Causes Of Heart Failure As Seen In Kumasi Ghana

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Abstract

This study was done to determine the aetiological factors underlying heart failure in patients seen at the Department of Medicine, Komfo Anokye Teaching Hospital Kumasi, Ghana.

Patients above twelve years admitted to the medical wards with diagnosis of heart failure were recruited. Detailed history was obtained. Clinical examination, electrocardiography, Chest X-ray, echocardiography and haematological tests were done.

One hundred and sixty seven patients were studied; 86 males and 81 females, aged 13 - 90 years with the mean 51.1 (+/- 21.1) years. The main causes of heart failure were hypertension (42.5 %; n=71), rheumatic heart disease (RHD) (21.6 %; n=36), and cardiomyopathy (17.4 %; n=29). Other conditions seen in the patients were electrocardiographic left ventricular hypertrophy (ECG LVH) (66.5 %) and anaemia (47 %).

In conclusion, the two most frequent causes of heart failure in our patients were hypertension and RHD. ECG LVH and anaemia were two major conditions seen in the patients.

INTRODUCTION

With the epidemiologic transition phenomenon [1] there has been an increased incidence of cardiovascular diseases in West Africa, which is already dominated by infectious diseases [2, 3]. This has posed the problem of 'double-burden' of diseases [4] in the West African sub-region. Studies suggest that non-communicable diseases will soon be the most important cause of morbidity and mortality in the developing world [3, 4].

Evidence available [5,6,7] shows that heart failure is a major health problem in the West African sub-region. Heart failure, stroke and renal diseases accounted for 23% of acute medical admissions, and 29% of deaths at KATH, Kumasi [5]. Heart failure constituted 8 % of all admissions to adult medical wards of Korle Bu Teaching Hospital (KBTH), Accra, Ghana, from 1st October, 1971 to 30th September, 1972 [6], and was responsible for 10 % of deaths in hospitalized adult medical patients at KBTH, Accra [7].

Several aetiological factors have been established for heart failure in West Africa [8,9,10]. These include: hypertension, cardiomyopathy, peripartum cardiac disease, rheumatic heart disease (RHD), and cor pulmonale. Amoah and Kallen[8] found the main causes of heart failure in Accra, Ghana, to be hypertension, RHD and cardiomyopathy. Ladipo et al.[9] studying the pattern of heart disease in Nigeria, found hypertension, peripartum cardiac disease, dilated cardiomyopathy and RHD as the major causes of heart failure. Antony [10] studied 315 cases of heart failure admitted to the General Hospital at Katsina, in the northern savanna region of Nigeria. He found that cardiomyopathy was the commonest cause (47 %) of heart failure, peripartum heart failure formed the commonest cause of heart failure among the females, anaemia and hypertension caused 13% and 12% of heart failure respectively.

Recent studies provide important and worrisome findings in both epidemiology and clinical outcomes of hypertension [11,12,13,14]. Hypertension has been reported to account for up to 30 % of hospital admissions for heart failure in West Africa [11], and the prognosis of hypertensive heart failure among Black Africans has also been found to be poor.[12]

Even though, overall hypertension prevalence is between 10% - 15%, [13, 14] prevalence rates as high as 30% - 32% have been reported in middle-income urban and some rural areas in Africa [13, 14]. Hypertension awareness, treatment, and control rates as low as 20%, 10%, and 1%, respectively have also been reported [13, 14]. The prevalence of hypertension and

the resulting morbidity are sufficiently high to justify viewing the condition as a serious health problem.

Acute rheumatic fever is a common health problem in Africa [15, 16]. The seriousness of the problem is reflected in the fact that almost 13.3 % of the population in the developing world may be throat carriers of group A streptococci [16], and almost 40 % of infected persons may suffer from the tragic complication, RHD. Incidence of RHD in Africa is estimated at 17% - 43% of all cardiovascular diseases [8,9,10, 16].

Various risk factors for heart failure have been described [17, 18]. Clinical factors that are strongly and consistently associated with heart failure include: age, ECG LVH, overweight or obesity and diabetes mellitus [17, 18]. Excessive alcohol consumption, cigarette smoking, dyslipidaemia, renal insufficiency, physical inactivity, low socioeconomic status, and increased heart rate are clinical factors less consistently associated with heart failure [17, 18]. Other risk factors include: biochemical markers such as homocysteine, insulin-like growth factor 1, tumor necrosis factor ?, interleukin-6, and natriuretic peptides [17, 18]. Identifying individuals who are at high risk for developing heart failure may allow implementing strategies that can prevent heart failure.

KATH is located in Kumasi, the capital of Ashanti Region in Ghana. The geographical location of the 1000-bed teaching hospital, the road network of the country and commercial nature of Kumasi make the hospital accessible to all the areas that share boundaries with the Region. The department of medicine has 220 beds, and the patients admitted are aged from 13 years and above. The department runs emergency service 24 hours, seven days a week. Referrals from regional hospitals, district hospitals, general practitioners and physician specialist clinics are admitted to the medical wards through the emergency unit.

The natural history of heart failure may be modified if the underlying aetiology can be determined. The main objective of this study was to determine the aetiological factors underlying heart failure in patients seen at the Department of Medicine, KATH, Kumasi, Ghana. It is hoped that this study may provide baseline data for future comparisons and monitoring of trends in cardiovascular morbidity with respect to heart failure at KATH, Kumasi.

MATERIALS AND METHODS

STUDY POPULATION AND DATA COLLECTION

The study was a hospital-based prospective descriptive carried out at the Department of Medicine, KATH in Kumasi from October 2004 to March 2005. Informed consent was obtained from each study participant and KATH ethical committee approved the study.

Patients aged thirteen years and above who were admitted to the medical wards with clinical diagnosis of heart failure were recruited. Detailed history including patients' socio-demographic characteristics, past medical history, drug history, alcohol and smoking habits were obtained from each study participant through a standard questionnaire. Common symptoms of heart failure such as dyspnoea on exertion or at rest, fatigue, orthopnoea, paroxysmal nocturnal dyspnoea, palpitation and ankle swelling were sought.

Clinical examination included general assessment to look for dyspnoea at rest, pedal oedema or generalized swelling, cyanosis, fever, and pallor of mucous membrane. The pulse rate, rhythm, volume and the character were noted. Jugular venous pressure, the blood pressure, the apex beat, the heart sounds (S1, S2, S3 and S4) and murmurs were also examined. The chest was auscultated for crackles, and the presence of hepatomegaly and ascites were also noted.

The blood pressure was recorded in the right arm, with patients lying supine after a 10-minute rest, using a mercury sphygmomanometer with a cuff size 12cm by 23cm. The cuff was deflated at 2 mm/s and the blood pressure was measured to the nearest 2 mmHg. Systolic pressure was recorded as appearance of the Korotkoff sounds (phase I) whilst diastolic pressure was recorded as disappearance of the Korotkoff sounds (phase V) [19].

Hypertension was defined as the presence of a persistent elevated systolic blood pressure ≥ 140mmHg and/or diastolic blood pressure ≥ 90mmHg in patients aged 15 years and above [19], and/or presence of hypertensive retinopathy and/or the use of antihypertensive drugs and/or past medical history of hypertension. Diabetes mellitus was defined as a random blood glucose level of 11.1 mmol/L or greater, and/or fasting blood glucose level of 7.0 mmol/L or greater [20], and/or use of insulin or an oral hypoglycaemic agent. Anaemia was defined as haemoglobin (Hb) level < 12 g/dL according to the World Health Organization classification [21].

A 12 lead standard ECG was obtained from each patient according to standard procedure, and evaluated by the author. Electrocardiographic LVH was diagnosed using Scott's criteria for LVH [22]. Chest X-rays were obtained from each patient and examined for increased cardiac size as

judged by a cardiothoracic ratio (CTR) more than 0.5, and the presence of pulmonary upper lobe blood diversion and/or alveolar oedema and/or pleural effusion.

Venepuncture was done from the antecubital veins in a recumbent position on all the patients, and 10mls of blood collected into appropriate bottles for; determination of haemoglobin (Hb) at the haematology laboratory using auto-analyzer, determination of serum creatinine levels and fasting blood glucose levels at the biochemistry laboratory.

M-mode and two dimensional transthoracic echocardiography were performed by the author using an Ultramark 5 ultrasound system equipped with 3.5 and 5.0 MHz probes. Standard echocardiographic procedures were followed. Measurements were taken using two dimensional directed M-mode, in the left parasternal long-axis view, with the patients in the left lateral position. The left ventricular internal dimension in end diastole (LVIDd), left ventricular posterior wall and septal thickness were taken at end-diastole. The left ventricular internal dimension in systole (LVIDs) was taken at the peak downward movement of the septal motion perpendicular to the peak upward motion of the posterior endocardium. The fractional fibre shortening (FS %) was obtained by the following formula:

FS = (LVIDd- LVIDs)/ LVIDd x 100.

Diagnosis of heart failure was confirmed, using the following modified Framingham criteria for the diagnosis of heart failure [8, 23]:

Major criteria: Paroxysmal nocturnal dyspnoea, raised jugular venous pressure, clinical cardiomegaly, basal crepitations, S3 gallop, clinical acute pulmonary oedema, pulmonary upper lobe blood diversion on chest X-ray (or pulmonary oedema on chest X-ray).

Minor criteria: tachycardia, orthopnoea, exertional dyspnoea, nocturnal cough, hepatomegaly, pleural effusion, diuretic use.

Heart failure was diagnosed if the patient had two major and one minor or one major and two minor criteria. The nature of heart failure was categorized as left ventricular failure (LVF), right ventricular failure (RVF) or biventricular (BVF). Severity of heart failure on admission was assessed using the NYHA functional classification [24].

INCLUSION CRITERIA

Patients aged thirteen years and above admitted to the medical wards for the first time, with the clinical diagnosis of heart failure who met the modified Framingham criteria for the diagnosis of heart failure, were included in the study.

EXCLUSION CRITERIA

The following patients were excluded from the study: Patients admitted with suspected heart failure but could not meet the diagnostic criteria and those who died within 24 hours before full clinical evaluation were undertaken.

STATISTICS

Data from the standard questionnaire were entered into a Microsoft Excel (2000) sheet. Data were then exported into Stata Version 8.0 statistical software for analysis. Descriptive analysis of baseline parameters was provided. Measure of central tendency using means and median, measure of spread using standard deviation and range were calculated. The chi squared test was used to test for association between categorical variables. The student t-test was used to compare means of two variables, whilst the ANOVA was used in the comparison of means of more than two variables. The level of significance was set at $p < 0.05$, and a 95 % confidence interval was applied to the numerical variables which are normally distributed.

RESULTS

One hundred and sixty-seven (167) patients were studied. The ages were between 13 - 90 years with the mean (standard deviation) of 51.1 (21.1) years.

There were 86 (51.5 %) males and 81 (48.5 %) females. The mean age of the males was 50.9 (21.4) years (median 52 years), and the mean age of the females was 51.3 (29) years (median 53 years). The age difference between the male and the female patients was not statistically significant (p=0.5).

History of chronic alcohol use was obtained from 43.1 % of the patients, and 13.2 % of the patients had smoked tobacco in their lifetime. The cause of heart failure was significantly associated with the history of chronic alcohol use (p=0.007) and tobacco smoking (p< 0.001).

Diabetes mellitus was seen in 9 % of the patients, anaemia was seen in 47 %, renal dysfunction was seen in 13.8 %, and stroke (or transient ischaemic attacks) was seen in 3.6 %. ECG LVH was present in 66.5 % of the patients. The mean Hb of male patients was 10.9 (2.7) g/dL, and that of the female patients was 10.7 (2.8) g/dL. The difference in Hb between the males and the females was not statistically significant (p=0.347).

Figure 1 illustrates the overall causes of heart failure. The main cause of overall heart failure was hypertension (42.5 %; n=71), followed by RHD (21.6 %; n=36) and CMP (17.4 %; n=29). Pericardial disease and ischaemic heart disease were seen in 4.2 % (n=7) and 3.6 % (n=6) of patients respectively. Cor pulmonale from COPD occurred in 2.4 % (n=4) of cases, whilst congenital heart disease also accounted for 2.4 % (n=4) of cases.

Figure 1

Figure 1: Bar chart showing the overall causes of heart failure.

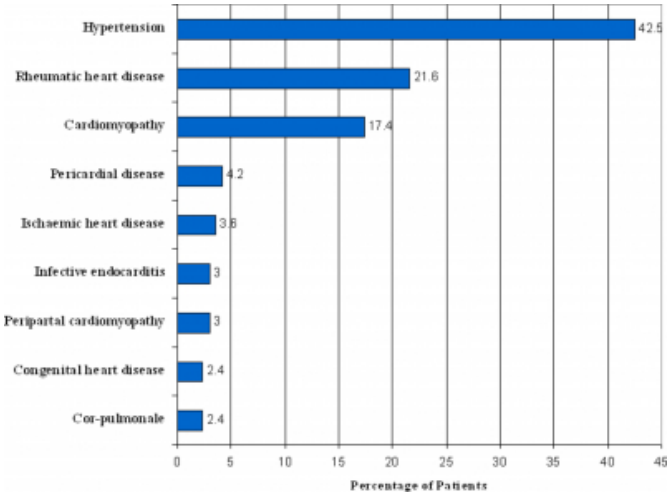
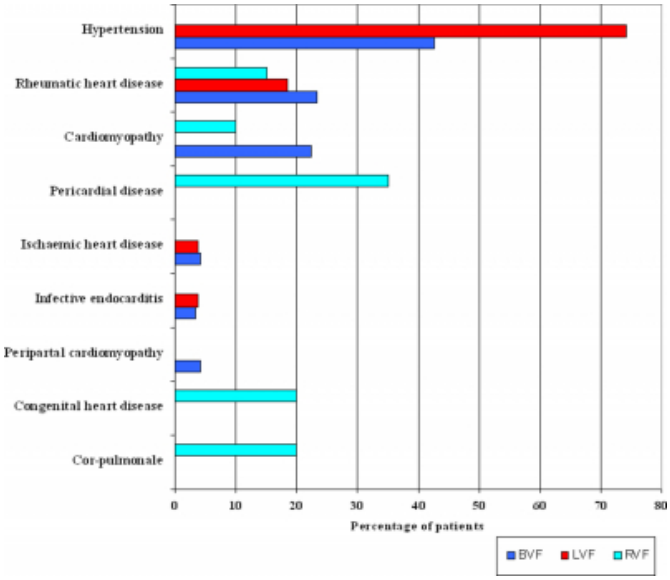


Figure 2 shows the causes of BVF, LVF and RVF. The main causes of BVF were hypertension (42.5 %; n=51), RHD (23.3 %; n=28) and CMP (22.2 %; n=27). Hypertension was responsible for 74.1 % (n=20) of LVF, whilst RHD accounted for 18.5% (n=5) of LVF. The main causes of RVF were pericardial disease (35 %; n=7), CHD (20 %; n=4) and cor pulmonary (20 %; n=4).

Figure 2

Figure 2: Bar chart showing the causes of biventricular failure (BVF), left ventricular failure (LVF) and right ventricular failure (RVF).



The mean ages for the causes of heart failure are shown in table 1. The mean ages for HHD and RHD were 59 (15) years and 38 (22) years respectively.

Figure 3

Table 1: The mean ages of patients for the various causes of heart failure.

Causes of Heart Failure	Mean age (years)	95 % Confidence Interval for mean age (years)	Median age (years)	Range (years)
HHD	59 ± 15	55.5 – 62.5	60	28 – 90
RHD	38 ± 22	30.4 - 45.8	29	13 – 60
CMP	58 ± 20	49.7 – 66	60	16 – 90
PD	31 ± 10	21.6 - 40.4	30	13 - 46
IHD	73 ± 6	66.3 - 79.7	73.7	64 – 80
IE	34 ± 15	14.9 – 53	27	21 – 60
PCMP	31 ± 8	20.6 - 41.8	29	22 – 45
CHD	25 ± 10	8.3 - 41.3	24	13 – 38
COR-P	75 ± 4	68.7-81.8	75.5	70-80

HHD=hypertensive heart disease, RHD=rheumatic heart disease, CMP=cardiomyopathy, PD=pericardial disease, IHD=ischaemic heart disease, IE=infective endocarditis, PCMP=peripartal cardiomyopathy, CHD=congenital heart disease COR-P= cor-pulmonale.

DISCUSSION

The main limitation of this study was that ejection fraction of the heart failure patients could not be measured. Diagnosis of heart failure was made clinically using the Framingham criteria. The Framingham criteria for the diagnosis of heart failure has been found to compare favourably to other clinically based criteria used to identify

persons with heart failure and left ventricular systolic dysfunction [25].

Data available [8,9,10] shows that the main causes of heart failure in Africa are hypertension, RHD, CMP and pericardial disease. Hypertension was seen as the commonest cause of heart failure in this study, and it was also reported as the commonest cause of heart failure in Accra [8]. In Ibadan, Falase et al.[26]reported that 40.2 % of heart failure cases seen at the University College Hospital were due to hypertension. In Kaduna, Abengowe [27] reported that 45.5 % of cardiovascular disorders seen at the Ahmedu Bello University Hospital were due to hypertension. The Framingham study [17]demonstrated that hypertension preceded the onset of heart failure in 70 % of men and 78 % of women.

There is accumulating evidence [28, 29] that successful control of hypertension can decrease the incidence of heart failure. Given the importance of hypertension, it is alarming that the awareness, treatment, and control rates of hypertension in Africa are as low as 20%, 10%, and 1%, respectively [13, 14].

In the West African sub-region, hypertension control assumes a relatively low priority and little experience exists in implementing sustainable and successful programmes for drug treatment [13]. The detection and control of hypertension remains a challenge even in developed countries, with as many as 70 % of hypertensive patients with uncontrolled high blood pressure [30]. There are many obstacles to the prevention and control of hypertension in the West African sub-region. Low literacy rates, inadequate access to basic healthcare and inadequate facilities in primary healthcare are important barriers to the detection and control of hypertension. The low doctor-to-patient ratio in the sub-region aggravates the problem.

Evidence [8,9,10, 27, 31, 32] abound that RHD is still a problem in Africa. In Accra, Pobee reported that vulvular heart disease, presumably RHD, occurred in 20.4 % of all cardiovascular diseases [31], and was responsible for 11 % of heart failure deaths [7]. In the study by Amoah and Kallen [8] in Accra, RHD accounted for 20.1 % of the cases of heart failure, and in Kaduna [27], it accounted for 14.4 % of cardiovascular disorders. In Nairobi [32], RHD was found to be the most common cause of heart failure, accounting for 32 % of the cases. In this study, RHD as the second commonest cause of heart failure was seen in 21.6 % of the cases.

The poor socioeconomic conditions, overcrowding and inadequate medical services in Africa are said to favour the high incidence rates of RHD [8, 18]. Poor housing and overcrowding promote the rapid spread of group A streptococcal infection. Inadequate medical resources and inadequate expertise of health-care providers result in inadequate diagnosis and inadequate treatment of streptococcal pharyngitis. RHD has been found to be more common among socially and economically disadvantaged population who have difficulties in accessing health-care, and cannot afford the high cost of valve replacement (or repair) surgery.

Since RHD affects the poor population who cannot afford the high cost of valve replacement (or repair) surgery, efforts should be made to reduce the incidence of RHD in Africa. This can be achieved through a high index of suspicion and good clinical judgment for prompt diagnosis of acute rheumatic fever, primary and secondary prevention of RHD.

CMP has been studied extensively in Africa [8,9,10, 32]. It accounted for 25.2 % of the cases of heart failure seen in Nairobi [32], 16.8 % of the cases seen in Accra [8], and 47 % of the cases seen in Katsina (northern savanna region of Nigeria) [10]. Dilated cardiomyopathy was the most common cardiomyopathy seen in this study. It accounted for 15.2 % (n=26) of the cases seen. EMF and PCMP were seen in 1.8 % and 3 % of the cases respectively, and no hypertrophic CMP was seen during the study period. The fact that Amoah and Kallen in Accra [8]saw only 1.6 % (n=9) cases of hypertrophic CMP over a period of 4 years shows that hypertrophic CMP is an uncommon cause of heart failure in Ghanaians.

Dilated cardiomyopathy is the most common cardiomyopathy in Africa [8, 10]. It is most likely that some of the cases of dilated cardiomyopthy were due to previous viral myocarditis, chronic excessive alcohol use, and type III hypertensive heart failure [33].

The incidence of pericardial disease in Africa is increasing, and this is partly due to the epidemic of HIV infection in Africa [34]. The main aetiology of pericardial disease in Africa is tuberculosis [34]. In this study, pericardial disease was seen in 4.2 % (n=7) of cases, it was presented as RVF, and accounted for 35 % (n=7) of cases of RVF. It was mainly effusive and fibrous type.

LVH which results from cardiac remodeling has been shown to increase the risk of heart failure [17, 18]. In the Framingham heart study [18], it was found out that ECG LVH was

associated with a 15-fold increase in the incidence of heart failure. In this study, majority (66.5 %) of all the patients, 91.7 % and 86.1 % of those with HHD and RHD respectively had ECG LVH. The prevention or regression of LVH should be an important therapeutic goal.

Anaemia has recently been recognized as an important comorbid condition in patients with heart failure [21, 35]and it is significantly related to symptoms, exercise capacity and prognosis of heart failure. It has been identified as an independent risk factor for mortality in those with left ventricular dysfunction [21, 35]. Heart failure patients with concomitant renal dysfunction invariably become anaemic owing to eythropoietin deficiency. Correction of anaemia has been shown to improve the outcome of heart failure [35]. Even though the 47 % of the patients with anaemia seen in this study is higher than the 13.2 % and the 13 % reported by Oyoo and Ogola in Nairobi [32], Antony in Nigeria [10]respectively, the prevalence rate of anaemia in heart failure has been found to range from 4 % to 55 % [35]. This study has shown that anaemia is commonly associated with heart failure in Kumasi and should be looked for and treated.

In conclusion, hypertension and RHD were the two most common causes of heart failure in the patients. ECG LVH and anaemia two major conditions seen in the patients. RHD is still a problem in the West African sub-region. Hypertension and RHD are largely preventable conditions; therefore primary prevention should be of public health importance. Early detection and effective control of hypertension should be recognized as a pre-requisite for strategies for the prevention of heart failure.

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