

Cardiovascular System Mortalities in Nigeria; Case Study of the University of Port Harcourt Teaching Hospital

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Abstract

Background: Studies have suggested epidemiological transition in the mortality pattern in Nigeria from communicable to non-communicable diseases of which Diseases of the cardiovascular system (DCVS) is prime. DCVS is thus a growing public health concern but its mortality profile is under-studied in Port Harcourt. This study was therefore designed to review the mortality profile of DCVS in Port Harcourt. **Methodology:** A retrospective case controlled study of deaths ascribed to DCVS at the University of Port Harcourt Teaching Hospital (UPTH) between January 2012 and December 2017. The composite diseases were grouped using the ICD10 scheme and analyzed using SPSS version 23. Minitab version 16 was used for trend analysis. **Results:** Of the overall 1902 deaths recorded within the period, 566 (29.8%) were cardiovascular system related. Of these, 301 (53.3%) were males and 265 (46.7%) were females. The elderly of 50 - 99 years were most commonly affected (65.5% of the mortalities). Cerebrovascular accidents (CVA) accounted for 322 deaths (56.9%); various types of shock caused 116 deaths (20.5%) while congestive cardiac failure (CCF) accounted for 114 deaths (20.1%). Pulmonary embolism, myocardial infarction, carotid aneurysm, and hypertensive encephalopathy caused 1.8%, 0.4%, 0.2%, and 0.2% deaths respectively. Peak annual mortality of 143 (25.3%) was recorded in 2013. Although the trend of mortality was undulating, there was an overall increase in annual incidence over the years. **Conclusion:** DCVS constitute the commonest systemic cause of death in Port Harcourt. Governmental and donor agencies involved in public health policy planning and implementation should scale-up strategies for the prevention and control of DCVS in order to stem the rising tide of associated mortalities.

Keywords

Mortality, Diseases, Cardiovascular System, Stroke, Port Harcourt, Nigeria

1. Introduction

Diseases of the cardiovascular system (DCVS) constitute enormous public health challenges [1] and contribute significantly to the burden of non-communicable diseases in sub-Saharan Africa [2]. WHO has reported that 17.9 million (31%) deaths are annually recorded globally from DCVS [3]. About 75% of these deaths occur in low and middle-income countries [4]. Although diseases of the cardiovascular system was reported as the second commonest cause of death after infectious diseases in Africa, current projections hold that an increase of 20% is expected by 2020 and the greatest burden likely to be experienced in enormous public Africa [5] [6] [7]. Consistent with this notion, other reports have stated that in most developing countries including Nigeria, deaths from non-communicable diseases like DCVS and cancers are on the rise while communicable diseases like infectious diseases are on the decline [8] [9] [10].

In Sub-Saharan Africa generally, including Nigeria, the current rise in DCVS is attributable to some modifiable risk factors, including rapid urbanization, effects of globalization and poverty especially among residents of urban areas [11] [12]. Also, the resultant preference for energy-dense and processed foods in lieu of traditional diets of natural composition, devoid of additives and colorants is a risk factor for the development of DCVS [13]. Other primary risk factors causing cardiovascular system-related deaths include; hypertension, diabetes, alcohol abuse, tobacco abuse, obesity and lack of physical exercise [14] [15]. Mortality due to DCVS significantly increases socio-economic costs, loss of productivity, disability and remains a contributing factor to health inequalities and poverty in developing countries [14].

The specific causes of mortalities associated with DCVS show significant global variation. For instance, among the developed countries, coronary-artery diseases remain the main cause of death while in sub-Saharan Africa, stroke is the leading cause of death followed by hypertensive heart diseases and heart failure [16]. Previous hospital-based studies identified hypertension as the commonest cause of cardiovascular mortality in Nigeria [17].

As the people of Nigeria gradually goes through epidemiologic transition with increasing burden of non-communicable diseases like DCVS, Port Harcourt, with cosmopolitan settlement sequel to decades of oil and gas activities that attract people of multiple races, nationalities, and tribes deserves an evaluation of the profile of cardiovascular system mortality.

The objective of this study is to determine the trend and causes of deaths due to diseases of the cardiovascular system at the University of Port Harcourt Teaching Hospital.

2. Methodology

This six-year retrospective case-controlled study was carried out at the University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt, Nigeria. UPTH with a bed capacity of 882, is the foremost tertiary health institution in Rivers

state serving as the major referral center for residents of the State. It also serves some residents from the neighboring states of Bayelsa, Abia, Imo, and Akwa Ibom—all in the oil-rich Niger Delta region of Nigeria [18]. In all, UPTH serves a population of not less than 10 million. Death registers, available case notes and death certificates of those who were managed for DCVS between January 2012 and December 2017 were selected and further reviewed. Information on: age, sex, clinical diagnosis that warranted admission, secondary causes of deaths were eluted. The causes of death were classified using the ICD 10 scheme. IBM Statistical Package for Social Sciences (SPSS) version 23 (SPSS Inc., Chicago, IL, USA) was utilized in the data analysis. Proportions and percentages were used to summarize qualitative data while means, median, and standard deviation for quantitative data. Student's t-test and Mann-Whitney U-test, for skewed data, were used to test the significance of differences between different mean and median values, respectively. The significance of association for qualitative variables was investigated by the Chi-square test. P-value of <0.05 at 95% confidence interval (CI) was considered significant. Forecasting of the future trend was done with Minitab, version 16. The University of Port Harcourt Teaching Hospital (UPTH) Ethics Committee granted approval for this study (UPTH/ADM/90/S.II/VOL.XI/859).

3. Results

Mortalities from DCVS constituted 566 (29.8%) of the overall 1902 mortalities recorded within the study period. There was a slight predominance of males—301 cases (53.3%) over females with 265 cases (46.7%). Peak mortality for males and females was observed in 2013 (**Figure 1**). The incidence increased with age till the bimodal peak ages in the 6th and 7th decades with the occurrence of 120 cases (21.2%) and 119 cases (21.0%) respectively (**Table 1**). The annual mean ages range from 50.9 to 58.4 years with an overall mean age of 54.5 ± 18.09 years (**Table 2**). The average of the median ages was 56 years while the annual range was 49 - 61 years. The mean age for female decedents was 53.2 ± 19.1 while for the males it was 56.0 ± 17.1 . For young adults aged 20 - 39 years, DCVS predominated among the females while for those aged above 40 years, there was a predominance of DCVS among the males (**Table 1**). While CVA and cardiac failure were noted more among the males, (244 vs. 192), shock of various types and pulmonary embolism were noted more among females (70 vs. 56). The trend was undulating with a peak occurrence in 2013 and least in 2012 (**Figure 2**). Cerebrovascular accident was the most common cause of DCVS with 322 cases (56.9%) followed by shock of all types and congestive cardiac failure with 116 cases (20.5%) and 114 cases (20.1%) respectively (**Table 3**). The primary causes of mortality among children (0 - 19 years) are depicted in **Figure 3** below. For CVA, the peak age of occurrence was 60 - 69 years with 76/322 cases (23.6%) while for the shock of all types there were bimodal peaks occurring at 60 - 69 and 30 - 39 years with 24/116 cases (20.7%) and 23/116 cases (19.8%) respectively.

Mortality from CCF peaked at 50 - 59 years with 31/114 cases (27.2%) (Table 4). Forecast analysis (2012-2020) showed a steady increase in mortality from 2018-2020 (Figure 4).



Figure 1. Annual gender disparity of mortality from DCVS.

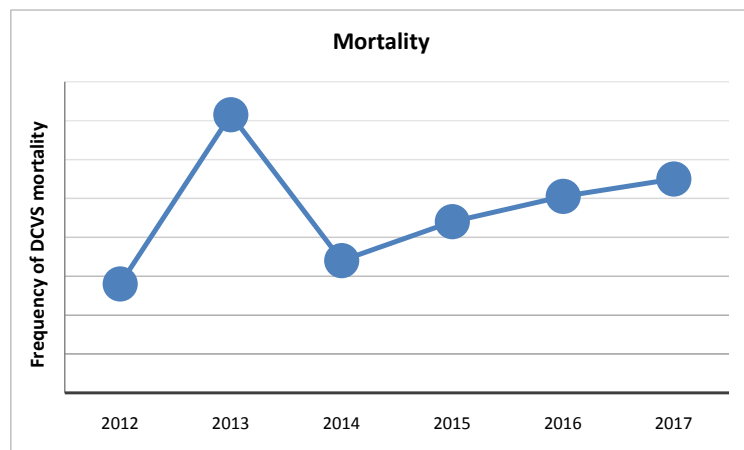


Figure 2. Mortality Trend of DCVS in UPTH, 2012 to 2017.

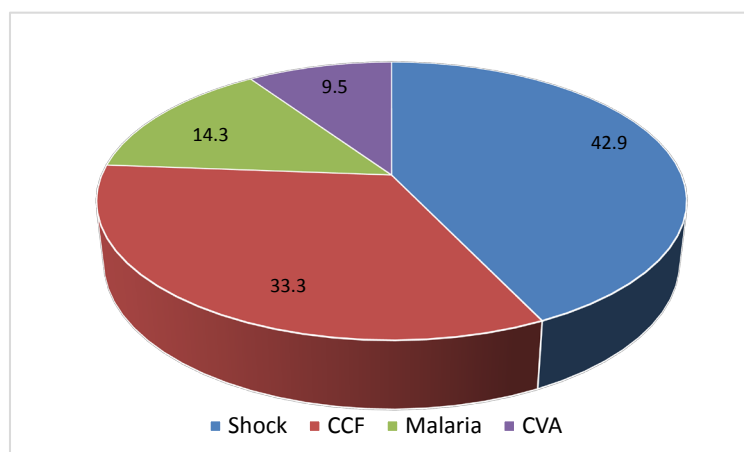


Figure 3. Causes of death due to DCVS in children aged 0 - 19 years.

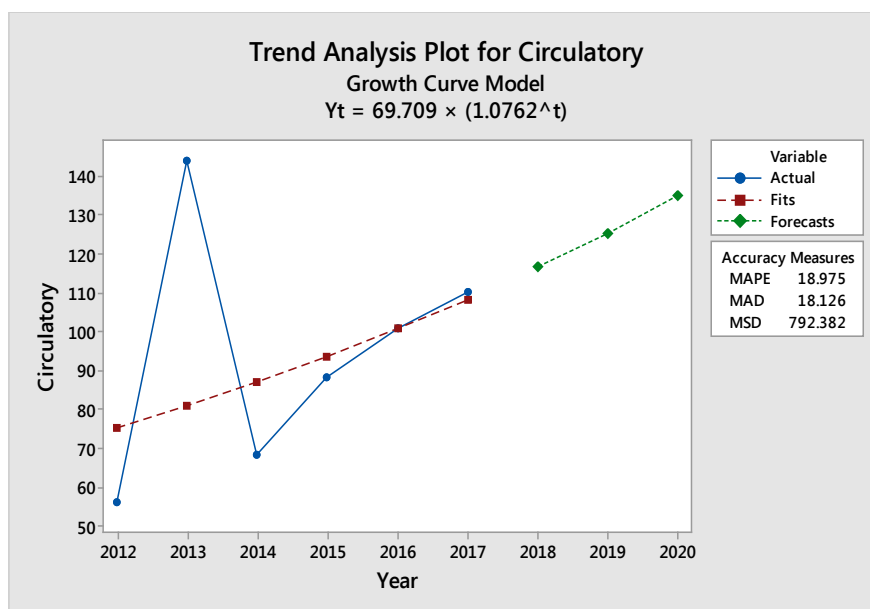


Figure 4. Trend and projection analysis of DCVS in UPTH (2012-2020).

Table 1. Age and sex distribution of cardiovascular mortality (2012-2017).

S/N	Age Range (Yrs)	DCVS		Total
		Male	Female	
1	0 - 9	8 (2.7)	6 (2.3)	14 (2.5)
2	10 - 19	4 (1.3)	3 (1.1)	7 (1.2)
3	20 - 29	5 (1.7)	20 (7.5)	25 (4.4)
4	30 - 39	20 (6.6)	46 (17.4)	66 (11.7)
5	40 - 49	58 (19.3)	25 (9.4)	83 (14.7)
6	50 - 59	69 (22.9)	51 (19.2)	120 (21.2)
7	60 - 69	64 (21.3)	55 (20.8)	119 (21.0)
8	70 - 79	56 (18.6)	36 (13.6)	92 (16.3)
9	80 - 89	13 (4.3)	20 (7.5)	33 (5.8)
10	90 - 99	4 (1.3)	3 (1.1)	7 (1.2)
TOTAL		301 (53.3)	265 (46.7)	566 (100)

NB: Values in parenthesis are for percentages. Number of Disease of cardiovascular system (n) = 566.

Table 2. Yearly distribution of mean age.

Age Dependent Variables	2012	2013	2014	2015	2016	2017
Mean	50.911	53.909	56.309	54.398	53.149	58.400
Std. Error of Mean	2.5167	1.5627	2.3734	1.7470	1.7304	1.6826
Median Age	49.000	55.000	60.500	56.000	55.000	61.000
Std. Deviation	18.8335	18.6875	19.5717	16.3879	17.3899	17.6475

Table 3. Gender distribution of mortality from DCVS.

Cause of Death	Gender				TOTAL	
	F	%	M	%	Frequency	%
Cerebrovascular Accidents	144	25.4	178	31.4	322	56.9
Shock of varying types	63	11.1	53	9.4	116	20.5
Congestive Cardiac Failure	48	8.5	66	11.7	114	20.1
Pulmonary Embolism	7	1.2	3	0.5	10	1.8
Myocardial Infarction	2	0.4	0	0	2	0.4
Carotid Aneurysm	1	0.2	0	0	1	0.2
Encephalopathy	0	0	1	0.2	1	0.2
Total	265	46.8	301	53.2	566	100.0

F: Female. M: Male.

Table 4. Age distribution of DCVS causes.

Age group	Cause of death							Total	
	Carotid aneurysm	CCF	CVA	Encephalopathy	Myocardial infarction	Pulmonary embolism	Shock	Frequency	Percentage
0 - 9 yrs	0	5	1	0	0	0	8	14	2.4
10 - 19 yrs	0	2	1	0	0	0	4	7	1.2
20 - 29 yrs	0	4	7	0	0	1	13	25	4.4
30 - 39 yrs	0	14	28	0	0	1	23	66	11.6
40 - 49 yrs	0	17	48	1	0	2	15	83	14.7
50 - 59 yrs	0	31	72	0	0	2	15	120	21.2
60 - 69 yrs	0	16	76	0	1	2	24	119	21.2
70 - 79 yrs	0	17	64	0	1	0	10	92	16.3
80 - 89 yrs	1	6	21	0	0	2	3	33	5.8
90 - 99 yrs	0	2	4	0	0	0	1	7	1.2
TOTAL	1	114	322	1	2	10	116	566	100

N/B: CCF: Congestive Cardiac Failure. CVA: Cardiovascular accident.

4. Discussion

Mortality data serve as an important indicator of the health status of a people and constitutes an indispensable factor in public health programming and planning. It assists policymakers to focus on key areas of intervention [19]. The mortality pattern of DCVS in UPTH presented in this study is important considering the cosmopolitan settlement in Port Harcourt as a result of the active oil and gas activities going on in the Niger Delta region of which Port Harcourt is the epicenter; with the attendant cosmopolitan settlement and influx of people of all races and many nations. This study presents the facts and figures of cardiovascular system mortalities in Port Harcourt and adds to the growing literature on the rising incidence of cardiovascular system-related morbidity and mortality

documented in other centres across Nigeria. Although this study was based on clinical diagnoses derived in turn from patient clerking, physical examination findings as well as laboratory and radiology investigation outcomes, it is handy considering the general negative attitude of the people of our environment to voluntary hospital autopsies. It thus fills the gap in providing good hospital data for mortalities from DCVS.

A total of 566/1902 (28.9%) deaths were recorded from DCVS. This makes it the commonest systemic cause of death in UPTH. This is well above the 11% mortality ascribed to cardiovascular diseases by WHO for Nigeria [10]. Other local studies have also alluded to the high prevalence of DCVS. For example, Obiorah and Amachree in their systemic analysis of sudden natural deaths at the Brathwaite Memorial Specialist Hospital (BMSH) Port Harcourt, reported that diseases of the cardiovascular system accounted for 87.6% of the sudden natural deaths autopsied [20]. In another 3-year retrospective review of mortality in women of reproductive age in UPTH, hypertensive disorders in pregnancy accounted for 41.3% of the deaths [21]. Besides, other similar studies carried out in Umuahia South Eastern Nigeria [22] and Ile-Ife South Western, Nigeria [23] also reported that DCVS were the commonest systemic causes of deaths in the respective tertiary hospital centres. Elsewhere in Tanzania, the recorded mortality due to diseases of the cardiovascular system was 6.31% of the total mortality [24] which is low compared to our findings and other previous Nigerian studies. Our high rate is only comparable to reports in the United States of America, where diseases of the cardiovascular system was reported as the leading cause of death [25]. This represents an epidemiologic shift as decades ago; the most feared cause of death in Nigeria was infectious diseases, with hundreds of thousands of people losing their lives to it in its varying modes and appearances. Our study shows that this is not anymore! DCVS are the new nightmare, spreading subtly but consistently into many homes, leaving tears, sorrows, and deaths across Rivers state. This is consistent with global trends where DCVS remains the leading cause of death [26]. In 2015 it accounted for about 1.91 million (36.7%) deaths in the 28 European Union countries [27]. In Sub Saharan African countries, the burden of deaths from DCVS has also steadily risen as further alluded to by this study finding [28]. The rising incidence of DCVS suggests imminent epidemics of cardiovascular diseases in Nigeria. In fact, what we as a nation should anticipate and plan for may not differ from what was reported in the United States where 2 to 3 decades ago, African Americans who had lower cardiovascular disease rates later and currently has overtaken North Americans in recording higher incidence of cardiovascular diseases, which was strongly attributed to modifiable lifestyles and extended exposure to risk factors [29] [30] [31]. Urbanization and globalization have exposed Nigerians to the same lifestyles and risk factors which include: predominant consumption of westernized diets, sedentary lifestyles, increasing obesity and smoking. Therefore instituting urgent measures that will stem the rising tide is urgently required. The measures should include:

embarking on public awareness and advocacy programs on lifestyle changes and other prevention strategies, training of personnel on screening exercises, correct and timely diagnoses of cases, and provision of necessary treatment infrastructure and subsidized drugs.

We recorded 46.8% of deaths among females and 53.2% among males. This gender distribution compares favorably with similar Nigerian studies which reported slight predominance of males in mortalities caused by DCVS—[17] [32] [33] [34]. Factors such as age, hypertension, total cholesterol, and low-density lipoprotein have a greater effect on men thereby predisposing them to more cardiovascular risks [35]. Women have also been reported to have better control of hypertension than men thereby reducing the risk of mortality from DCVS [36] [37]. Another explanation to the higher DCVS mortality in males in our study stems from their predisposition to other common risk factors such as smoking, heavy drinking, poor dietary habit [38] and diabetes [39]. We also add that the state of Nigeria's economy and the associated pervading poverty tends to keep the majority of men on their toes, attempting to make ends meet for their families where they are breadwinners. This predisposes them to psychological and emotional stress and frustration, especially for those who are unable to meet up to the expected family and societal demands. In line with our thought, Steyn *et al.* in their interheart African study identified smoking and permanent stress as the strongest risk factors of cardiovascular diseases among Africans [31]. However, for younger decedents 20 - 39 years, mortality was noted more among females. The reasons for this twist in the gender trend are not clear but may be related to the general prevalence of obesity which is a strong risk factor for cardiovascular diseases among females in Nigeria [40].

The proportion of recorded deaths among children and adolescents aged 0 - 19 years was 4%. This is higher than 0.7% mortality from DCVS reported among children of the same age range in hospital-based study in south Eastern Nigeria by Arodiwe *et al.* [41]. The commonest causes of DCVS mortality in our study was the shock of various types (42.9%) and CCF (33.3%) (Figure 3). This further goes to show that it could be as a result of diarrhoeal diseases and other infective conditions that could end in septic shock. The heart failures could be associated with anaemia often resulting from several illnesses encountered in children commonest of which is malaria.

The overall mean age was 54.5 years which is similar to the 54.9 years reported in Ibadan by Adedapo *et al.* [32] The people of the mean age group constitute the bulk of experienced workforce and captains of businesses. Therefore their demise definitely impacts negatively on the economy and creates vacuum in families with attendant multiplier effects on the already bad societal poverty. A study by the American heart association put the indirect costs of lost earnings and household productivity from premature death due to cardiovascular system diseases at 237 billion dollars [42].

Different Nigerian studies have shown inconsistent reports on the order of

occurrence among the specific causes of deaths from DCVS. The order of our study is: Cerebrovascular accidents > shock > congestive cardiac failure > Pulmonary embolism > myocardial infarction > carotid aneurysm > encephalopathy. That of Lagos (South Western Nigeria) was: hypertensive heart diseases > cerebrovascular accident > myocardial infarction > heart failure > cardiomyopathies > atherosclerosis > pulmonary embolism [17], while Umuahia (South-Eastern Nigeria) was: cerebrovascular accident > congestive cardiac failure > hypertension/hypertensive heart disease > shock > subarachnoid hemorrhage > acute pulmonary edema and cor pulmonale [43]. In Kano (North-Western Nigeria), the order was: hypertension > stroke > heart failure > rheumatic heart disease > congenital heart disease [6]. The plausible reason for this inconsistency is not clear and may underlie environmental influence on disease patterns and prevalence. Government through the management of UPTH should make adequate provision for proper management of cerebrovascular accidents that will ensure better treatment outcomes. Specifically, screening for hypertension and diabetes which are common causes of CVA and heart failure in later stages should be made a routine. On the contrary, myocardial infarction was very uncommon in this study. While this is in line with Nwanelis' submission in his review study on Coronary Heart Disease in Nigeria that CHD is relatively uncommon in Nigeria and therefore does not contribute significantly to morbidity and mortality from cardiovascular diseases but also call to question the diagnostic capacity of most facilities in Nigeria for both acute and chronic CHD [44]. It is possible that the disorder is under-diagnosed and therefore under-reported.

The trend was undulating with a peak occurrence in 2013 and least in 2012. Short of the spike in 2013, the course and trend showed a steady upward swing. This is similar to reports from other centres across Nigeria that indicate a rising incidence of DCVS.

This study was limited by the non-autopsy confirmation of the causes of death and dependence on clinical diagnoses based data only. The general poor record-keeping attitude of the hospital has not helped the situation either as it is possible that some cases were missed out.

5. Conclusion

This study shows an epidemiologic shift from infectious causes to DCVS as the commonest causes of mortality for admitted patients in UPTH Port Harcourt. The demise of people of the mean age of 54 years owing to DCVS impacts negatively on the economy and creates a vacuum in families with attendant multiplier effects on the already bad societal poverty. There is, therefore, a need to aggressively develop and implement health programs and interventions that can help reduce risk factors especially for cerebrovascular accidents, which was the most common cause of DCVS mortality observed; while enhancing the documentation of mortalities resulting from these diseases for tracking of the effectiveness of instituted intervention measures.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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