

# Sudden cardiac death in Nigerians - The Ile - Ife experience

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## Summary

**Objective:** To determine the clinico-pathologic features, circumstances of death and related epidemiological variables in cases of sudden cardiac death among Nigerians.

**Methods:** A review of all cases of medico-legal autopsies performed at the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria, on cases of sudden unexpected deaths over a ten-year period (1987 - 1997).

**Results:** The records of 2,529 medico-legal autopsies were reviewed, of which 79 were found to be cases of sudden cardiac deaths (SCD). The SCD cases consisted of 59 males (74.7%) and 20 females (25.3%), with age ranging from 27 to 80 years. The mean age (and standard deviation) was 53.7 (+11.2) and 52.2 (+10.9) for males and females respectively. A total of 68 cases (86.1%) were brought dead into the hospital and 38 (55.1%) of these were apparently healthy prior to death. The nature of activities associated with SCD, where such was documented, was passive in 90% of cases. Hypertensive heart disease was the cause of death in 66 cases (83.5%), of which only 20 (30.3%) were previously diagnosed. Ischaemic heart disease and cardiomyopathies ranked next as the most common cause of death with 5 cases (6.3%) each.

**Conclusion:** Hypertensive heart disease is the most common cause of sudden cardiac death in Nigerians, and many of hypertensive cases were previously undiagnosed. Cases of coronary heart disease and myocardial infarction played significant roles as causes of sudden cardiac death, indicating that their incidence may not be as rare among Nigerians as previously thought.

**Keywords:** Sudden cardiac death, Hypertensive heart disease, Epidemiology, Nigerians.

## Résumé

**Objectif:** Déterminer des traits clinico-pathologiques, circonstances de la mort et des variables ayant rapport à l'épidémiologie dans des cas des morts subites suite à l'arrêt cardiaque chez les Nigeriens.

**Méthodes:** Un bilan de tous les cas des autopsies médico légales opérées au centre complexe hospitalo universitaire d'Obafemi Awolowo, Ile-Ife, Nigeria sur les cas des morts inattendues/soudaines au cours d'une période de dix ans (1987 - 1997).

**Résultats:** Les dossiers de 2,529 autopsies médico-légales ont été passés en revue parmi lesquels 79 dossiers étaient notés d'être des cas des morts soudaines à cause d'arrêt cardiaque (SCD). Les cas de SCD concernent 59 hommes soit 74,7% et 20 femmes soit 25,3% avec l'âge de l'ordre de 27 à 80ans. L'âge moyen (et l'écart) était 53,7(+11,2) et 52,2 (+10,9) pour des hommes et femmes respectivement. Au total, 68 des cas soit 86,1% ont été amenés mort à l'hôpital, et 38 soit 55,1% de ceux-ci étaient apparemment en bonne santé avant la mort. La nature des activités ayant rapport avec SCD, la ou elle était documentée, était passive en 90% des cas. La maladie de Coeur hypertensif était la cause de mort dans 66 cas soit 83,5%, entre lesquelles 20 soit 30,3 seulement étaient diagnostiqués auparavant. La maladie de Coeur Ischémique et

cardiomyopathie est de l'ordre secondaire étant la cause de mort la plus courante chez 5 cas soit 6,3% chacun.

**Conclusion:** La maladie de coeur hypertensif est la cause la plus courante de mort soudaine provoquée par l'arrêt cardiaque chez les Nigériens et un grand nombre des cas hypertensifs étaient nondiagnostiqués auparavant. Les cas de la maladie coronaire du Coeur et l'infarctus du myocarde ont joué un rôle prépondérant comme des causes de la mort subite suite à l'arrêt cardiaque, ce qui indique que leur incidence pourrait ne pas être aussi rare chez les Nigeriens comme signalé auparavant.

## Introduction

Sudden cardiac death (SCD) is of continuing interest to the medical profession because of the challenges presented in its prediction and possible prevention. SCD has been defined variously as death occurring instantaneously (within one minute) or within one, six, 12 or 24 hours after the onset of symptoms.<sup>1</sup> The World Health Organisation defines sudden death as death occurring within 24 hours of an abrupt change in previous clinical status.<sup>1</sup> Although sudden death is usually used for non-violent or non-traumatic deaths, various mentality or even physically traumatic events can precipitate sudden death.<sup>2,3</sup>

The incidence of SCD is high in industrialised societies. It is estimated to be the mode of death of about 20 percent of fatalities in the United States and Europe, amounting to between 300,000 and 450,000 persons annually depending on the definition used.<sup>4,5,6,7</sup> Many of the cases of SCD occur in persons in apparent good health, without any prior evident of heart disease and outside the hospital. SCD is the most common and often the first manifestation of coronary artery disease and is responsible for about 50% of mortality from cardiovascular disease in the United States and other developed countries.<sup>8</sup> Reports from Asia on sudden death<sup>9,10,11,12</sup> estimated an annual incidence of 145 per 100,000 in people over 15 years. Though disease of the circulatory system made up approximately 90 percent of all cases of sudden death, cases due to ischaemic heart disease were less frequent than in Western countries.<sup>9</sup>

Whereas coronary artery disease is the most common cause of SCD in Caucasians and Asians, the situation appears different for blacks of Africa and the Caribbean.<sup>13</sup> Ischaemic heart disease has been reported to be rare in most African communities.<sup>14,15,16,17</sup> However, with increasing control of infectious diseases, cardiovascular diseases are becoming more important in the burden of diseases,<sup>18,19,20,21</sup> reflecting a state of epidemiological transition<sup>22,23</sup> in Africans. Hypertension is the most common cardiovascular disease among Africans<sup>24</sup> and its complications including congestive heart failure and cerebrovascular accidents are amongst the leading non-communicable causes of death.<sup>25</sup> Our previous work<sup>26</sup> on 50 autopsied cases of sudden unex-

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pected death from cardiac causes in Nigerians found complications of hypertension as the cause of death in 82% of cases.

The present paper further examines the pattern of sudden unexpected cardiac death in Nigerians, based on a larger population of cases. It presents an analysis of clinico-pathologic features, circumstances of death and related epidemiological variables.

## Materials and Methods

Hospital-based records of all the medico-legal autopsies performed on cases of sudden unexpected death at the mortuaries of the Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), Ile-Ife, Nigeria over a ten-year period (July 1987 - June 1997) constituted the study frame. All available clinical notes and autopsy reports for the study period were reviewed and cases of death attributed to cardiac causes were included in the study. Data collected in respect of each case included age, sex, occupation and duration of hospitalisation. Data on the circumstances of death and major pathologic findings, including the weights of the hearts and morphologic findings at autopsy, were also collected as part of the study.

The WHO's 24-hour based definition of sudden death<sup>1</sup> was used in this study. In operational terms, cases of deaths of ill persons whose conditions were not yet diagnosed within 24 hours of hospital admission and who at autopsy were found to have died from cardiac causes were included in the study. Cases of unexpected natural death of persons previously believed to have been in good health but suddenly collapsed and died, and found at autopsy to have died from cardiac causes were also included.

Data analysis was carried out by means of Minitab statistical software (version 12). Age and other descriptive statistics (of continuous nature) were expressed in terms of means and standard deviation, but median was used in cases where the data was not normally distributed.

## Results

### Demographic information

A total of 2,529 medico-legal autopsies were performed during the 10-year study period. There were 584 (23.1%) cases of deaths from natural causes and of these, 109 (18.7%) individuals died from cardiac causes. However, only 79 of the latter met the inclusion criteria regarding the circumstances of their deaths and availability of pathological findings for review.

Of the 79 cases, 59 (74.7%) were males and 20 (25.3%) were females with a ratio of 3:1. The age range was between 27 and 80 years for men (mean  $53.7 \pm 11.2$ ) and 37 - 75 years for women (mean  $52.2 \pm 10.9$ ). The peak age of occurrence was in the fifth (34.2% of cases) and sixth decades of life (27.8% of cases) (Table 1). Information on occupation was available for 74 cases, and showed 50 cases (67.6%) as belonging to lower social class,<sup>27</sup> consisting of semi-skilled and unskilled workers (particularly farming, petty trading, and artisans), while 24 (32.4%) belonged to upper social class made up of professionals (including medical doctors, academicians, retired military officers, and business executives).

**Table 1** Age and sex distribution of cases of sudden cardiac death

Age (years)	Male	Female	Total
21 - 30	2	-	2 (2.5%)
31 - 40	5	3	8 (10.1%)
41 - 50	19	8	27 (34.2%)
51 - 60	18	4	22 (27.8%)
61 - 70	12	4	16 (20.3%)
71 - 80	3	1	4 (5.1%)
Total	59 (74.7%)	20(25.3%)	79(100%)

### Circumstances of death

Sixty-eight (86.1%) cases were brought into the hospital dead, 38 (55.9%) of these cases were found dead in bed having gone to sleep in apparently good health the previous night. The remaining 30 deceased (44.1%) were reported to have suddenly collapsed during normal day-to-day activities. The nature of the activities was documented in 27 (90%) of these cases and they were relatively passive in nature (such as sitting at home or in a vehicle) in 11 cases (40.7%) or mildly exerting (such as walking, defecating and jogging) in 16 cases (59.3%).

Eleven (13.9%) of the cases died within 24 hours of admission in hospital. The most common presenting complaints prior to death were sudden loss of consciousness, severe headache and breathlessness.

Past medical history was only available for 57 of the cases. Of these, 35 (61.4%) were apparently healthy prior to death, while 20 (35.1%) were known cases of hypertension and 2 (3.5%) had history of heart diseases of unknown aetiology. Duration of pre-existing diseases and treatment history could not be ascertained with any reasonable degree of accuracy in the majority of cases.

### Clinicopathological findings

Autopsy result showed that of the total 79 cases, 66 (83.5%) died of complications of hypertensive heart disease (HHD), 5 (6.3%) of ischaemic heart disease, 5 (6.3%) of cardiomyopathies, and 1 (1.3%) each of congenital heart disease, infective endocarditis and acquired valvular heart disease. The overall pattern of causes of death differed slightly for males and females with HHD accounting for higher proportion of deaths among females (95% compared to 79.7% in males) while ischaemic heart disease and cardiomyopathy played a comparatively higher role among males (Figure 1).

For the HHD cases, 64 (97%) had essential hypertension while the two secondary hypertensives were renal-related (a case each of chronic pyelonephritis and adult polycystic kidney disease). The mean age of the cases with essential hypertension was 53.8 years, 71.4% of them were in the age range 41 - 60 years. The heart weights were recorded in only 25 (37.8%) of HHD cases and showed a range of 350g to 680g (median 500g) compared to the normal range of 250 - 300g in females and 300 - 350g in males.<sup>28</sup> The left ventricular thickness ranged between 1.3cm. to 2.3cm (median 2cm), whereas the free wall measurement of the left ventricle in non-hypertensive individuals should be less than 1.5cm. Sixteen cases had atherosclerosis including coronary atheroma of less than 50% lumina occlusion. Fifty-five (83.3%) of the

HHD died of acute left ventricular failure and 11 (16.7%) died of congestive cardiac failure (Table 2).

A case of acquired valvular heart disease was recorded in a 60-year-old male who died within 24 hours of presentation. At autopsy the heart weighed 410gms, the LV was

2.1cm thick and the RV was 0.6cm thick. The mitral valve leaflets were fused and deformed with associated shortening of the cordae tendinae and hypertrophy of the papillary muscles. The other valve leaflets and coronary vessels were unremarkable. The left atrial chamber was markedly dilated with fibrosis of the endocardium. The cause of death was acute left ventricular failure from a longstanding chronic rheumatic mitral valve disease.

**Table 2 Causes of death as identified at autopsy**

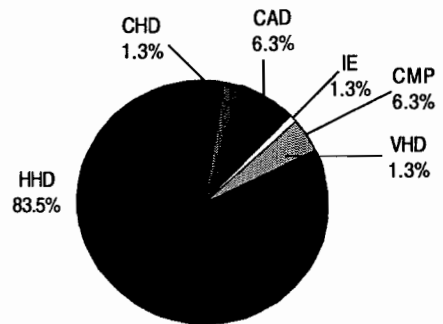
Age	Hypertensive Heart Diseases				CAD	CHD	VHD	IE
	ALVF	CCF	HOCM	DCM				
21 - 30	3	-	1	-	-	-	-	-
31 - 40	4	1	-	-	1	1	-	1
41 - 50	19	2	1	2	2	-	-	-
51 - 60	13	5	-	1	1	-	1	-
61 - 70	13	2	-	-	1	-	-	-
71 - 80	3	1	-	-	-	-	-	-
<b>Total</b>	<b>55</b>	<b>11</b>	<b>2</b>	<b>3</b>	<b>5</b>	<b>1</b>	<b>1</b>	<b>1</b>
	(69.6%)	(13.9%)	(2.5%)	(3.8%)	(6.3%)	(1.3%)	(1.3%)	(1.3%)

- Keys:  
 ALVF - Acute left ventricular failure  
 CCF - Congestive cardiac failure  
 DCM - Dilated cardiomyopathy  
 CHD - Congenital heart disease  
 IE - Infective endocarditis  
 HOCM - Hypertrophic cardiomyopathy  
 CAD - Coronary artery disease  
 VHD - Valvular heart disease

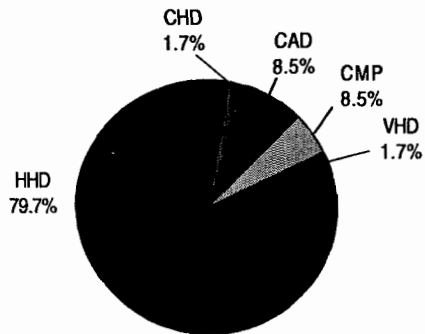
The five cases of ischaemic heart disease were all males, aged between 40 and 65 years (mean 51.4 ± 9.8), and belonged to professional group, in terms of occupation (2 specialist medical practitioners, a university lecturer, a retired military officer and a business executive). One was a known hypertensive-diabetic, three were apparently healthy and the past medical history of the fifth was unknown. They all collapsed suddenly, complaining of severe chest pain, and died before reaching the hospital. The pathologic findings were that of acute myocardial infarction involving over 40% of the myocardial wall and coronary atheromatosis with over 70% occlusion of their lumina. The hearts weighed between 290g and 600g (median 470g). Three of them showed evidence of HHD with concentric left ventricular hypertrophy.

Two of the five cases of cardiomyopathies had hypertrophic type, while the other three were of dilated type. They were all males aged between 30 and 60 years (mean 44.2±9.44). The two cases of hypertrophic cardiomyopathy were found dead in bed having gone to sleep in apparently good health the previous night. Causes of death were acute left ventricular failure for the hypertrophic cases and congestive cardiac failure for the dilated cardiomyopathies.

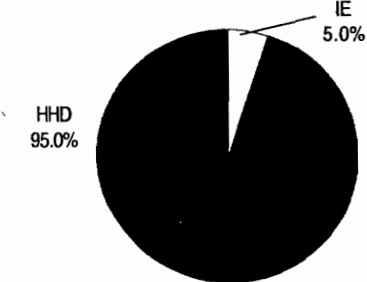
The only case of congenital heart disease was in a 40-year old male who had been on treatment for cardiomegaly of unknown cause. He was found dead in the farm. The heart weighed 830g and had a 2cm diameter ventricular septal defect. There was severe right ventricular hypertrophy, the myocardium was 9mm thick, the left ventricle was 10mm thick, and the ratio of the left ventricle (LV) to the right was 1:1 (as against the normal 3:1). The cause of death was acute cor-pulmonale due to persistent ventricular septal defect. The infective endocarditis case was a 37-year-old female who died within 24 hours of presentation with history of persistent high-grade fever. This was the only case among females that occurred earlier than the fourth decade of life. At autopsy the heart weighed 380gms and there were large friable vegetations on the mitral valve leaflets.



A: Among total study population (N = 79)



B: Among males only (N = 59)



C: Among females only (N = 20)

**Fig. 1 Causes of death: Autopsy findings**

- Legends:  
 CHD: Congenital heart disease  
 CAD: Coronary artery disease  
 IE: Infective endocarditis  
 CMP: Cardiomyopathies  
 VHD: Valvular heart disease  
 HHD: Hypertensive heart disease

**Discussion**

In this study, almost three-quarters of the sudden cardiac deaths (72.1%) occurred in working age people. The

occurrence of SCD peaked at age-group 41 - 50 years, unlike the pattern in western countries where there is increasing incidence generally with age. The decline after 50 years, particularly the sharp drop after the age of 60 years, may be a reflection of cultural beliefs. In the southwestern part of Nigeria, where the study was carried out, people above 60 years are often adjudged as being sufficiently old to die from natural causes. Hence, such deaths may not be deemed as unexpected by family members and, therefore, not brought to the hospital for further investigation. This is in contrast to the practice in developed countries where any unexpected death, irrespective of the age of the victim, is investigated to exclude foul play and obtain a death certificate mandatory for the burial. So, the result of this study with respect to age incidence may not reflect the true incidence of sudden cardiac death in the community.

The male-to-female ratio of 3:1 recorded in this study agrees with reports of higher male preponderance from studies on sudden deaths in our environment<sup>21, 26, 28, 29</sup> and studies on SCD<sup>30, 31</sup> from other parts of the world. This is not surprising as cardiovascular diseases are more common in males worldwide.<sup>30, 31</sup> This sex-related pattern may reflect testosterone induced cardiovascular risks in males or protective influence of oestrogen in females.<sup>32</sup>

Almost half (44.3%) of the deaths in this study occurred in persons who were apparently healthy. This agrees with reports from other parts of the world<sup>7, 9, 10, 12</sup> where it has been documented that about a third of victims of sudden cardiac death do not have a past history of heart disease. The precise role of activity, physical and emotional, in triggering the terminal events of sudden cardiac death is controversial. Our finding that majority of sudden cardiac deaths occur at home in individuals who were essentially passive agrees with some previous published works.<sup>4, 7</sup> However, other reports have shown that some activities may contribute to sudden cardiac death.<sup>2, 3</sup>

Our result indicating HHD as the most common primary cause of death agrees with that of other studies<sup>21, 28, 29</sup> on sudden natural deaths among Nigerians. Majority of the hypertensives were previously undiagnosed and, thus, not on any form of treatment. HHD is increasingly considered a strong and independent risk factor for sudden cardiac death.<sup>33, 34</sup> The pathogenesis of this is linked to the associated left ventricular hypertrophy (LVH) and the effects of hypertension on the vessels including those of the heart. In fact, hypertensives with LVH (by ECG criteria) significantly have more premature ventricular contractions than patients with established hypertension without LVH or normotensive subjects.<sup>35, 36</sup> Studies have also shown that the effects of hypertensive vascular disease, in addition to the left ventricular hypertrophy, contribute significantly to the increased risk of sudden death in such patients.<sup>37, 38</sup>

Although ischaemic heart disease is thought to be rare in Nigerians,<sup>16</sup> there were five deaths (5.2%) from acute myocardial infarction due to coronary artery disease in this series. Interestingly, all of them were males. Three of these cases had significant concentric LVH consistent with hypertensive heart disease. Coronary artery disease is a disease of affluence and, thus, occurs more in the upper socio-economic

group, especially those that are also hypertensives.<sup>19</sup>

Cases of death from cardiomyopathy especially the hypertrophic type have been previously reported in Nigerians.<sup>39, 40</sup> The finding of five cases (5.2%) of cardiomyopathies in this series further highlights the occurrence of these heart muscle diseases as causes of sudden cardiac death in our environment. As with hypertensive heart disease, in most of the cardiomyopathies especially the hypertrophic type, LVH and subsequent arrhythmias are considered to be the crucial factor in the pathogenesis of SCD.

## Conclusions

Hypertensive heart disease is the most common cause of sudden cardiac death in Nigerians and the prognosis is worse when there is left ventricular hypertrophy. Many of such hypertensives are undiagnosed and therefore not on treatment. This study also suggests that coronary artery disease and myocardial infarction may not be as rare in Nigerians as previously thought.

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