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SPECTRUM OF CARDIOVASCULAR DISORDERS IN A NATIONAL REFERRAL CENTRE, GHANA
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SPECTRUM OF CARDIOVASCULAR DISORDERS IN A NATIONAL REFERRAL CENTRE, GHANA

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ABSTRACT

Objective: **To determine the pattern of cardiovascular disorders in Ghana.**
Design: **A four-year prospective study.**
Setting: **National Cardiothoracic Centre (NCTC), Korle-Bu Teaching Hospital, Accra, Ghana.**
Subjects: **Seven hundred and eight subjects with cardiovascular disorders referred to the NCTC, Accra, were evaluated clinically and with ancillary laboratory tests, chest x-ray, and electrocardiography. Subjects were also assessed with the aid of two-dimensional echocardiography with doppler and colour flow mapping.**
Results: **Hypertensive heart disease(n=133), rheumatic heart disease(n=123), idiopathic cardiomyopathy(n=103), congenital heart disease(n=90) and coronary artery disease(n=80) were the major causes of cardiovascular morbidity. The mean age of the subjects was 41.6 ± 0.8 years. The male to female ratio was 1.3:1.0. The peak incidence of cardiovascular disease occurred in the fifth decade. Subjects with coronary artery disease were relatively older and had the highest incidence of hypertension(66.3%), diabetes(22.5%), smokers(11.8%), hyperlipidaemia(8.8%) and regular alcohol use(12.5%). The commonest rheumatic valvular lesion was mitral regurgitation. Dilated cardiomyopathy was the commonest form of cardiomyopathy(n=56). Hypertrophic cardiomyopathy and endomyocardial fibrosis were seen in 25 and 22 subjects respectively. Ventricular septal defect, atrial septal defect, tetralogy of Fallot and patent ductus arteriosus were the commonest congenital lesions. The major cardiovascular disorders in children were congenital (n=27) and rheumatic heart(n=11). Idiopathic cardiomyopathy(n=1) was rare in children.**
Conclusion: **Major causes of cardiovascular morbidity in Ghanaians were hypertension, rheumatic heart disease and cardiomyopathy. Congenital and rheumatic heart diseases were the commonest cardiovascular disorders in Ghanaian children. Idiopathic cardiomyopathy was rare in children.**

INTRODUCTION

Cardiovascular disorders pose an increasing burden on health resources of many low and middle-income countries(1). Hypertension, rheumatic heart disease, cardiomyopathy and congenital heart disease are major cardiovascular conditions in sub-Saharan Africa(2-7), and contribute significantly to cardiovascular morbidity and mortality(6-10). There is, however, a paucity of literature with respect to cardiovascular disease in Africa(11). Even fewer studies have been reported from Ghana. Moreover, previous clinical studies on heart disease in Ghana relied largely on clinical acumen with supportive evidence from the chest X-ray and electrocardiogram for diagnosis (4,9,12-14). Furthermore, the aetiology of heart disease was often said to be obscure or probable(4,9,12-14). Besides, it is nearly twenty years since the study of Kpodonu *et al*(4), which employed, to a very restricted extent , M-mode echocardiography to aid cardiac diagnosis.

The National Cardiothoracic Centre (NCTC) at the Korle Bu Teaching Hospital, Accra, is the only national and tertiary referral centre for cardiovascular disorders in Ghana, and receives referrals from all over the country. In this communication, the spectrum of cardiovascular disorders seen at the NCTC, is presented.

MATERIALS AND METHODS

In this prospective study, 708 consecutive subjects with cardiovascular disorders referred to the National Cardiothoracic Centre, Korle Bu Teaching Hospital, Accra, from January, 1992 to December, 1995, were evaluated to determine the nature of their disease. The patients were referred to the NCTC by specialist internists and paediatricians from the two tertiary teaching hospitals, and the ten provincial hospitals in the country. Some subjects also came to us from practitioners in sub-provincial (district) hospitals, and private and quasi-government health facilities.

Clinical data were collected including the age and sex of subjects. The presence of hypertension [BP > 160/95 mm Hg(15), or use of anti-hypertensive drugs], diabetes mellitus, anti-diabetic drug use, alcohol ingestion and smoking of cigarettes were recorded. It is to be noted that hypertension is generally diagnosed in Ghana by the WHO criteria(15) [Amoah, AGB; personal observation]; therefore this criteria was used rather than that of the Joint National Committee(16). A previous history of hypertension, rheumatic fever/rheumatic heart disease, coronary artery disease, diabetes mellitus, angina or myocardial infarction were also ascertained. Patients had a chest x-ray and 12-lead electrocardiogram. M-mode and two-dimensional doppler echocardiography with colour flow was performed on all subjects, using an Aloka SSD-870 Colour Doppler Echocardiograph equiped with 2.5,3.5,5.0 MHz and biplane transoesophageal probes. Standard echocardiographic procedures(17-19) were followed. In subjects with poor images on transthoracic echocardiography, transoesophageal echo was performed to ascertain the underlying cardiac lesion. Hyperlipidaemia was noted if the subject, after a 10-12 hour fast, had one or more abnormal serum lipid profiles (total cholesterol >5.2mmol/l; LDL cholesterol > 3.4mmol/l; HDL cholesterol <1.1mmol/l; fasting triglyceride >1.7mmol/l (20) or if the subject was on lipid lowering diet or drugs for hyperlipidaemia. Results of other tests such as stress electrocardiography, thyroid function and blood culture results were noted.

Data were entered on a personal computer and analysed using the statistical package of Excel (Microsoft, USA) to determine means and standard error of means (SEM).

RESULTS

The mean age of the Ghanaian subjects was 41.6 ± 0.8 (SEM) years. The age range was 0.02 to 95 years. The male to female ratio of the subjects was 1.3:1.0. Table 1a shows the spectrum of cardiovascular disorders observed in the subjects. Hypertensive heart disease (n=133; 18.8%) was the commonest disorder. Rheumatic heart disease (n=123; 17.3%), idiopathic cardiomyopathy (n=103; 14.6%), congenital heart disease (n=90; 12.7%) and coronary artery disease (n=80; 11.3%) were other major causes of cardiovascular morbidity. Table 1b shows other miscellaneous cardiovascular disorders seen in Ghanaian subjects.

Table 1a

Spectrum of cardiovascular disorders in Ghanaian subjects (n=708)

Cardiovascular disorder	% subjects (n)
Hypertensive heart disease	18.8 (133)
Rheumatic heart disease	17.4 (123)
Idiopathic cardiomyopathy	14.6 (103)
Congenital heart disease	12.7 (90)
Coronary artery disease	11.3 (80)
Pericardial disorders	7.9 (56)
Infective endocarditis	4.5(32)
Arrhythmia	1.8 (13)
Primary pulmonary hypertension	1.7 (12)
Thyrotoxic heart disease	1.4 (10)
Aortic aneurysm	1.1 (8)
Anaemia	0.9 (6)
Pulmonary embolism	0.9 (6)
Thromboembolic pulmonary hypertension	0.7 (5)
Miscellaneous	4.4 (31)

Table 1b

Miscellaneous cardiovascular disorders in Ghanaian subjects

Cardiovascular disorder	No. of subjects
Amyloid heart disease	3
Annuloectasia of aorta	4
Aortic root sclerosis	1
Aortic valve replacement	2
Cardiac trauma	1
Calcific aortic stenosis	3
Left ventricular aneurysm	1
Marfan's syndrome with aortic regurgitation	2
Mitral valve prolapse	9
Mitral valve replacement	1
Viral myocarditis	1
Pulmonary ectasia	1
Tricuspid regurgitation	1
Tricuspid valve prolapse	1

Table 2 shows the distribution by age, sex and disease category. The peak incidence of cardiovascular disease occurred in the fifth decade. The major cardiovascular disorders in subjects aged 12 years and below were congenital heart disease (n=27), rheumatic heart disease (n=11) and pericardial disease (n=7). Idiopathic cardiomyopathy (n=1) was rare in children.

Table 3 shows the mean ages, sex ratio and risk factor profiles of adult subjects (13 years and above) with major cardiovascular disorders. Subjects with coronary artery disease were relatively older (mean age 60.1 ± 1.2 years) and had the highest incidence of smokers, hypertension (if subjects with hypertensive heart disease are excluded), hyperlipidaemia, diabetes and regular alcohol use. There were relatively more males with coronary artery disease than females (Table 3).

A previous history of rheumatic fever was elicited in 18 (14.6%) subjects with rheumatic heart disease. 31.7% of subjects with rheumatic heart disease were aged 20 years or below (Table 2). Table 4 shows the pattern of valvular involvement in rheumatic heart disease. The commonest rheumatic valvular lesion in Ghanaian subjects on doppler echocardiography with colour flow mapping was mitral regurgitation. Tricuspid stenosis was distinctly rare.

Dilated cardiomyopathy was the commonest form of idiopathic cardiomyopathy (n=56). Hypertrophic cardiomyopathy and endomyocardial fibrosis were seen in 25 and 22 subjects respectively. The main types of congenital heart lesions in Ghanaian subjects are shown in Table 5. The commonest congenital heart lesions were ventricular septal defect, atrial septal defect, tetralogy of Fallot and patent ductus arteriosus.

Table 2

The number of Ghanaian subjects by disease, age and sex category

CVD	Age categories (years)																Total		
	≤12		13-20		21-30		31-40		41-50		51-60		61-70		>70				
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M + F
HHD	–	–	1	1	1	–	11	7	17	9	16	18	19	14	8	11	73	60	133
RHD	7	4	12	16	12	11	10	7	8	9	7	7	7	6	–	–	63	60	123
CMP	1	–	1	10	11	10	9	12	11	8	12	3	2	4	5	4	52	51	103
CHD	16	11	8	17	10	8	4	5	6	4	–	–	–	1	–	–	44	46	90
CAD	–	–	–	–	–	–	1	2	8	3	20	5	22	8	8	3	60	20	80
PCD	3	4	4	6	12	5	4	2	3	1	3	–	4	3	1	1	34	22	56
INF E	2	2	1	5	2	5	3	1	3	2	1	1	3	–	–	–	15	17	32
ARRH	–	–	–	–	2	–	1	2	1	2	–	–	1	1	1	1	7	6	13
PPHT	–	–	2	1	2	1	1	1	3	–	–	–	–	–	–	1	8	4	12
THD	–	–	–	–	–	–	2	–	4	–	3	–	–	1	–	–	–	10	10
A AN	–	–	–	–	–	–	–	–	2	–	2	–	2	–	1	1	7	1	8
P EM	–	–	–	–	–	–	–	2	1	–	–	–	2	–	–	1	3	3	6
ANAE	–	–	5	–	–	–	–	–	–	–	–	–	–	–	–	1	5	1	6
TEP	–	–	–	–	–	–	–	2	–	–	1	–	2	–	–	–	3	2	5
MISC	2	–	–	2	5	2	2	2	4	–	4	1	2	–	3	1	23	8	31
	31	21	35	59	57	42	47	46	67	42	67	38	66	39	27	24	397	311	708
Total	52		94		99		93		109		105		105		51		708		

CVD = Cardiovascular disease; M = Male; F = Female; HHD = Hypertensive heart disease; RHD = Rheumatic heart disease; CMP = Idiopathic cardiomypathy; CHD = Congenital heart disease; CAD = Coronary artery disease; PCD = Pericardial disorder; INF E = Infective endocarditis; ARRH = Arrhythmia; PPHT = Primary pulmonary hypertension; THD = Thyrotoxic heart disease; A AN = Aortic aneurysm; P EM = Pulmonary embolism; ANAE = Anaemia; TEP = Thromboembolic pulmonary hypertension; MISC = Miscellaneous cardiovascular disorders

Table 3

Characteristics and risk factor profile of adult subjects with major cardiovascular disorders

Disorder	Mean age ± SEM (years	Male: Female Ratio (%)	Smokers (%)	Hyperlipidaemia (%)	Hypertension (%)	Diabetes mellitus (%)	Alcohol use (%)
HHD	56.1 ± 1.2	54.9 ± 45.1	2.3	2.3	100	6.0	8.3
RHD	36.3 ± 1.6	50 ± 50	0	0	0	0	0
ICM	41.2 ± 1.7	50 ± 50	2.9	0	2.9*	0	10.8^
CHD	27.1 ± 1.4	75 ± 25	0	0	0	0	0
CAD	60.1 ± 1.2	44.4 ± 55.6	11.3	8.8	66.3	22.5	12.5

HHD = Hypertensive heart disease; RHD = Rheumatic heart disease; CMP = Idiopathic cardiomyopathy; CHD = Congenital heart disease; CAD = Coronary artery disease

*Subjects who also had hypertrophic cardiomyopathy; ^In subjects with dilated cardiomyopathy (n=8) and hypertrophic cardiomyopathy (n=2)

Table 4

Valvular involvement in rheumatic heart disease ascertained by 2-dimensional echocardiography with Doppler and colour flow in Ghanaian subjects

Valve lesion	% subjects with lesion (n)
Ar	5.69 (7)
ar/as	5.69 (7)
ar/tr	0.81 (1)
As	1.63 (2)
Mr	16.26 (20
mr/ar	13.01 (16)
mr/ar/pr	0.81 (1)
mr/ar/tr	4.88 (6)
mr/ar/tr/pr	0.81 (1)
mr/ms	9.76 (12)
mr/ms/ar	0.81 (1)
mr/ms/ar/as	0.81 (1)
mr/ms/ar/pr	0.81 (1)
mr/ms/ar/tr	2.44 (3)
mr/ms/tr/ts	1.63 (2)
mr/tr	11.38 (14)
mr/tr/pr	3.25 (4)
Ms	9.76 (12)
ms/ar	3.25 (4)
ms/ar/pr	0.81 (1)
ms/ar/tr	0.81 (1)
ms/ar/tr/pr	0.81 (1)
MVR	0.81 (1)
mr/ms/tr	2.44 (3)
mr/ms/ar/tr/pr	0.81 (1)

ar=aortic regurgitation; as = aortic stenosis; mr = mitral regurgitation; ms = mitral stenosis; tr = tricuspid regurgitation; ts = tricuspid stenosis; pr = pulmonary regurgitation; MVR = mitral valve replacement

Table 5

Spectrum of congenital heart lesions in Ghanaian subjects

Congenital lesion	No. of subjects
ASD 1	4
AVCD/ASDII	1
AVCD	1
ASD II	13
ASD II/VSD	1
Bicusp aortic valve	1
Cleft mitral valve	1
Double outlet right ventricle	1
Congenital mitral stenosis	1
PAPVD	1
Patent ductus arteriosus	3
Single ventricle	1
Subaortic stenosis	5
Supravalvar pulmonary stenosis	3
Sinus of Valsalva aneurysm	1
Transposition of great arteries	1
Tetralogy of Fallot	12
Tetralogy of Fallot/ASD	1
Pulmonary stenosis (valvar)	1
VSD	32
VSD/Subaortic stenosis/Bicusp aortic valve	1
VSD/Congenital mitral stenosis	1
VSD/Patent ductus arteriouss	1
VSD/Suboartic stenosis	1
VSD/Pulmonary stenosis (valvar)	1

ASD I = Primum atrial septal defect; ASD II = Secundum atrial septal defect; AVCD = Atrioventricular canal defect; DORV = Double outlet right ventricle; PAPVD = Partial anomalous pulmonary venous drainage; VSD = Ventricular septal defect

Constrictive pericarditis was seen in five subjects. Predisposing lesions commonly identified in subjects with infective endocarditis included rheumatic heart disease (n=11; 34.4%), mitral valve prolapse (n=7; 21.9%) and congenital heart disease (n=6; 18.8%). In another 18.8% of subjects with endocarditis no underlying cardiac disease was evident. Vegetations were commonly seen on the mitral valve (n=13). Blood cultures were rarely positive (n=4) in clinical cases of endocarditis.

Table 6a

Arrhythmias observed on resting 12-lead ECGs in subjects with no structural lesions of the heart

Arrhythmia	No. of cases
Atrial flutter	1
Broad complex tachycardia	1
Complete heart block	5
Intermittent Wolff Parkinson White syndrome	1
Lone atrial fibrillation	3
Mobitz II heart block	1
Supraventricular tachycardia	1

Table 6b

Subjects with structural cardiovascular disorders who were in sinus rhythm or had abnormal rhythms on their resting 12-lead ECGs

Arrhythmia	HHD	RHD	CMP	CHD	CAD
Sinus rhythm	119	93	93	88	78
Atrial fibrillation	10	18	6	2	1
Atrial flutter	1	0	2	0	0
Complete heart block	2	0	0	0	1
Supraventricular tachycardia	1	0	2	0	0

HHD = Hypertensive heart disease; RHD = Rheumatic heart disease; CMP = Idiopathic cardiomyopathy; CHD = Congenital heart disease; CAD = Coronary artery disease

Table 6a shows the arrhythmias observed on resting ECGs in subjects with no structural lesions of the heart. Table 6b shows the cardiac rhythms observed in the subjects who had one of the major structural cardiovascular disorders.

DISCUSSION

The speed and relative simplicity of echocardiography compared with more sophisticated methods for evaluating cardiac problems make it ideal for developing countries(21). Two-dimensional echocardiography with doppler and colour flow mapping provide a non-invasive means for accurate cardiovascular diagnosis(17-19). To the best of our knowledge, this is the first study to employ these imaging modalities to ascertain the spectrum of cardiovascular disorders in Ghanaians.

In the present study, hypertensive heart disease was a major cause of cardiovascular morbidity among subjects seen at the National Cardiothoracic Centre in Accra. A review of 303 cases seen at the cardiac clinic at the Korle Bu Teaching Hospital in Accra from 1969 to 1973 revealed that 44.5% of patients had systemic hypertension(13). Indeed, hypertension was estimated to account for 24% of outpatients attending the general physician (adult medical) clinics at the

hospital(13). In a review of the causes of deaths in adult medical patients at Korle-Bu Hospital, hypertension was responsible for 36% of those dying from heart failure(9). In a five-year period (1975-1979), Kpodonu *et al*(4) reported that 44% of their 773 cardiac subjects at the same hospital had hypertensive heart disease and that hypertension was responsible for 49% of all cardiovascular deaths. The relatively lower rate of hypertensive heart disease observed in our subjects may have been due to selection bias. As observed by Pobee(13), the majority of subjects with hypertension and hypertensive heart disease continue to attend the general physician clinics run by specialist physicians (internists) at the same hospital.

Rheumatic heart disease remains a major cause of cardiac pathology at our centre. In 1975, valvular heart disease was responsible for 20.6% of cases seen at the cardiac clinic(13). In the series of Kpodonu *et al*(4), 15% of subjects were said to have rheumatic heart disease. Of subjects dying with heart failure and cardiovascular disease, about 11% had valvular lesions of the heart(4,9). The rheumatic aetiology of the valvular lesions in these earlier studies was often unclear. Only one study used, and to a very limited extent, M-mode echocardiography(4). In the present series, 17.3% of subjects had rheumatic heart disease. The relatively high number of young subjects with rheumatic heart disease in a predominantly adult cardiac centre confirms other reports from other developing countries(6). Most studies report a predominance of mitral valve involvement in rheumatic heart disease. The present study confirms this observation. Mitral regurgitation (n=86) was the commonest valvular lesion. Pure mitral regurgitation(n=20) accounted for about one-fourth of those with mitral regurgitation. Aortic regurgitation was the second commonest valvular lesion in Ghanaians with rheumatic heart disease. Stenotic valve lesions were relatively uncommon in Ghanaians. Despite the decline in the incidence in rheumatic heart disease in developed countries(22,24), sub-Saharan countries continue to record relatively high levels of the disease(7,23-25). The preponderant poor socio-economic conditions, overcrowding and inadequate medical services on the continent are said to favour the relatively high rates of rheumatic heart disease(25). It must be noted that the cost of valve replacement surgery in Ghana is currently estimated at 5,000 USD. Moreover, 60% of about 200 open heart cases done annually at the NCTC, Accra, are due to rheumatic heart disease (Frimpong-Boateng K, 1999, personal communication) and this is extremely high in a country with a GNP of under 500 USD. It may be timely therefore to promote primary prevention of rheumatic heart disease through widespread use of penicillin to prevent acute rheumatic fever and its costly cardiac complications in Ghana.

In the present series, idiopathic cardiomyopathy occurred in 14.6% of subjects. Dilated cardiomyopathy was the commonest type. This condition is not well understood. It is interesting to note that regular alcohol use was relatively higher among subjects with dilated than the other forms of cardiomyopathy. Pole *et al*(26), noted that 16% of 241 cardiac patients in Accra had cardiomyopathy. In 2,645 randomly selected community sample from urban Accra, 8.9% were said to have obscure cardiomegaly (12). In a series of 773 cardiac patients at the Korle Bu Teaching Hospital, Accra, Kpodonu *et al*(4) reported a slightly higher proportion of cases with cardiomyopathy (19.1%). It is conceivable that some of their cases of dilated cardiomyopathy may actually have been due to previously undiagnosed hypertension presenting as normotensive heart failure; the authors reported that 20% of their subjects later developed moderate hypertension(4). It is possible that some of the cases in the present series may have been due to secondary cardiomyopathy as neither myocardial biopsies nor viral serological studies were performed.

Endomyocardial fibrosis has characteristic echocardiographic features(27) and it was observed in 22 subjects. The disease had not previously been described in Ghanaians although endomyocardial fibrosis occurred in neighbouring Cote d'Ivoire and in Nigeria(28,29). In the present series, hypertrophic cardiomyopathy was observed in 25 subjects. Though mentioned, no figures were quoted by Kpodonu *et al*(4) for hypertrophic cardiomyopathy in their series.

The most common cardiovascular disorder in Ghanaian children was congenital (51.9%) and rheumatic heart (21.2%) diseases respectively. This finding is in agreement with that of El Hag, who reported that among his 179 Sudanese children who had echocardiography, 56% and 39% respectively had congenital and rheumatic heart disease respectively(30). Ventricular septal defect was the commonest congenital lesion in our subjects. In 1980, it was reported that 2.8 % of subjects on the adult cardiac register at the Korle Bu Teaching hospital had congenital heart disease(4). The higher proportion of congenital heart disease in our study population may be due to better diagnostic facilities. Furthermore, in the earlier study, the subjects were all adults and cardiac diagnosis was essentially clinical with no facility for two-dimensional or Doppler echocardiography(4). It must be noted that in a more recent study from Kenya, which employed two-dimensional and Doppler echocardiography, and which involved largely a paediatric or young adult subjects, congenital heart disease was also the commonest cardiac disease (38.4%) in 117 subjects with abnormal echocardiographic findings(23). In a recent study at our centre, congenital heart disease was responsible for 48% of heart failure cases in children(32).

In the present series pericardial disease, mainly cardiac tamponade from predominantly idiopathic and infective pericarditis occurred in 7.9% subjects. Five subjects had constrictive pericarditis. The proportion of subjects with pericardial disease on the Accra Cardiac Register in 1980 was 1.7% (4). The relatively high number of cases of pericardial disease in our series may have been partly the result of selection bias and partly the result of better diagnostic facilities. As noted elsewhere(32), subjects with cardiac tamponade were likely to be referred to our centre for echo-guided pericardiocentesis.

Out of 4000 medical admissions seen over a three

year period (1968-1970) at the Korle Bu Teaching Hospital, ten had ischaemic heart disease(31). Nearly a decade later, the coronary artery morbidity and mortality at the Korle Bu Teaching Hospital were 3.6% and 5.9% respectively among cardiac patients(4). Compared with the earlier studies from Ghana, a greater proportion of the subjects (11.3%) in the present study had coronary artery disease. Acculturation and urbanisation of the local population may be a factor in the apparent increase in trend for coronary artery disease. Known major risk factors for coronary artery disease identified in our subjects with coronary artery disease were hypertension (66.3%) and diabetes (22.5%). Smoking and hyperlipidaemia were noted in 11.3 and 8.8% of the subjects respectively. Further work is however, needed to confirm an increasing trend in coronary artery disease and to ascertain the levels of risk factors in Ghanaians.

In the present series, infective endocarditis occurred in 4.5% of subjects. Predisposing cardiac lesions identified in subjects included rheumatic valvular lesions (34.4%), mitral valve prolapse (21.9%) and congenital heart lesions (18.8%). Mitral valve prolapse appears to be overtaking congenital heart disease as a risk factor for endocarditis. Any change in the pattern of endocarditis remains however to be confirmed in a study involving a larger number of subjects. It is also to be noted that endocarditis occurred in a significant proportion of subjects (18.8%) with normal native valves. Vegetations were commonly seen on the mitral valve. A common practice among Ghanaians is to buy capsules of antibiotics from street peddlers and to take these when not feeling well (personal observation, Amoah AGB). This may explain the relatively high proportion of culture negative endocarditis in the present series. In the study by Kpodonu *et al*(4), only two subjects had endocarditis. Primary pulmonary hypertension and aneurysm of the aorta were diagnosed in 12 and eight subjects respectively. It is noteworthy that these conditions were not mentioned in the earlier series from Ghana(4,9,13).

In those with structurally normal hearts on echocardiography, complete heart block was the commonest arrhythmia. Lone atrial fibrillation occurred in three subjects. The commonest abnormal cardiac rhythm disturbance in those with diseased hearts was atrial fibrillation.

Though the data presented in this report are based on hospital study and therefore highly selective and unrepresentative for the general Ghanaian population, they nevertheless provide useful information regarding cardiovascular morbidity, which may be helpful to health planners and policy makers in Ghana. The study also confirms that the two major causes of cardiovascular morbidity in Ghanaians are hypertension and rheumatic heart disease. These are largely preventable and controllable disorders whose prevention and control through intervention programmes may be cost effective(33).

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