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Clinical and Demographic Characteristics of Patients Presenting with Heart Failure to a Teaching Hospital in Kumasi, Ghana

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Abstract

This was a 6-month prospective descriptive study carried out at the Department of Medicine, Komfo Anokye Teaching Hospital (KATH), Kumasi, Ghana. The main objective of the study was to determine the socio-demographic characteristics and clinical presentation of patients with heart failure seen at KATH, Kumasi, Ghana. Patients aged thirteen years and above admitted to the medical wards with diagnosis of heart failure were recruited. Detailed history, clinical examination, electrocardiography (ECG), Chest X-ray, echocardiography, haematological and biochemistry tests were done. One hundred and sixty seven (167) patients were studied, 86 males and 81 females. They were aged 13 - 90 years with the mean 51.1 (± 21.1) years. Age group 61-70 years had the highest incidence of heart failure. Majority of the patients presented with biventricular failure (71.9 %; n=120) and the New York Heart Association (NYHA) functional class IV (64.2 %; n=107). The commonest presenting complaint was dyspnoea on exertion (95.8 %, n=160), followed by fatigue (94 %, n=157). History of chronic alcohol use was obtained from 43.1 % of the patients. ECG left ventricular hypertrophy (LVH) was seen in 66.5 % of the patients. Hypertension and anaemia were seen in 42.5 % and 47 % of the patients respectively. *Conclusions:* Heart failure occurred almost equally in males and females with the highest incidence in age group 61-70 years. Majority of the patients presented with NYHA functional class IV. The commonest presenting complaint was dyspnoea on exertion, and ECG LVH, hypertension and anaemia were three major conditions seen in the patients.

Keywords

Heart failure, orthopnoea, hypertension, electrocardiography, LVH, NYHA functional classification

1. Introduction

The prevalence of cardiovascular disease is increasing in Africa[1-3]; where infectious diseases and nutritional deficiencies are still endemic. Cardiovascular disease is recognized as a major and escalating public health problem [4], and it is one of the most important causes of morbidity and mortality in the world [5].

Heart failure is becoming increasingly common in Africa [6, 7]. It is a lethal condition [8], and the prognosis of advanced heart failure is poor; with mortality rates reported in clinical trials [9, 10] and in community data [11] indicating that within 3-5 years, around half the patients with a diagnosis of heart failure will have died. The prognosis is even worse than that observed in many malignancies [12]. Patients with NYHA functional class III disease have one-year survival of 80 – 90%, and those with NYHA functional class IV have one-year survival of 50 – 70% [13].

In Africa, the main causes of heart failure include: hypertension, rheumatic heart disease, and cardiomyopathies [7 14-17]. Recent studies have shown degenerative valvular heart disease and ischaemic heart disease as emerging causes of heart failure in Africa [7, 18].

Various cardiovascular risk factors for heart failure have also been described [6, 18- 23].

Clinical factors that are strongly and consistently associated with heart failure include: age, ECG LVH, overweight or obesity and diabetes mellitus [6, 17, 19- 23].

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 [20]. Other risk factors include biochemical markers such as homocysteine, insulin-like growth factor 1, tumor necrosis factor α, interleukin-6, and natriuretic peptides [20]. Identifying individuals who are at high risk for developing heart failure may allow implementing strategies that can prevent heart failure.

Despite its importance, there is inadequate published data on heart failure in Africa. There is also hardly any study at KATH, Kumasi, Ghana, examining the socio-demographic characteristics and clinical presentation of patients with heart failure. The main objective of this study was to determine the socio-demographic characteristics and clinical presentation of patients with heart failure seen at KATH, Kumasi, Ghana. It is hoped that this study may provide information for future comparisons and monitoring of trends in cardiovascular morbidity with respect to heart failure at KATH, Kumasi, Ghana.

2. Materials and Methods

2.1. Study Population and Data Collection

This was a 6-month hospital-based prospective descriptive study carried out at the Department of Medicine, KATH, Kumasi, Ghana. 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 oedema, cyanosis, fever, and pallor of the mucous membrane. The pulse rate, rhythm, volume and the character were noted. Jugular venous pressure, the blood pressure, the apex beat, the heart sounds (S_1, S_2, S_3 and S_4) 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) [24].

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 [24], 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 [25], 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 [26].

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 [27]. Chest X-rays were obtained from each patient and examined for increased cardiac size as judged by a cardiothoracic ratio (CTR) greater 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.

All the heart failure patients had standard transthoracic echocardiographic procedures performed by the author. The echocardiographic data of the patients which were obtained included; m-mode, 2- dimensional, doppler, colour flow imaging, and valvular apparatus characteristics. Left ventricular systolic dysfunction was defined as left ventricular ejection fraction (EF) < 50%. Left ventricular diastolic dysfunction was defined as E/A ratio<1 or E/A ratio >2, DT>220ms or DT<160ms, IVRT>100ms or IVRT < 70ms. Tissue Doppler imaging could not be done.

Diagnosis of heart failure was confirmed, using the following modified Framingham criteria for the diagnosis of heart failure [7, 14, 28]:

1. 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).
2. 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 [29]

2.2. 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.

2.3. Exclusion Criteria

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 were excluded from the study.

2.4. Statistics

Data from the standard questionnaire were entered into a Microsoft Excel sheet. Data were then exported into Stata Version 12 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.

3. Results

3.1. Socio-Demographic Characteristics

One hundred and sixty-seven (167) patients were enrolled into the study. Table 1 shows the demographic characteristics of the heart failure patients. 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). The demographic characteristics of the patients is shown in table 1.

Figure 1 shows the age and sex distribution of the patients. The age group 61-70 years had the highest incidence of heart failure.

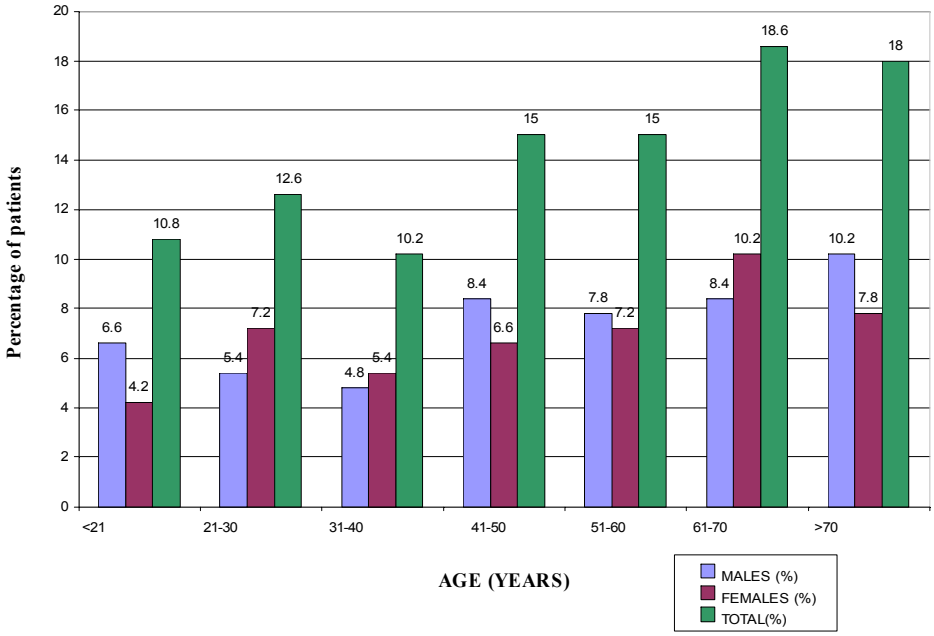

Figure 1. *Bar chart showing the age and sex distribution of all the heart failure patients.*

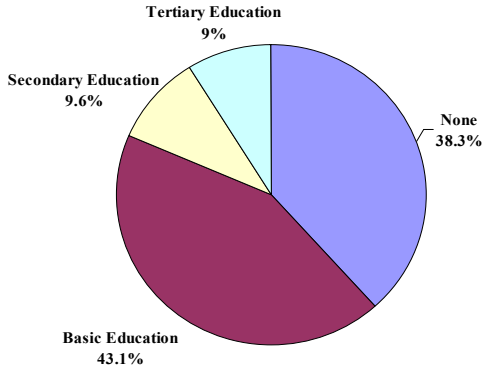

Figure 2. *Pie chart showing the educational background of the heart failure patients*

Majority (59.9 %) of the patients were married. Most (81.4 %) of the patients did not have education up to the secondary level. Figure 2 and table 2 illustrate the educational background and the occupation of the patients over the last 12 months before the study, respectively. Among the patients, 25.8 % were unemployed. Most of the employed had low-income jobs.

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. Majority of those who smoked tobacco were of low socio-economic status.

3.2. Clinical Presentation

Table 3 lists the presenting complaints of patients. The

commonest presenting complaint was dyspnoea on exertion (95.8 %, n=160), followed by fatigue (94 %, n=157) and orthopnoea (86.2 %, n=144).

Table 4 illustrates the nature of heart failure and the NYHA functional classification at presentation. BVF was seen in 71.9 % (n=120) of the patients, LVF in 16.2 % (n=27), and RVF in 11.9 % (n=20). The majority of the patients (64.2 %, n=107) presented with NYHA functional class IV. There was a significant association ($p<0.001$) between the nature of heart failure and the NYHA functional classification at presentation. Majority of the patients who were admitted with BVF presented with NYHA functional class IV (severe heart failure).

Table 1. *The clinico-demographic characteristics of the heart failure patients.*

Patients clinico-demographic characteristics	
Gender of Patients	**Number (%)**
Males	86 (51.5)
Females	81 (48.5)
Age (years)	
Males	
Mean±SD	50.9 (±21.4)
95 % CI of mean	46.3-55.5
Median	52
Range	13-90
Females	
Mean±SD	51.3 (±29)
95 % CI of mean	46.7-56
Median	53
Range	13-90
Mean Pulse rate (beats/minute)	98 (±20)
Mean SBP(mmHg)	
Hypertensive	175 (±15)
Non-hypertensive	113 (±15)
Mean DBP (mmHg)	
Hypertensive	112 (±24)
Non-hypertensive	68 (±17)
Mean BMI (kg/m^2)	
Males	21.1 (±3.8)
Females	22.8 (±3.6)
Mean CTR	0.67 (±0.08)
Mean LVIDd (cm)	5.7 (±1.1)
Mean Haemoglobin (g/dL)	
Males	10.9 (±2.7)
Females	10.7 (±2.8)

SD=standard deviation, CI=confidence interval
- p-value for mean ages between males and females = 0.5
- p-value for SBP between hypertensive and non-hypertensive < 0.001
- p-value for DBP between hypertensive and non-hypertensive < 0.001
- p-value for mean BMI between males and females < 0.01
- p-value for mean heamoglobin between males and females = 0.347

Hypertension was seen in 42.5 % of the patients, diabetes mellitus was seen in 9 %, anaemia was seen in 47 %, renal dysfunction was seen in 13.8 %, stroke (or transient ischaemic attacks) was seen in 3.6 %, and 1.8 % of the patients were human immunodeficiency virus (HIV) seropositive.

The clinical characteristics of the patients is shown in table 1. Mean systolic blood pressure (SBP) and the mean diastolic blood pressure (DBP) of the hypertensive patients were 175 (±15) mmHg, and 112 (±24) mmHg respectively.

SBP and DBP of the non-hypertensive patients were 113 (±15) mmHg and 68 (±17) mmHg respectively. The differences in SBP and DBP between the hypertensive and the non-hypertensive patients were statistically significant ($p<0.001$).

Mean pulse rate of the patients was 98 (±20) beats/minute. Mean body mass index (BMI) for the male patients was 21.1 (±3.8) kg/m^2 and that of the female patients was 22.8 (±3.6) kg/m^2. The difference in the BMI between the male and female patients was statistically significant ($p<0.01$).

Table 2. *Occupation (over the last 12 months) of the heart failure patients.*

Occupation	**N**	**(%)**
Unemployed	43	25.8
Farmers	33	19.8
Traders	30	18.0
Students	16	9.6
Teachers	8	4.8
Pensioneers	7	4.2
Drivers	5	3.0
Mechanics	3	1.8
Hairdressers	2	1.2
Security officers	2	1.2
Others	18	10.8
Total	167	100

Table 3. *Presenting complaints of the heart failure patients*

Presenting complaints	**BVF N (%)**	**LVF N (%)**	**RVF N (%)**	**Total N (%)**
Dyspnoea on exertion	120 (71.9)	27 (16.2)	13 (7.7)	160 (95.8)
Fatigue	118 (70.7)	23 (13.8)	16 (9.5)	157 (94)
Orthopnoea	117 (70)	27 (16.2)	0 (0)	144 (86.2)
PND	114 (67)	26 (16)	0 (0)	140 (83)
Palpitation	104 (62.3)	17 (10.2)	17 (10.2)	138 (82.7)
Pedal swelling	110 (56.9)	0 (0)	20 (11.9)	130 (77.8)
Abdominal swelling (ascites)	88 (52.7)	0 (0)	19 (11.3)	107 (64)
Cough	67 (40)	19 (11.3)	0 (0)	86 (51.3)
Chest pain	49 (29.3)	4 (2.4)	3 (1.8)	56 (33.5)
Fever	1 (0.6)	1 (0.6)	2 (1.2)	4 (2.4)

Table 4. *Nature of heart failure and the NYHA functional classification at Presentation*

Nature of heart failure	**NYHA functional classification**			**Total N (%)**
	II	**III**	**IV**	
	N (%)	**N (%)**	**N (%)**	
Biventricular failure	2 (1.2)	37 (22.1)	81 (48.6)	120 (71.9)
Left ventricular failure	3 (1.8)	6 (3.6)	18 (10.8)	27 (16.2)
Right ventricular failure	2 (1.2)	10 (5.9)	8 (4.8)	20 (11.9)
Total	7 (4.2)	53 (31.6)	107 (64.2)	167 (100)

$p<0.001$, Pearson's chi squared

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 ($p=0.347$).

Majority of the patients had a displaced apex beat. The mean cardiothoracic ratio (CTR) of the patients' chest X-rays was 0.67 (±0.08), and their mean LVIDd was 5.7 (±1.1) cm.

Electrocardiographic LVH was found in 66.5 % of the patients, left atrial enlargement (LAE) in 3.4 %, right ventricular hypertrophy (RVH) in 9.6 % and right atrial enlargement (RAE) in 16.2 %.

4. Discussion

Diagnosis of heart failure was made clinically using the modified Framingham criteria[7, 14, 28]. 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 [30]. This method of diagnosing heart failure is more appropriate for healthcare providers in resource-poor countries where echocardiography is largely unavailable. It is recommended that echocardiography is required for all patients with suspected heart failure to obtain objective evidence of cardiac dysfunction[31].

The mean age of the heart failure patients (51.1 ± 21.1 years) in this study is similar to the mean age of heart failure patients reported by earlier publications [7, 32] from Kumasi, Ghana. Isezuo et al. [33] reported a similar mean age of 53 (±12.1) years among adult Gambians and Nigerians with heart failure, and Ajayi et al. [34]also found a similar mean age of 53 (±6) years among adult Nigerians with heart failure. However, Amoah and Kallen [14] found a lower mean age of 42.3 (±0.9) years among children and adult heart failure patients reporting to the national cardiothoracic centre in Accra. Another study in Kumasi, Ghana found a higher mean age of 63.59 (±18.12) among patients with hypertensive heart failure. It has been shown that patients with hypertensive heart failure tend to have a higher mean age[35]. The mean age of heart failure in the general European population [31] and the Framingham Heart Study [6] was reported as 74 years and 70 (± 10.8) years respectively. These data show that in the West African sub-Region, heart failure occurs almost 20 years earlier as compared to Europe and America. This could be as a result of the differences in the aetiology of heart failure. In Africa, rheumatic heart disease and cardiomyopathies, occurring usually in adolescents and young adults account for a considerable number of cases[7, 14-17] whereas in the developed world rheumatic heart disease is uncommon; ischaemic heart disease is the main cause of heart failure. Many people with myocardial infarction in the developed world are surviving because of advances in treatment. These patients eventually end up with heart failure.

Heart failure occurred almost equally in males (51.5 %) and females (48.5 %) in this study. This observation is similar to what Pobee et al. [36], Amoah and Kallen [14], and Isezuo et al. [33] have reported in the West African sub-Region. However, in Europe and America, the male sex has been described as a major risk factor for heart failure [10, 20, 21]. This is because the male sex is an important risk factor for atherosclerosis and ischaemic heart disease [31].

This study showed that the majority of the heart failure patients had low socio-economic status as shown by the occupation and the educational background of the patients. A total of 81.4 % of the patients did not have education up to the secondary level. Patients who were unemployed were 25.8 %, and the majority of the employed had low income jobs. Low socio-economic status has been described as a risk factor for rheumatic heart disease [14, 20, 21] and heart failure [6, 14, 20]. In Africa, patients with low socio-economic status are unable to afford the high cost of medical care for chronic heart failure, resulting in fatal consequences. This is due to the lack of health insurance facilities in most countries in Africa.

History of alcohol use was significant among the participants in this study. Excessive alcohol consumption and tobacco smoking have been described as behavioural risk factors for heart failure [30]. Detrimental effects of alcohol on the heart comprise a decrease in myocardial contractility, hypertension, atrial and ventricular arrhythmias [37]. Excessive alcohol consumption is strongly associated with dilated cardiomyopathy [20, 37] and the effects of alcohol on the cardiovascular system have been reported to be genetically determined [37]. Excessive alcohol consumption in patients with hypertension has been found to accelerate the progression of hypertensive heart disease [37].

The main presenting complaints of the patients in this study were dyspnoea on exertion, fatigue and orthopnoea from pulmonary oedema. This is due to the late presentation of patients to the hospital; which is the case in most parts of Africa. Patients usually wait till severe dyspnoea and orthopnoea from pulmonary oedema develop before they report to healthcare facilities.

The severity of heart failure at presentation using the NYHA functional classification in this study was similar to the findings of Oyoo and Ogola in Nairobi [38]; 62 % of their patients were in NYHA functional class IV, 31.9 % were in class III and 3.3 % were in class II. However, Amoah and Kallen at the national cardiothoracic centre in Accra [14] found majority (62.2%) of their patients in NYHA functional class III. As a national referral centre, it is likely that most of the patients they saw were already on medications and therefore, fewer patients were seen with severe heart failure (NYHA functional class IV). Another study in Kumasi among heart failure patients attending a specialist cardiac clinic showed 45% and 39 % of the patients with functional class II and III respectively[7]. These findings suggest that despite its fatality, with specialist care, heart failure patients may achieve good quality of life and live longer. Unfortunately, specialist care for heart failure patients is not readily available in many parts of Africa.

Activation of the sympathetic nervous system, mediated through noradrenaline simulation of the adrenergic system, is an important factor in severe heart failure [39]. An increased sympathetic activity raises the heart rate. Increased heart rate is a bad prognostic sign; it increases myocardial oxygen demand and reduces myocardial blood supply by diminishing coronary diastolic perfusion time. The mean resting pulse rate (98 ±20 beats/minute) of the patients in this study reflects an increased sympathetic activity in these patients which is not a good prognostic sign.

The mean SBP (175 ± 15mmHg) of the hypertensive patients in this study was slightly lower than the mean SBP (180.4 ± 28.2) reported by Isezuo et al. [26] among Gambians and Nigerians with hypertensive heart failure. However, the mean DBP (117 ± 12.9mmHg) of the hypertensive patients in this study was similar to DBP (112 ± 24 mmHg) obtained by Isezuo et al [26]. A positive relationship between diastolic dysfunction and the level of the blood pressure has been established [40], with the degree of the diastolic dysfunction proportionate to increasing level of blood pressure [40]. High blood pressure leads to concentric hypertrophy. Concentric hypertrophy impairs ventricular relaxation and filling, leading to reduced end-diastolic volume and myocardial stretching.

It has been shown [41] in Zaria, Nigeria that large ventricle (or cardiomegaly) in heart failure was a good predictor of death. In this study, the apex beat was displaced in the majority of the patients, and the mean CTR of the patients was high (0.67 ± 0.08). In resource-poor countries where echocardiography and ECG may not be available, clinical location of the apex beat and the determination of the CTR from chest X-ray may be less expensive ways of determining cardiomegaly. This should be used more often in rural areas of Africa where echocardiography and ECG are not readily available.

Majority (66.5 %) of the patients had ECG LVH. LVH which results from cardiac remodeling has been shown to increase the risk of heart failure [6]. In the Framingham heart study [6], it was found out that ECG LVH was associated with a 15-fold increase in the incidence of heart failure. The prevention or regression of LVH should be an important therapeutic goal. When present, aggressive treatment of LVH (or cardiomegaly) may prevent or delay the onset of heart failure.

Anaemia has recently been recognized as an important co-morbid condition in patients with heart failure [42] 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 [42]. 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 [42].

Even though the 47 % of the patients with anaemia seen in this study is higher than the 13.2 % reported by Oyoo and Ogola in Nairobi [38], the prevalence rate of anaemia in heart failure has been found to range from 4 % to 55 % [42]. This study has shown that anaemia is commonly associated with heart failure in Kumasi and should be looked for and treated.

Evidence available [42] suggests that renal dysfunction is independently associated with the development of heart failure, and it was seen in 13.8 % of the patients in this study. Renal dysfunction tends to be common in heart failure not only because of the reduced tissue perfusion, which occurs in heart failure; some of the conditions which predispose to heart failure also cause renal dysfunction. Hypertension is a major cause of both heart failure and renal dysfunction.

Diabetes mellitus has been described as a risk factor for heart failure [6, 20]. In the Framingham study [6] diabetes mellitus was found to be associated with a 4-fold increase in the incidence of heart failure. The increase in incidence of heart failure in diabetics has been attributed to coronary artery disease, concomitant hypertension and diabetic CMP [6, 21]. In this study, diabetes mellitus was seen in 9 % of the patients. This may be under-estimation because fasting blood glucose was not done for all the patients.

Individuals with stroke are at heightened risk for, or have associated comorbid heart failure [43]. This is because stroke and heart failure share links to many of the predisposing, potentially modifiable risk factors such as hypertension, diabetes mellitus, abnormal blood lipids and tobacco smoking [43]. This might explain the reason why 3.6 % of the heart failure patients had co-morbid stroke or transient ischaemic attack.

5. Conclusion

In conclusion, heart failure occurred almost equally in males and females with the highest incidence in age group 61-70 years. Majority of the patients presented with BVF and NYHA functional class IV. Most of the patients had low socio-economic status. The commonest presenting complaint was dyspnoea on exertion, and ECG LVH, hypertension and anaemia were three major conditions seen in the patients.

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