FACTORS THAT PRECIPITATE HEART FAILURE AMONG CHILDREN WITH RHEUMATIC HEART DISEASE

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ABSTRACT

Objective: To identify factors that precipitates heart failure in children with rheumatic heart disease.
Design: A descriptive cross-sectional study.
Setting: Paediatric wards at the Moi Teaching and Referral Hospital.
Subjects: Children with Rheumatic heart disease admitted for in-patient care due to decompensated heart failure.
Results: A total of 33 patients were studied, thirty two of whom were in the New York Heart Association (NYHA) class IV and one in class III. Non-compliance to anti-failure therapy was the most common precipitating factor occurring in 87.9% cases. Arrhythmia, recurrent rheumatic fever, pneumonia, infective endocarditis, anaemia and overexertion were identified as other precipitating factors. Seventy percent of the patients did not adhere to secondary prophylaxis against rheumatic fever.
Conclusion: Non compliance to anti-failure therapy was the most common precipitating factor.

INTRODUCTION

Rheumatic fever usually follows an untreated beta haemolytic streptococcal throat infection in children. When it affects the heart it may cause rheumatic heart disease which is a chronic valvular heart disease that may be non progressive if well managed or progress to heart failure, atrial fibrillation or embolic phenomena (1). Currently, rheumatic heart disease mainly affects children in developing countries especially where poverty is widespread. Rheumatic heart disease is a major cause of cardiac failure in Africa and Asia especially in children five to fifteen years and young adults (2). In Kenya, like the rest of sub-Saharan countries, rheumatic heart disease is a leading cause of cardiac morbidity and mortality although the exact disease burden is unknown (3).

Symptoms of cardiac failure in children with rheumatic heart disease develop in two to ten years but may occur earlier especially when there is severe carditis in initial or recurrent rheumatic fever (4). Symptomatic heart failure that may lead to admission is usually due to deterioration in cardiac function as a result of the underlying disease, however factors other than the underlying heart disease have been observed in many patients who were otherwise well compensated but developed acute decompensation (5,6). These precipitating factors may contribute to or even induce heart failure. It has been postulated that identification and prevention of precipitating factors may decrease the number of admissions due to decompensated cardiac failure (5). This study looked at precipitating factors among children who were admitted with rheumatic heart disease and heart failure. Identification of the common precipitating factors may guide medical practitioners in optimal management of rheumatic heart disease patients and thereby reduce or avoid decompensated heart failure episodes.

MATERIALS AND METHODS

This was a descriptive cross-sectional study carried out at the Moi Teaching and Referral Hospital (MTRH) in Uasin Gishu District between April 2006 and January 2007. Consecutive patients aged five to fifteen years admitted with rheumatic heart disease and heart failure were recruited. This study was approved by Institutional Research and Ethics Committee (IREC) of Moi University and MTRH and informed consent was received.
Data collection and procedures: History was taken and clinical examination performed by the investigator on the day of admission and recorded in a coded questionnaire. Clinical diagnosis of rheumatic heart disease and cardiac failure were used as the screening criteria and patients who met the study criteria underwent further clinical and laboratory evaluation.

Procedures:
Blood culture: Three blood culture specimens were taken

at 30 minutes interval from different venepuncture sites before antibiotics were started. The blood culture medium used was Hemoline^R and the standard procedures for identification of microorganisms in blood were followed (7).

Complete blood count: Blood (2-3 milliliters) was collected using standard venepuncture procedure. Complete blood count with differential was done using automated Coulter Multi Diff II (Beckman).

Anti-Streptolysin O (ASO) titres: Anti-Streptolysin O titres were measured by a semi-quantitative latex test using Dialab® kit (Dialab diagnostic GmbH, wein Austria). Titres higher than 240 I.U for children five to nine years and more than 320 I. U for those 10-15 years was considered positive.

Echocardiography: Transthoracic cardiac imaging studies were done using Hewlett Packard Sonos 2500 with 3.5 or 5 MHz traducers.

Electrocardiography: A twelve lead electrocardiogram was done using Cardiosmart (Marquette Hellige Medical systems). The electrocardiogram was reported by a cardiologist who was blind to the study.

Chest x-ray: Standard posteroanterior (PA) chest x-rays were done in the Department of Radiology and imaging at Moi Teaching and Referral Hospital. Where PA view could not be done because of the patient's condition, anteroposterior (AP) views were obtained.

RESULTS

Thirty three patients with female to male ratio of 4.5:1 were admitted into this study. Their ages ranged from five to fifteen years with a mean of 11.3 ± 2.9 years and median of 12 years. On admission thirty two (97%) patients were in New York Heart Association (NYHA) functional class IV and one (3%) was in class III. Dyspnea at rest, easy fatiguability and breathlessness were the most common presenting symptoms while tachycardia, elevated JVP and tachycardia were the most common signs (Tables 1 and 2).

Table 1
Presenting symptoms on admission

Symptom	Frequency (n=33)	Percentage
Dyspnoea at rest	32	97
Easy fatiguability	30	90.9
Breathlessness	27	81.8
Body swelling	27	81.8
Night cough	27	81.8
Orthopnoea	27	81.8
Paroxysmal nocturnal dyspnoea	26	78.8
Palpitation	24	72.7
Weight loss	21	63.6
Abdominal pains	19	57.6
Body hotness	12	36.4

Respiratory symptoms, dyspnoea at rest, easy fatiguability, breathlessness, night cough and orthopnoea, were the most common symptoms.

Table 2
Physical features at admission

Sign	Frequency (n=33)	percentage
Tachycardia	31	93.9
Elevated JVP	28	84.8
Tachypnoea	28	84.8
Displaced Apex	28	84.8
Peripheral oedema	27	81.8
Tender hepatomegaly	27	81.8
Hepatojugular reflex	22	66.7
Basal rales	19	57.6
S3 Gallop	13	39.4
Fever	6	18.8
Finger clubbing	2	6.3
Splenomegaly	1	3
New murmur	1	3
Embolic phenomenon	0	0

Most patients presented with signs of congestive cardiac failure. Signs of thromboembolic phenomenon, splenomegaly, finger clubbing and changing murmurs as indicators of infective endorcaditis were rare in this study (n=33).

Factors that precipitate heart failure that were observed in these patients included non-compliance to heart failure therapy, advanced primary lesion, anaemia, arrhythmias, recurrent rheumatic fever, pneumonia and infective endocarditis. Non compliance to anti-failure therapy, dietary salt restriction and advanced valvular lesions were identified as the leading precipitating factors (Table 3). Nine patients (27.3%) had arrhythmia among whom six had atrial fibrillation and three had atrial flutter. Six patients (18.2%) had recurrent rheumatic fever and all of them had not been on secondary

prophylaxis against rheumatic fever. Pneumonia was present in 12.1% of patients and infective endocarditis was diagnosed in 9%. Thirteen patients (39.4%) had anaemia out of whom one had severe anaemia (haemoglobin <5 g/dl) while two had moderate anaemia (haemoglobin 5-7 g/dl) and the rest had mild anaemia.

Of the twenty nine patients who were non-compliant to anti-failure drugs, ten (34.5%) had been given a prescription on at least one occasion but they did not comply while 65.5% had not been started on maintenance treatment for heart failure.

Table 3
Precipitating factors in children admitted with heart failure

Factor	Frequency (n=33)	Percentage
Non-compliance to anti-failure drugs	29	87.9
Non-compliance to dietary salt restriction	28	84.8
Advanced valvular lesion	21	63.6
Anaemia	13	39.4
Arrthymia	9	27.3
Recurrent rheumatic fever	6	18.2
Over-exertion	5	15.2
Pneumonia	4	12.1
Infective endocarditis	3	9

Non compliance to anti-failure drugs and dietary salt reduction and advanced valvular lesion were the most common contributors to heart failure. The factors are not mutually exclusive hence one patient could have more than one factor (n=33).

Ten patients (30%) were on secondary prophylaxis in the six months preceding admission while twenty three (70%) were not and of this, two (8.7%) had been started on prophylaxis but did not comply while the rest had not been started. All the patients who were on prophylaxis used monthly injection of benzathine penicillin given at public health facility in 90% of cases and private clinics in 10%.

DISCUSSION

Rheumatic heart disease is a major cause of cardiac failure in Africa and Asia especially in children five to fifteen years and young adults. It is the most common cause of cardiac failure in people below 30 years (2). Assessment and prevention of factors that precipitate acute decompensation in patients with chronic heart failure is an important objective in the care and management of such patients.

In this study non compliance to anti-failure therapy was the most common precipitating factor. Most studies that have looked at precipitating factors have been done in adult patients. Michalsen *et al* (8) found that non-compliance to medical regimen was responsible for 41.9% of decompensated heart

failure in adult patients with chronic heart failure. Non-compliance was the main precipitating factor in another study done by Tsuyuki *et al* (9) in a randomised trial of 768 patients with left ventricular dysfunction. The finding in the current study suggests similarity in compliance to medication between adults and children.

Cardiac arrhythmia was found in nine (27.3%) patients in this study which compares well with the 29% reported by Ghali *et al* (10) among 101 patients readmitted with decompensated heart failure but it is higher than the 6.1% reported by Michalsen *et al* (8) and 13% by Tsuyuki *et al* (9). The finding that atrial fibrillation was the most common arrhythmia in this study is similar to what has been found in other studies before (5).

The prevalence of anaemia in patients with heart failure in the current study is comparable to that observed in other studies where it ranged from 4 to 55% (11). The prevalence of infective endocarditis (9%) found in this study is comparable to that reported by Anabwani *et al* (12) where they analysed results of patients sent for echocardiography and found a prevalence of 7.7%. The prevalence of pneumonia in this study was lower than that observed in children in Nigeria where acute respiratory infection was the leading cause of childhood

heart failure with prevalence of 36% (13). However in that study they looked at children zero to twelve years admitted with heart failure irrespective of the underlying cause.

Compliance to intramuscular penicillin has been shown to be effective in prevention of recurrent rheumatic fever (14). The high rate of non-compliance found in this study may contribute to the cases of recurrent rheumatic fever.

In conclusion, non compliance to anti-failure drugs and dietary salt reduction were the most frequently identified precipitating factors. Most patients were found not to adhere to secondary prophylaxis against rheumatic fever

Recomendations: In all patients with rheumatic heart disease efforts should be made to encourage compliance to anti-failure therapy and secondary prophylaxis against rheumatic fever.

A study should be done to identify factors that lead to poor compliance to rheumatic fever prophylaxis and come up with interventional strategy.

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