

Prevalence and pattern of cardiovascular-related causes of out-of-hospital deaths in Lagos, Nigeria

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Abstract

Background: In developed countries 50% - 75% of deaths from cardiovascular-diseases occurs out-of-hospital. In Nigeria where patronage of orthodox health facilities is low, the impact of cardiovascular-related diseases on out-of-hospital mortality has been sparsely studied.

Objectives: To determine the prevalence and pattern of cardiovascular-related causes of out-of-hospital deaths in Lagos, Nigeria.

Methods: A 5-year retrospective review of all autopsied medical decedents brought-in-dead (BID) to a Nigerian tertiary health facility to identify cardiovascular-related causes of death.

Results: A total of 90 cardiovascular-related deaths out of 176 medical BID cases were identified, giving a prevalence of 51.1%. Mean age was 65.2 ± 15.6 years. Male: Female ratio was 1.4: 1, the females were older (68.29 ± 14.89) vs (61.63 ± 15.55) years. Age group > 60 years accounted for 63.3% of deaths. Commonest primary diseases were hypertensive heart disease (48.9%) and cerebrovascular accident (24.4%). Myocardial infarction occurred in 8.9%. Heart failure, cerebral dysfunction and unspecified circulatory collapse were the causes of death in 54.4%, 23.3% and 14.4% respectively.

Conclusion: Cardiovascular-related diseases are major contributors to out-of-hospital medical deaths occurring chiefly in those >60 years. Hypertensive heart disease and heart failure are the greatest contributors to this cardiovascular-related disease mortality.

Keywords: Pattern of out-of-hospital deaths, brought-in-dead (BID), cardiovascular-related disease mortality in Nigeria.

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Introduction

In 2008, 63% of global deaths were reported due to non-communicable-diseases, 48% of which were due to cardiovascular-related-diseases alone.¹ Over 80% of those deaths from cardiovascular-diseases occurred in developing countries, with majority being in those below

70 years of age.¹ Though cardiovascular-diseases contributed only 8.8% of the deaths recorded in sub-Saharan Africa,² the global mortality burden from cardiovascular-diseases has been projected to increase by 20% by year 2020 with the greatest contribution expected from regions such as sub-Saharan Africa.¹ The spectra of and associated mortalities from cardiovascular-diseases however differ between sub-Saharan Africa and developed western countries. While coronary-artery-disease (CAD) is the main cause of death in developed countries³ and the leading cause of death among black Americans,⁴ stroke was the leading cardiovascular cause of death in sub-Saharan Africa.² Hypertensive heart disease and heart failure are also commonly reported cardiovascular causes

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of death in sub-Saharan Africa.⁵ CAD is considered to be relatively rare in sub-Saharan Africa, although low but rising prevalence have been reported.^{5,6,7} Most of those studies were however hospital based and were conducted in late 1990s to early 2000s.

It is known that CAD is associated with high mortality, majority of which occur outside the hospital.^{5,8} In developed countries, 50%–75% of deaths from cardiovascular-disease events occur out-of-hospital.⁸ In Western Nigeria, 86.1% of sudden-cardiac-deaths occurred out-of-hospital.⁹ Low patronage of orthodox hospitals in Nigeria may contribute to more out-of-hospital deaths.¹⁰ It is therefore possible that some cases of CAD never got to the hospital. Data on out-of-hospital mortality is sparse in this environment. In one centre in Nigeria, CAD prevalence in coroner's autopsy was 1.6% while only 41 clinical cases out of 110,000 patients were seen.¹¹ Mortality rate from CAD was expected to double between 1990 and 2020 with about 82% of the contribution from developing countries.¹²

It is therefore pertinent to review the mortality burden posed by cardiovascular-related diseases among out-of-hospital Nigerian-decedents who may have been left out in clinical reviews. It is believed that the data generated from this study would give a broader view of the burden of cardiovascular diseases beyond that obtained from hospital based mortality and assist in making informed health policy.

The aim of this study was to determine the prevalence and pattern of cardiovascular-related causes of out-of-hospital deaths in Lagos, Nigeria.

Methodology

Study design

This was a 5-year retrospective, descriptive study conducted at the Lagos University Teaching Hospital (LUTH), a tertiary health facility situated in Lagos: a cosmopolitan city of Nigeria. The study period was from September 1st 2011 to 31st August 2016. Ethical clearance was obtained from the Health Research Ethics Committee of the hospital.

Subjects

These were all decedents 'brought-in-dead' (BID) to LUTH during the period of study. LUTH receives referrals from all over Lagos metropolis and the surrounding states. BID cases are first taken to the emergency department of the hospital where registration processes occur, death is confirmed, and permission for transfer to the Anatomic and Molecular Pathology Department of the hospital (AMPD) for autopsy is obtained from the next of kin. Some decedents are taken by relatives, directly to the AMPD mortuary for storage and autopsies are performed in situations where there was no prior death certification. Registration records of such decedents are entered into the 'home register' of the AMPD.

Inclusion criteria

All decedents \geq 18 years of age that were brought-in-dead from suspected medical causes.

Exclusion criteria

Deaths that occurred within hospital setting.

Deaths related to surgery, obstetrics and gynaecology, or trauma (such as gun shots, road traffic accidents or assaults).

Operational definitions

"Brought-in-Dead" (BID) in this study refers to decedents whose deaths occurred before arrival at the hospital.

Medical cause of death refers to non-traumatic, non-surgical, non-obstetrics and gynaecology related cause of death.

Primary Disease refers to the underlying–proximate cause of death. It is defined as the disease or event that started the chain of events that led to death.¹³

Cause of death is either a consequence or complication of the primary cause, which might have contributed to the death of the person.¹⁴

Cardiovascular-related cause of death in this study refers to "total cardiovascular disease" as defined by the International Classification of Diseases-10 (ICD-10).¹⁵

'Cerebral dysfunction' includes autopsy finding of brain tonsillar herniation, cerebral haemorrhage, thrombosis, and/or oedema.

'Complete autopsy report' refers to availability of detailed records of the primary disease, cause of death, gender and age.

Data collection method

The emergency department death register and the 'home register' of the AMPD were reviewed to identify decedents brought-in-dead from suspected medical causes. The data collected included age, gender, date and time of presentation/death. A simple proforma was prepared for data entry. Records of all identified autopsied medical BID cases were then retrieved from the autopsy register at the AMPD. Data retrieved from the register included the primary diseases and causes of death as assigned by the supervising consultant Pathologists. Data of decedents with cardiovascular-related cause of death were then retrieved and included in the study.

Data management and statistical analysis

Data was entered into excel sheet for cleaning and imported into the Statistical Package for Social Sciences(SPSS) version 20.0 for analysis. Continuous variables were expressed as means with standard deviations. Categorical variables were expressed as frequencies with percentages.

Results

There were 320 suspected medical BID cases deposited during the period of study. Only 176 of these had complete autopsy reports, out of which 90 were found to have cardiovascular-related causes of death giving a prevalence of 51.1%.

Characteristics of the study population

Table 1 shows the characteristics of the study population.

Table 1: Characteristics of the study population

Characteristic	No(%)
Gender	
Male	48(53.3)
Female	42(46.7)
Age group in years	
<20	0(0)
21-40	7(7.8)
41-60	26(28.9)
>60	57(63.3)

The 90 cases studied comprised males and females in ratio 1.4: 1. Their age ranged from 33 to 101 years with a mean of 65.2 ± 15.6 years. The mean ages of the female and male subjects were (68.29 ± 14.89) and (61.63 ± 15.55) years, respectively.

Primary cardiovascular-related diseases of the study population

Table 2 shows the distribution of the primary cardiovascular-related diseases in the study population. The most frequent primary cardiovascular-related diseases were hypertensive heart disease and cerebrovascular accident. More than half of the subjects with hypertensive heart disease were males. A pertinent observation is that 50%-75% of all the primary diseases occurred in the >60 years age group. Among the uncommon diseases were 2 cases of hypertrophic cardiomyopathy.

Table 2: Primary diseases of the study population by gender and agegroup.

Primary cardiovascular disease	Total population N=90 n(%)	Males N=48 n(%)	Females N=42 n(%)	Age groups (years)		
				21-40	41-60	>60
				N=7 n(%)	N=26 n(%)	N=57 n(%)
Hypertensive heart disease	44(48.9)	26(54.1)	18(40.9)	2(4.5)	13(29.5)	29(65.9)
Cerebrovascular-Accident	22(24.4)	11(50.0)	11(50.0)	4(18.2)	6(27.3)	12(54.5)
Myocardial-Infarction	8(8.9)	4(50.0)	4(50.0)	0(0)	2(25.0)	6(75.0)
Heart-Failure	8(8.9)	2(25.0)	6(75.0)	0(0)	2(25.0)	6(75.0)
Cardiomyopathies	6(6.7)	4(66.7)	2(33.3)	0(0)	3(50)	3(50)
Atherosclerosis	1(1.1)	1(100)	0(0)	0(0)	0(0)	0(0)
Pulmonary-Hypertension	1(1.1)	0(0)	1(100)	1(100)	0(0)	0(0)

Causes of death of the study population

The causes of death in the study population are shown in Table 3.

Heart failure was the commonest cause of death seen. Hypertensive heart failure accounted for more than half (57.1%) of all the heart failure cases.

Table 3: Causes of death of the study population by gender and agegroup.

Causes of death	Total Population N=90 n(%)	Males N=48 n(%)	Females N=42 n(%)	Age groups (years)		
				21-40	41-60	>60
				N=7 n(%)	N=26 n(%)	N=57 n(%)
Heart Failure	49(54.4)	28(57.1)	21(42.9)	1(2.0)	14(28.6)	34(69.4)
Cerebral Dysfunction	21(23.3)	13(61.9)	8(38.1)	3(14.3)	7(33.3)	11(52.4)
Unspecified circulatory collapse	13(14.4)	4(30.8)	9(69.2)	3(23.1)	4(30.8)	6(46.2)
Respiratory Failure	4(4.4)	3(75.0)	1(25.0)	0(0)	0(0)	4(100.9)
Renal Failure	2(2.2)	0(0)	2(100.0)	0(0)	0(0)	2(100.0)
Pulmonary Embolism	1(1.1)	0(0)	1(100.0)	0(0)	1(100.0)	0(0)

Table 4 shows the relationship between the primary diseases and causes of death.

Heart failure was the cause of death in 28(63.6%) of sub-

jects with hypertensive heart disease and in 7(87.5%) of subjects with myocardial infarction, while cerebral dysfunction was the commonest 17(77.3%) cause of death in subjects with cerebrovascular-accident.

Table 4: Relationship of the primary disease to cause of death of the study population.

Primary diseases	Causes of death						Total
	Heart Failure	Cerebral Dysfunction	Undefined Circulatory collapse	Respiratory Failure	Renal Failure	Pulmonary Embolism	
Hypertensive Heart Disease, N(%)	28(63.6)	4(9.1)	9(20.5)	1(2.3)	2(4.5)	0(0)	44(100)
Cerebrovascular Accident, N(%)	0(0)	17(77.3)	2(9.1)	2(9.1)	0(0)	1(4.5)	22(100)
Myocardial Infarction, N(%)	7(87.5)	0(0)	1(12.5)	0(0)	0(0)	0(0)	8(100.0)
Heart Failure, N(%)	8(100.0)	0(0)	0(0)	0(0)	0(0)	0(0)	8(100.0)
Cardiomyopathies, N(%)	6(100.0)	0(0)	0(0)	0(0)	0(0)	0(0)	6(100.0)
Atherosclerosis, N(%)	0(0)	0(0)	0(0)	1(100.0)	0(0)	0(0)	1(100.0)
Pulmonary Hypertension, N(%)	0(0)	0(0)	1(100.0)	0(0)	0(0)	0(0)	1(100.0)

Discussion

The impact of cardiovascular-related diseases on out-of-hospital mortality in Nigeria has been sparsely studied. Cardiovascular-related diseases were responsible for 51.1% of all autopsied out-of-hospital medical deaths in our study. This closely corresponds to the global prevalence of 48% reported by the WHO but is much higher than the average 8.8% deaths reported to be due to cardiovascular-related diseases in sub-Saharan Africa.^{1,2} This difference may be due to differences in the period of study; whereas the sub-Saharan African review was done between 1990 and 2010, our review was from 2011 to 2016. Also their estimation was based on all deaths while ours was denominated on deaths from cardiovascular-related diseases only. The higher prevalence in our study may also be related to the WHO expected 20% rise in cardiovascular-disease mortality by year 2020 with the greatest contribution expected to be from developing countries.¹ The mean age of our study subjects is in keeping with the WHO report of the probability of cardiovascular disease related deaths occurring before age 70 years

in Nigerians.¹⁶ It is however higher than the mean age of 50.7±17.5 years that was recorded for in-hospital medical emergency mortality of the same institution.¹⁷ This probably suggests that medical attention may be sought more promptly for younger people than it is for the older. The mean age of our study population also corresponds to the retirement age in Nigeria¹⁸ hence there may be limitation in financial capability which in turn may limit ability to access health-care as desired. Our finding of significantly older females compared to the males is in keeping with the later year of onset of cardiovascular diseases that has been observed in women.¹⁹

The predominance of hypertensive heart disease and heart failure as causes of death in this study is likely a reflection of the increasing prevalence of hypertension, the low level of awareness of hypertension status and low prevalence of treatment in the country.^{20,21} Our finding is similar to that reported in some studies of coroner's autopsy of sudden death in Nigeria.^{9,22-24} Our observed higher frequency of hypertensive heart disease in males

also corresponds with the reported higher prevalence of hypertension in males with increasing age in Nigeria.^{20,21} Hypertensive heart failure accounted for more than half of all the heart failure cases in our study which compares with a report from another study in which hypertensive heart failure accounted for 73.3% of cardiovascular cause of sudden death while all heart failure accounted for 80%.²² Almost two-thirds of our subjects who died of heart failure were older than 60 years, in keeping with the reported higher prevalence of heart failure in older individuals in whom the symptoms are also often atypical, or absent.²⁵ This results in low awareness and low health-seeking behaviour,²⁶ which may explain why our subjects' deaths had occurred out-of-hospital.

Our finding of Cerebrovascular-accident and cerebral dysfunction as the distant second commonest causes of death contrasts with reports from in-hospital mortality studies in the same institution over the same period in which cerebrovascular accident was the leading cause of death and heart failure was the distant fifth cause.^{17,27} The reason for this difference is uncertain but the in-hospital mortality studies were based on emergency department deaths and the subjects were younger than those in the present study. It is probable that medical attention would be sought earlier for the younger, especially with the dramatic presentation often associated with cerebrovascular-accident. Also, the sometimes chronic clinical course of heart failure may have contributed to fewer deaths being recorded in the emergency-department. The older age recorded in our subjects is in keeping with the reported higher incidence and mortality of cerebrovascular-accident seen in that age group.²⁸ Similarly, although the prevalence of cerebrovascular-accident has been reported to be higher in males, it is a relatively more common cause of death in females than in males.¹⁹ This may explain the equal gender frequency of cerebrovascular-accident recorded in our study, in addition to the fact that our female subjects were significantly older.

The finding of myocardial-infarction in 8.9% of our subjects is much lower than the prevalence of coronary-artery-disease in autopsied out-of-hospital sudden deaths in China (50.3%), India (56.9%) and Ireland (75.0%).^{3,29,30} It however suggests a possible increasing prevalence of coronary-artery-disease in Nigerians as studies from earlier years had reported prevalence rates ranging from 0% to 6.3% in coroner's autopsy cases.^{9,11,22} This apparent in-

creasing prevalence is in keeping with the WHO's projected doubling mortality from CAD by year 2020 with 82% of the contribution expected to be from developing countries.¹² In addition, the prevalence of myocardial-infarction in our subjects is higher than that reported for in-hospital mortality of the same institution.^{17,31} This difference may be expected as the bulk of mortality from CAD reportedly occur out-of-hospital.^{3,8,30} This is particularly relevant to Nigeria where low patronage of orthodox health facility has been reported,¹⁰ and may buttress the possibility of an actual higher prevalence of coronary-artery-disease in Nigerians. The equal gender distribution of myocardial-infarction in our study contrasts with the reported higher prevalence in males in other studies.^{3,11,24} This can be explained by the known higher incidence of acute myocardial-infarction in older women (as seen in our study) such that the prevalence in them equals that in men with advancing age.^{19,32} The predominance of heart failure as cause of death following myocardial-infarction in this study is in keeping with reports from other African studies,^{7,33} but differs from the myocardial rupture and repeat infarction reported in a European study.³⁴ Cardiomyopathies were infrequent causes of death in our study, similar to previous study in Nigeria,⁹ but more frequent than was reported in a European based study.³⁵ Pulmonary embolism was rare (1.1%) in this study compared to the prevalence of 10.4% reported among sudden death cases in one Nigerian study,²² but corresponds with that recorded for in-hospital mortality of same institution.¹⁷ A limitation of this study is the problem of incomplete data, inherent to retrospective studies, necessitating exclusion of such from the study.

Conclusion

Cardiovascular-related diseases are major contributors to out-of-hospital medical deaths in both men and women, occurring chiefly in those >60 years. Hypertensive heart disease and heart failure are the greatest contributors to this cardiovascular-related disease mortality. This pattern differs from that reported for in-hospital mortality. The reasons these deaths occur out-of-hospital is worth exploring. Intensifying hypertension control strategies through focused health education of this vulnerable group may help minimize this preventable loss.

Conflict of interest

The authors declare no conflict of interest.

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