
Cough	82	59.8	Tachypnoea	137	100.0
Difficulty with breathing	68	49.6	Hepatomegaly	137	100.0
Vomiting	42	30.7	Cardiomegaly	85	62.0
Diarrhoea	16	11.7	Small pulse volume	120	87.6
Swelling of feet	4	3.0	Cold extremities	100	73.0
Sleeplessness	4	3.0	Restlessness	80	58.4
Excessive sweating	2	1.5	Gallop rhythm	50	36.5
Abdominal pains	2	1.5	Peripheral cyanosis	40	29.2
Orthopnoea	2	1.5	Elevated JVP	15	10.9
Palpitation	1	0.7	Pedal oedema	10	7.3

JVP = Jugular Venous Pressure

(59.9 percent), difficulty with breathing in 68 patients (49.6 percent) and vomiting in 42 patients (30.7percent). Significant tachycardia and tachypnoea, as defined above, were present in all the patients who also had tender hepatomegaly. Other signs (Table II) that were present included small pulse volume in 120 patients (87.6 percent), cold extremities in 100 patients (73.0 percent), gallop rhythm in 50 patients (36.5 percent), elevated jugular venous pressure in 15 patients (10.9 percent ) and bilateral pitting oedema in 10 patients (7.3 percent). The mean respiratory rate of all the

patients was  $70.8 \pm 18.6$  breaths/second, while that of survivors was  $69.31 \pm 17.47$  and of those who died,  $77.67 \pm 24.16$  breaths/second. There was thus, a significant difference ( $p < 0.05$ ) between the respiratory rates of the survivors and the dead. Similarly, the mean heart rate of all the patients was  $167.5 \pm 22.3$  beats/second, while those of survivors and dead ones were  $167.7 \pm 21.6$  and  $167.2 \pm 24.3$  beats/second, respectively. The difference here was not significant ( $p > 0.5$ ).

The underlying causes of heart failure in the 137 patients are shown in Table III. Pneumonia,

occurring in 59 patients (43.1 percent), severe anaemia in 55 patients (40.1 percent) and septicaemia in 29 patients (21.2 percent) were the commonest causative factors. Multiple causative factors occurred in 30 patients (21.9 percent). The high prevalence of pneumonia and septicaemia as causative factors, decreased with increasing age, while that of anaemia did not follow any particular pattern, but was actually highest between one and two years of age (Table IV). The above three major causative factors were commonest among patients under three years of age. Forty-nine (83 percent) of the 59 cases of pneumonia were bronchopneumonia, while 10 (17.0 percent) were lobar pneumonia. Of the seven patients (aged between one day and two years, mean age,  $7.1 \pm 6.6$  months) with congenital heart diseases, three had ventricular septal defect (VSD) and two each were suspected to have transposition of the great arteries (TGA) and tricuspid atresia (TA).

TABLE III

*Causes of Heart Failure in 137\* Patients*

<i>Cause</i>	<i>No of Patients</i>	<i>Percent of Total</i>
Pneumonia	59	43.1
Anaemia	55	40.1
Septicaemia	29	21.2
Bronchiolitis	7	5.1
Congenital heart disease	7	5.1
Septic pericarditis	3	2.2
Meningitis	2	1.5
Croup	2	1.5
Endocarditis	1	0.7
Acute rheumatic fever	1	0.7
Birth asphyxia	1	0.7

\* Note: 30 patients had more than one cause.

TABLE IV

*Age-groups and Major Causes of Heart Failure*

<i>Age-group (Years)</i>	<i>Cause</i>		
	<i>Pneumonia</i>	<i>Anaemia</i>	<i>Septicaemia</i>
<1	38	15	15
1-2	16	21	7
3-4	3	4	3
5-6	1	5	0
7-8	0	4	1
≥9	1	6	3
Total	59	55	29

The packed cell volume (PCV) in patients with anaemia ranged between four and 25 percent (mean,  $13.6 \pm 5.05$  percent). The mean values of the serum electrolytes were: sodium,  $130 \pm 1.72$  mmol/L (range, 123-138 mmol/L), potassium,  $3.8 \pm 0.51$  mmol/L (range, 3.3-4.9 mmol/L) and bicarbonate,  $21.5 \pm 4.26$  mmol/L (range, 12-30 mmol/L). The mean duration of heart failure was  $1.22 \pm 0.96$  days, while the mean period of hospitalization was  $6.3 \pm 4.25$  days.

There were 31 deaths (Table V), a mortality rate of 22.6 percent, in the series. It is evident that 24 (77.4 percent) of the deaths occurred in patients under the age of three years. Anaemia, accounting for 12 deaths (38.7 percent), was the commonest cause, while pneumonia and septicaemia were responsible for 10 (32.3 percent) and 6 (19.4 percent) of the deaths, respectively. Complications that occurred in the 106 survivors included metabolic acidosis in 20 patients (18.9 percent), hypoxic encephalopathy in 16 patients (15.1 percent) and dehydration in 11 patients (10.4 percent). There was no recurrence of heart failure in any of the patients during the period of study.

TABLE V  
Age-groups and Mortality among 137 Patients with Heart Failure

Age-group (Years)	No of Patients	Percent of Total
<1	14	10.2
1-2	10	7.3
3-4	3	2.2
5-6	0	0.0
7-8	1	0.7
≥9	3	2.2
Total	31	22.6

### Discussion

In the present study, heart failure occurred in a majority (80.3 percent) of children under the age of three years; this high prevalence of failure among the under-three-year olds, is similar to the findings of other workers.<sup>8,9</sup> Similarly, the present low prevalence of 3.6 percent in the neonatal period is in agreement with the findings of Jaiyesimi in Ibadan.<sup>4</sup> The leading complaints in our series, in descending order, included refusal of feeds or poor appetite, cough, difficulty in breathing and vomiting. All of these complaints may be explained on the basis of the venous congestion that occurs in heart failure in most organs of the body. It is noteworthy that elevated jugular venous pressure that was elicited in only 10 percent of the patients and pedal oedema in 7.3 percent, were the least common signs in the series. It should be noted that elevated jugular venous pressure and pedal oedema are hardly present in children under the age of three years who constituted the majority of the patients in the series. As has been shown above, the mean respiratory rate of the patients who died was significantly higher ( $p < 0.05$ ) than that of the survivors. In the light of this finding,

it is suggested that an aggressive therapeutic intervention be applied to patients with heart failure and increasing respiratory rate.

The commonest underlying causative factors in the present study were pneumonia in 43.1 percent, severe anaemia in 40.1 percent and septicaemia in 21.2 percent of the patients. The lesser causes included congenital heart disease in 5.1 percent, bronchiolitis in 5.1 percent and septic pericarditis in 2.2 percent of the patients. This distribution of causative factors is close to that reported by Jaiyesimi in Ibadan,<sup>8</sup> but is in contrast to that reported by others<sup>10,11</sup> in technically developed countries. Rheumatic fever was a rare causative factor in the series in contrast to the findings of others in Nigeria.<sup>12,13</sup> Further studies will be required to confirm that this is an apparent rarity of rheumatic heart failure in our locality.

A mortality rate of 22.6 percent in the present series, was slightly higher than that reported by others.<sup>8,9</sup> It is important to note that anaemia, a common preventable and easily treatable condition, was the leading cause with 38.7 percent of the deaths in the series. We would like to suggest that delay in obtaining blood from the blood bank for urgent transfusion was perhaps, the major factor that contributed to death from anaemia. On the basis of the present findings, it is suggested that in every acutely ill infant or child, aged three years and below with pneumonia, anaemia, septicaemia or bronchiolitis, careful evaluation for evidence of heart failure should be undertaken and prompt and adequate treatment administered.

### Acknowledgement

The secretarial assistance of Mrs EO Oyenuga, Department of Paediatrics, is hereby acknowledged.

## References

- 1 Godman MJ. Heart failure. In: Textbook of Paediatrics. Forfar JO and Arneil GC, eds. New York: Churchill Livingstone (Publishers) 1984; 661-4.
- 2 Lees MH. Heart failure in the newborn infant. *J Pediatr* 1969; 75: 139-52.
- 3 Olowu AO. Heart failure in infancy - Recognition and pitfalls in diagnosis. *Nig Med Pract* 1990; 19: 13-4.
- 4 Jaiyesimi F. Heart failure in infancy and early childhood. *Med Digest* 1981; 7: 13-23.
- 5 Artman M and Graham TP. Congestive heart failure in infancy: Recognition and management. *Am Heart J* 1982; 103: 1040-55.
- 6 Nyberg L and Wettrell G. Digoxin dosage schedules for neonates and infants based on pharmacokinetic considerations. *Clin Pharmacokinetics* 1987; 3: 453-61.
- 7 Kaplan S. Congestive Heart Failure. In: Vaughan VC, McKay RJ and Behrman RE, eds. Nelson's Textbook of Pediatrics. Philadelphia: WB Saunders Company 1979: 1346-8.
- 8 Jaiyesimi F. Congestive cardiac failure in emergency paediatric practice in Nigeria. *Trop Cardiol* 1977; 3: 9-14.
- 9 Keith JD. Congestive heart failure. In: Heart Disease in Infancy and Childhood. Keith JD, Rowe RD and Vlad P, eds. New York: Macmillan Publishing Co. 1978: 163-84.
- 10 Moller JH and Neal WA. Congestive cardiac failure. In: Heart Disease in Infancy. Fuhrman BP, ed. New York: Appleton-Century Crofts, 1981: 463-6.
- 11 Wolfe RR. Congestive heart failure. In: Current Paediatric Diagnosis and Treatment. Kempe CH, Silver HK and O'Brien D, eds. California: Lange Medical Publications 1982: 324-7.
- 12 Jaiyesimi F and Antia AU. Childhood rheumatic heart disease in Nigeria. *Trop Geogr Med* 1981; 33: 8-13.
- 13 Antia AU, Wilkinson JL and Jaiyesimi F. The cardiovascular system. In: Hendrickse RG, Barr DGD and Mathews TS, eds. Paediatrics in the Tropics. Oxford: Blackwell Scientific Publications 1991: 233-73.