

Cardiovascular causes of death in an east African country: An autopsy study

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Abstract

Background: *The spectrum of cardiovascular diseases varies between countries. Data from east Africa is scarce, but important in formulating disease management strategies. The aim of this study was to describe the spectrum of cardiovascular causes of death in Kenya.*

Methods: *One hundred and thirty four autopsy cases of cardiovascular related deaths examined at the Department of Human Anatomy, University of Nairobi, from December 2005 to November 2009 were analyzed for disease type, age and gender distribution. Only cases in which cardiovascular disease was the most likely cause of death were included. Data was analyzed using SPSS version 15.0 for Windows and presented using tables and bar graphs.*

Results: *Cardiovascular causes comprised 13.2% of all autopsy cases. Common conditions included myocardial infarction (18.7%), cardiomyopathy (17.2%), subarachnoid hemorrhage (15.7%), pulmonary thromboembolism (14.2%), ruptured aortic aneurysm (11.2%) and hypertensive heart disease (9.0%). Infective pericarditis and rheumatic heart disease comprised 7.5% and 6.7%, respectively. Mean age was 50.4 years, peaking at 40–60 years, with 56.7% aged 50 years and younger. Male: female ratio was 2.7:1.*

Conclusions: *Cardiovascular disease contributes more than 13% of overall mortality in Kenya. Myocardial infarction is the commonest, while rheumatic heart disease is the rarest. It is predominantly male and mainly affects those aged under 50 years. This suggests that non-communicable diseases, while predominant, overlap with infectious conditions as causes of cardiovascular mortality. A search for, and the prevention of, risk factors, combined with prudent management of infection, are recommended. (Cardiol J 2011; 18, 1: 67–72)*

Key words: cardiovascular disease, myocardial infarction, Africa, Kenya

Introduction

The spectrum of cardiovascular diseases (CVD) varies between, and within, countries depending on stage of epidemiological transition and risk factor profiles [1, 2]. With increasing risk factors in sub-Saharan Africa, CVD constitutes a major health problem, with myocardial infarction (MI), for example, rapidly approaching epidemic propor-

tions [3]. Preliminary reports indicate that CVD complications occur more frequently in Africans than in Caucasians and most affected individuals are young [4]. This imposes a high economic burden because of the number of active life years lost [1]. To avert this imminent epidemic, data is essential to inform health promotion and prevention strategies. Most of the data available is from south and west Africa [5]. Data from east Africa is generally

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Table 1. Criteria for diagnosis of cardiovascular cause of death.

Condition	Clinical history	Autopsy findings
Myocardial infarction	History of angina pectoris Medical record of treatment for coronary heart disease	Visible significant narrowing or blockage of coronary artery Myocardial pallor
Hypertensive heart disease	History of hypertension	Cardiomegaly (> 400 g) Left ventricular hypertrophy
Pericarditis	Abdominal distension Leg edema History of treatment for tuberculosis	Pericardial effusion and thickening
Rheumatic heart disease	Heart disease in childhood	Thickening/calcification of valve leaflets Fusion, shortening, fibrosis and calcification of chordae tendinae
Cardiomyopathy	Record of cardiomyopathy Absence of above conditions, chronic alcoholism, systemic disease or congenital heart disease	Cardiomegaly
Pulmonary thromboembolism	History of immobilization or deep vein thrombosis	Thrombus in pulmonary arterial system
Subarachnoid hemorrhage	Sudden history of headache, neck stiffness or neurological deficit	Blood in the subarachnoid space
Ruptured aortic aneurysm	Sudden onset of chest or abdominal pain	Hemoperitoneum or hemomediastinum

scarce, and often conflicting [6, 7]. Our study therefore investigated the spectrum of cardiovascular causes of death in Kenya, an east African country.

Methods

Study design and setup

This was a prospective autopsy study at Chirromo Funeral Parlor (CFP), Department of Human Anatomy, University of Nairobi, Kenya between December 2005 and November 2009. CFP is a commercial unit which receives an average of 3,300 bodies a year. It serves middle to lower class Kenyans from all ethnic communities. Ethical approval for the study was granted by Kenyatta National Hospital/University of Nairobi — Ethics and Research Committee. Autopsy examination was requested by next of kin.

The commonest reasons for autopsy request were to find the cause of unexplained death and to document details of fatal injury to facilitate settlement of medical insurance claims.

Methodology

The study included all cases of non-violent death which had occurred within 12 hours from onset of complaint. At the time of request for autopsy examination, the situation was explained to the next of kin and they were asked to sign con-

sent for inclusion in the study. Those who did were asked to provide information as to the deceased's age, gender, past medical history and the symptoms that immediately preceded death. History of hypertension, treatment for heart disease, angina pectoris, breathlessness at rest or exertion and leg edema were recorded. Diagnosis of CVD was based on these features and the autopsy findings shown in Table 1. All autopsies were done by a consultant pathologist with the participation of at least one of the authors. During autopsy, all systems were examined, but with the emphasis on the heart, lungs, brain and blood vessels. The heart was weighed and inspected, then opened. The chambers, valves, chordae tendinae and coronary arteries were given special attention. The ventricles were sectioned serially 10 mm apart. The myocardium was inspected macroscopically for pallor, and coronary arteries checked for narrowing, blockage and hardening.

Data analysis and presentation

The data was analyzed for age, sex and predominant cardiovascular cause of death. Those in whom age was unknown, cardiovascular diagnosis was uncertain, or in whom another major pathology was detected, were excluded from the study. Data analysis was done via SPSS version 15.0 for Windows and presented in the form of tables and bar graphs.

Table 2. Mean affected age of cardiovascular causes of death.

Diagnosis	Frequency	Mean age
Myocardial infarction	25	48
Cardiomyopathy	23	50
Subarachnoid hemorrhage	21	58
Pulmonary thromboembolism	19	49
Ruptured aortic aneurysm	15	55
Hypertensive heart disease	12	52
Pericarditis	10	23
Rheumatic heart disease	9	44
Total	134	

Results

One hundred and forty five cases were examined. Eleven were excluded, two for absence of definite age, four for presence of other major pathology, and five for uncertain diagnosis. Cardiovascular causes comprised 13.2% (n = 134) of the 1,016 autopsies done over the study period. Leading cardiovascular causes of death were MI (18.7%), cardiomyopathy (17.2%), subarachnoid hemorrhage (15.7%), pulmonary thromboembolism (14.2%), ruptured aortic aneurysm (11.2%) and hypertensive heart disease (8.9%). Infective pericarditis and rheumatic heart disease comprised 7.4% and 6.7%, respectively.

Non-cardiovascular causes of death in the remaining cases were related to injury (45.1%), infection (25.1%), poisoning (7.5%), malignancy (5.5%) and aspiration pneumonitis (3.6%).

Age and gender distribution

Overall mean age was 50.4 (range 22–79) years; varying with condition. Pericarditis had the

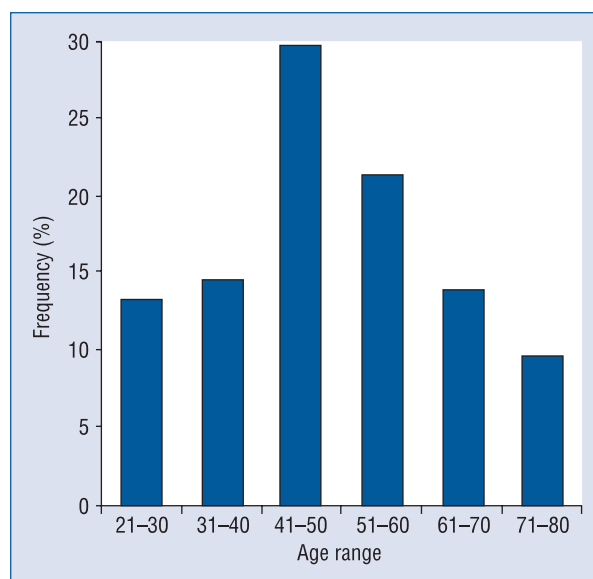


Figure 1. Age distribution of cardiovascular deaths.

lowest mean age (Table 2). Most of the subjects (56.7%) were aged 50 or below (Fig. 1). Age distribution, however, varied with condition (Table 3). Overall male to female ratio was 2.7:1 but also varied with condition. The highest male predominance was observed in pericarditis, cardiomyopathy and subarachnoid hemorrhage. That of MI was 2.1:1 (Fig. 2).

Discussion

CVD accounts for only 9.2% of the total causes of death in Africa [8]. Most deaths, in Kenya for example, are caused by communicable diseases such as malaria, tuberculosis, Human Immune deficiency virus, respiratory and gastrointestinal infections [9, 10]. The current study, however, re-

Table 3. Distribution of cardiovascular causes of death by age.

Diagnosis	Frequency for age groups						Total
	21-30	31-40	41-50	51-60	61-70	71-80	
Myocardial infarction		7	10	4	4		25
Cardiomyopathy	3	7	2	1	5	5	23
Subarachnoid hemorrhage	3	4	3	7		4	21
Pulmonary thromboembolism	3		5	9		2	19
Ruptured aortic aneurysm			4	3	8		15
Hypertensive heart disease		2	6	3		1	12
Pericarditis	8	2					10
Rheumatic heart disease		1	8				9
Total	17	23	38	27	17	12	134

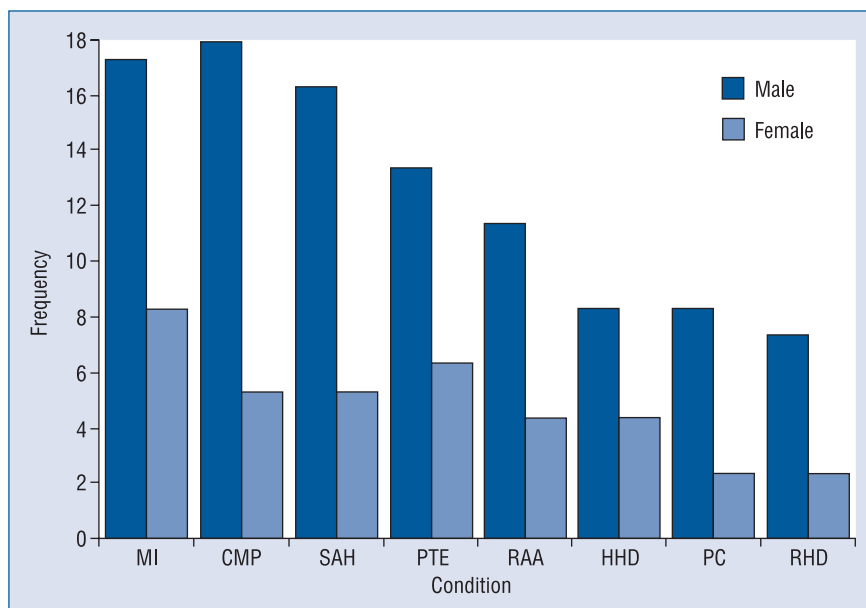


Figure 2. Gender distribution of different cardiovascular diseases; MI — myocardial infarction; CMP — cardiomyopathy; SAH — subarachnoid hemorrhage; PTE — pulmonary thromboembolism; RAA — ruptured aortic aneurysm; HHD — hypertensive heart disease; PC — pericarditis; RHD — rheumatic heart disease.

veals that cardiovascular deaths constitute 13.2% of the total, comparable to the 13.8% found in Botswana [11]. This suggests that some sub-Saharan African countries are at a more advanced stage of epidemiological transition. This is at variance with reports that sub-Saharan Africa is largely in the first stage [12]. This finding supports literature reports that countries in the same region as each other, or parts of the same country, may be at different stages of transition [1]. This difference is reflected in the profile of cardiovascular conditions observed in the current study.

Profile of cardiovascular disease

Most CVD cases in sub-Saharan Africa are reported to be due to non-ischemic causes with rheumatic, hypertensive heart, cardiomyopathy, chronic lung and pericardial diseases predominating [1, 4]. Autopsy studies reveal, for example, that in Ghana, while mortality from hemorrhagic stroke is high, the incidence of MI is very low [13]. In Ethiopia, MI accounts for only about 6.5% of deaths [14]. In west Africa in general, it accounts for 6–9% of cases and in south Africa it is also very low (Table 4) [15–17].

In Kenya, the predominant conditions are reported to be rheumatic heart disease, cardiomyopathy, hypertensive heart and pericardial diseases. Ischemic heart disease accounts for only about 2% of heart failure cases [6]. Our current study reveals, at variance with previous reports, that MI is the

leading cause of cardiovascular death, contributing nearly 20%.

This suggests that in sub-Saharan Africa there are wide variations in the profile of CVD conditions, probably depending on the distribution of risk factors. As most ischemic conditions are due to atherosclerosis [18], these observations suggest that atherosclerosis is a major problem in Kenya. Further, the profile of CVD conditions described in the present study demonstrates that ischemic conditions are more common than infectious ones, namely infective pericarditis and rheumatic heart disease, commensurate with advancing epidemiological transition [2]. Indeed, studies have shown that most of the risk factors for coronary heart disease resemble those described in Caucasian populations of developed countries [19].

Myocardial infarction. Coronary atherosclerosis has previously been considered rare in Kenya [20]. A recent review of the literature, however, shows that the disease and its risk factors are increasing [7]. The present study indicates that it is already an established problem, and a leading cause of mortality. These observations resemble those of Caucasian populations [21] suggesting that CVD such as atherosclerosis have come of age in Kenya.

Cardiomyopathy. The current study reveals that, as in other sub-Saharan African countries, cardiomyopathy is a major cause of cardiovascular morbidity [4, 5]. Regional variations in the pathogenesis

Table 4. Predominant cardiovascular cause of death in sub-Saharan Africa: autopsy studies.

Author	Country	Predominant causes of cardiovascular deaths (%)
Steenekamp et al. 1992 [15]	South Africa	Cerebrovascular (32) Pulmonary hypertension (31) Cardiomyopathy and valvular disease (17) Hypertensive heart disease (14)
Mandong et al. 2006 [16]	Nigeria	Hypertensive heart disease (46) Cerebrovascular accident (32) Pulmonary embolism (13.6) Myocardial infarction (9)
Bertrand et al. 2006 [17]	West Africa multicentres	Stroke (31.9) Vascular collapse (18.4) Pulmonary embolism (9.2) Coronary heart disease (6.1)
Current study	Kenya	Myocardial infarction (18.7) Cardiomyopathy (17.2) Cerebrovascular disease (15.7) Pulmonary thromboembolism (14.2)

of cardiomyopathy underlie the heterogeneity of causative factors [5]. That it accounts for 17.2% of cardiovascular deaths in Kenya invites a search for risk factors to better inform its management.

Subarachnoid hemorrhage. Subarachnoid hemorrhage is a frequent cause of morbidity in Kenya. It is most commonly caused by intracranial aneurysms [22]. The current study demonstrates that stroke constitutes 15.6% of CVD deaths. These findings confirm that this condition, like coronary artery disease, is a significant cause of morbidity in Kenya.

Pulmonary thromboembolism. There is a dearth of information on this condition in sub-Saharan Africa. In western countries, it is as a well recognized thromboembolic disease, as are cerebral and MI [23]. Necropsy studies reveal that it varies between 5% and 14% [24]. In the current study, it is a frequent cause of death, suggesting that predisposing factors similar to those in other populations already exist in Kenya.

Aortic aneurysm. This condition is rarely reported in Africa. In Caucasian communities, it is a frequent CVD whose prevalence and incidence parallels that of atherosclerosis [25]. Findings of the current study reveal that it causes 11.2% of deaths, again suggesting that it is more prevalent than hitherto perceived. Indeed, a recent study in Kenya revealed that it is not uncommon, and causes mortality by rupture. Further, most of the risk factors resemble those which obtain in developed countries [26].

Hypertensive heart disease. Hypertension has been implicated in virtually all ischemic and

hemorrhagic vascular diseases, including heart failure [27]. Our study reveals a relatively high occurrence of this condition. It suggests that control of blood pressure through lifestyle and dietary modification, and rational drug compliance, constitutes a practical way of containing cardiovascular mortality and morbidity.

Rheumatic heart disease. This condition, due to valvular stenosis, is the eighth commonest cause of death in our series. This is at variance with literature reports that it is the most frequent cause of heart failure in Kenya [6] and other sub-Saharan African countries [1, 28]. Findings of the current study emphasize that even where ischemic conditions predominate, rheumatic heart disease still exists. Accordingly, secondary prevention and screening for early prevention should be enhanced to effectively contain it.

Pericarditis. Most of the cases were infective pericarditis, predominantly tuberculous, as in other African countries [29]. This condition is believed to have become more prominent as a result of the HIV epidemic. Non-HIV infected subjects still have other etiologies of pericardial effusion. Indeed, in the present study two cases were non-tuberculous. The fact that in the current study pericarditis together with rheumatic heart disease constitutes 14.1% implies that infectious diseases are still a major cause of cardiovascular morbidity in Africa. Indeed, in Ethiopia, pulmonary complications of tuberculosis are the commonest cause of natural death [30]. This suggests that prudent management of infection will reduce CVD morbidity and mortality.

Age and gender distribution

The mean age at presentation with first time MI in the INTERHEART-Africa study was 53.3 years [3]. In the present study, mean age at death due to MI was 48 years, while the overall mean age was 50.4 years, varying with type of disease, but generally lower for infectious disease causes than for ischemic ones. These findings support reports that CVD occurs earlier among Africans than in Caucasian populations [1, 4]. This earlier onset may be attributed to unique risk factor profiles operating in this environment [31]. This implies that it disables young individuals, thus reducing economic productivity. Observations of the current study reveal, similar to literature reports [8, 12], that cardiovascular causes of death occur more commonly in males than in females. This sex predisposition may be related to lifestyle and other risk factors among males.

Conclusions

CVD contributes over 13% of overall mortality. MI is the most common, while rheumatic heart disease is the least common. It shows male predominance and mainly affects those aged 50 years and younger. This suggests that non-communicable diseases, while predominant, overlap with infectious conditions as causes of cardiovascular mortality. A search for, and consequent prevention of, risk factors, combined with prudent management of infection, are recommended.

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