UNDER PEER REVIEW

Original Research Article

CARDIOVASCULAR DISEASE SPECTRUM AND MORTALITY IN A TERTIARY HOSPITAL IN SOUTHERN NIGERIA: A 5-year review

ABSTRACT

Background: Cardiovascular disease is a leading cause of mortality globally. Approximately 80% of deaths occur in low- and middle-income countries like Nigeria, where preventive health practices are poor or non-existent. The aim of this study was to assess the pattern of cardiovascular disease admissions and mortality over a 5-year period in a tertiary hospital in Rivers State, Nigeria.

Methods: Admissions records of patients admitted into the medical wards within the study period (January 2017 to December 2021) were reviewed and relevant information pertaining to the study objectives was retrieved for analysis. Data obtained from the records were the age, sex, final diagnosis, co-morbidities, duration of admission and outcome.

Results: There were a total of 1901 cardiovascular admissions with a male to female ratio of 1.3 to 1. Cardiovascular mortality was also higher in males with a ratio of 1.0 to 0.9. Cerebrovascular accident accounted for 44.9% of total admissions which was closely followed by heart failure (39.4%), hypertensive crises (10.2%) and pulmonary embolism also accounted for 3.5% of cases. Acute coronary syndrome, arrhythmias, pericarditis, and peripheral vascular disease accounted collectively for less than 2% of cases. A 20.6% cardiovascular mortality was observed over the 5year period. Males had significantly higher cases of heart failure during the study period.

Conclusion: A high burden of cardiovascular disease related admissions and mortality was found with an exponential increase over the 5-year study period. Cerebrovascular accident and heart failure accounted for the commonest cause of CV mortality. Preventive measures to reduce the burden of CV disease is essential to curtail this growing menace.

words: Cardiovascular disease, mortality, admissions, deaths, hypertension, stroke.

INTRODUCTION

Cardiovascular diseases (CVD) are among the top four leading causes of deaths due to non-communicable diseases, with others being cancer, diabetes and respiratory diseases such as asthma and chronic obstructive pulmonary disease.[1] These diseases altogether contribute to over 35 million global deaths annually and a major percentage occurring in low- and middle-income countries and at a younger age in comparison to high income countries[2][3]

Africa is home to over 1 billion people and is a major contributor to the global burden of CVD. [4][5] In 2013, an estimated 1 million deaths were attributable to CVD in sub-Saharan Africa alone, which constituted 5.5% of all global CVD-related deaths and 11.3% of all deaths in Africa.[6] CVD-related deaths contributed to 38% of all non-communicable disease-related deaths in Africa, reflecting the growing threat of CVD. An almost twofold increase in the over-all number of CVD related deaths since 1990 has been reported, with a >10% difference in mortality among women compared with men. [6] The cardiovascular spectrum study in Addis Ababa in 2014 pointed out five most common cardiovascular diseases in their environment; valvular heart disease (62%), hypertension (14.7%), cerebrovascular disease (11.5%), congenital heart disease (8.5%), and ischemic heart disease (IHD) (6.8%). [7] A recent study conducted in Northern Ethiopia focusing on the trend of cardiovascular diseases in outpatients showed that Hypertensive heart disease was the predominant etiologic diagnosis of cardiovascular disease followed by rheumatic heart disease. [8A study conducted in six main Referral Hospitals of Ethiopia seen in the cardiology outpatient clinic also showed that rheumatic heart disease is the most common cause of cardiovascular disease followed by hypertensive heart disease and cardiomyopathy. [9] Studies showed that much of the population risk of CVD is attributable to modifiable traditional risk factors, including smoking, hypertension, diabetes, obesity, lack of physical activity, raised blood lipids and psychosocial factors. [10] These risk factors account for 61% of CVD deaths globally and alleviating exposure to these risk factors would improve global life expectancy by almost 5 years. [11]

The trends in CVD mortality sex ratios by previous studies has shown that the pace of CVD mortality differ between men and women. The male to-female ratio of CVD mortality among people aged 30–69 years shows that, premature CVD mortality was up to twofold higher in men

than in women in high-income countries. Over time, this ratio has increased by two to threefold in most countries, and to nearly fourfold in Finland. The ratio has reached a plateau or has decreased in English speaking high-income countries and northwest Europe, whereas the ratio continues to increase in central and Eastern Europe, Japan, and Latin America and Africa. [12]

In western high-income countries, the decline in CVD mortality among women had already begun in the 1950s, especially among those aged <70 years. The decline had also begun in men in a few countries, such as Canada, Sweden, and Switzerland in the 1950s. By the 1970s, total CVD death rates were declining in most high-income countries, including in Japan. The rate of decline varied substantially between countries, with the best-performing and worst performing countries per decade generally being about 30% apart.[13] The extraordinary feature of the decline in CVD mortality is that it showed no sign of slowing; indeed, the proportional rate of decline in 2000–2009 seems even greater than that in previous decades. Total CVD mortality in Japan began to decline in the early 1960s, owing to the decline in total stroke deaths, although, the incidence of ischemic heart disease has continued to rise. [14] Another study conducted in Ethiopia indicated a prevalence rate of cardiovascular mortality of about 24.3%. [15] A study in Southwest, Nigeria over a 16-year period showed a progressive rise in cardiovascular admissions and mortality. [16]

A study in Southern Nigeria on non-Communicable diseases (NCD) found that CVD were the commonest NCDs and accounted for 35.7% of total admissions. [17] Cardiovascular risk factors peculiar to residents of Rivers State includes high alcohol consumption rates and air pollution from illegal oil refineries. In Nigeria CVD admissions constitute 20% of medical admissions. [18 – 20] A mortality pattern study conducted in Ekiti State in South-Western Nigeria, showed that stroke was the most common cause of cardiovascular deaths followed by heart failure and thirdly by hypertensive crises with a culminated annual cardiovascular death of between 21.4% - 24.3%.[21] In that study, there was a significant association between other comorbidities like diabetes mellitus and hypertension with the incidence of these cardiovascular deaths. The aim of this study was to determine the spectrum of cardiovascular diseases and the pattern of mortality in the medical wards in University of Port Harcourt Teaching hospital over a 5-year period.

METHODOLOGY

This study was a retrospective study conducted on patients admitted into the male and female medical wards between the year 2017 and 2021 in the Department of Internal Medicine of University of Port Harcourt Teaching Hospital. The study encompassed the use of patients' medical records, nurses' report and case notes of cardiovascular-related patients admitted from January 2017 to December 2021. The cardiovascular admissions, the duration of stay and the mortality rate within the study periods were ascertained. The data obtained were analyzed using Statistical Package for Social Sciences (SPSS version 25) and the results presented in table and charts. This needs to be beefed up. Add details as to how you carried it out. The type of diagnosis that were included in your data retrieval, who retrieved the data, the areas that are served by UPTH, the departments that refer to internal medicine or where they see patients etc.

Ethical clearance

Ethical clearance was obtained from the UPTH research ethical committee.

RESULTS

Data was obtained from the medical records of patients admitted into the medical wards of the University of Port Harcourt Teaching Hospital over a 5- year-period (2017 -2021). A total of 1901 patients' admissions were recorded with a male to female ratio of 1.3 :1. About 55.9% of the study participants were males and 44.1% were females. Majority of the participants were Christians. The average days on admission was 10.59 ± 9.34 (Table 1)

Sixty percent had a history of hypertension and 13.5% of the total admissions over the 5- year period was living with Type II diabetes mellitus. A total of 10,488patients were admitted in this period, with cardiovascular admissions accounting for 18.1% males had a significantly higher rate of heart failure at 47.5% (p-value = 0.001), while females had a higher incidence of cerebrovascular accident at 49.8%. (Table 2)

Table 1. Descriptive variables of patients

Variables	Frequency (N=1901)	Percentages =100%
Sex		
Male	1063	55.9
Female	838	44.1
Age (Mean±SD)	56.60±14.75	Range (17-99)
Religion		
Christianity	1897	99.8
Islam	4	0.2
History of Hypertension		
Yes	1143	60.1
No	758	39.9
History of Diabetes mellitus		
Yes	256	13.5
No	1645	86.5
Cardiovascular admissions		
2017	351	18.5
2018	473	24.9
2019	446	23.5
2020	384	20.2
2021	247	13.0
Total medical admissions		
2017	2070	19.7
2018	2069	19.7
2019	2421	23.1
2020	2115	20.2
2021	1806	17.2
Days on admission which patients? (Mean ± SD)	10.59±9.34	Range (1-123)
Outcome on CVS admission		
Discharged	1462	76.9
Deceased	391	20.6
SAMA?	36	1.9
Absconded	2	0.1
Transferred	10	0.5
Total medical mortality within study period		
2017	101	8.9
2018	212	18.8
2019	285	25.2
2020	284	25.1
2021	243	21.5

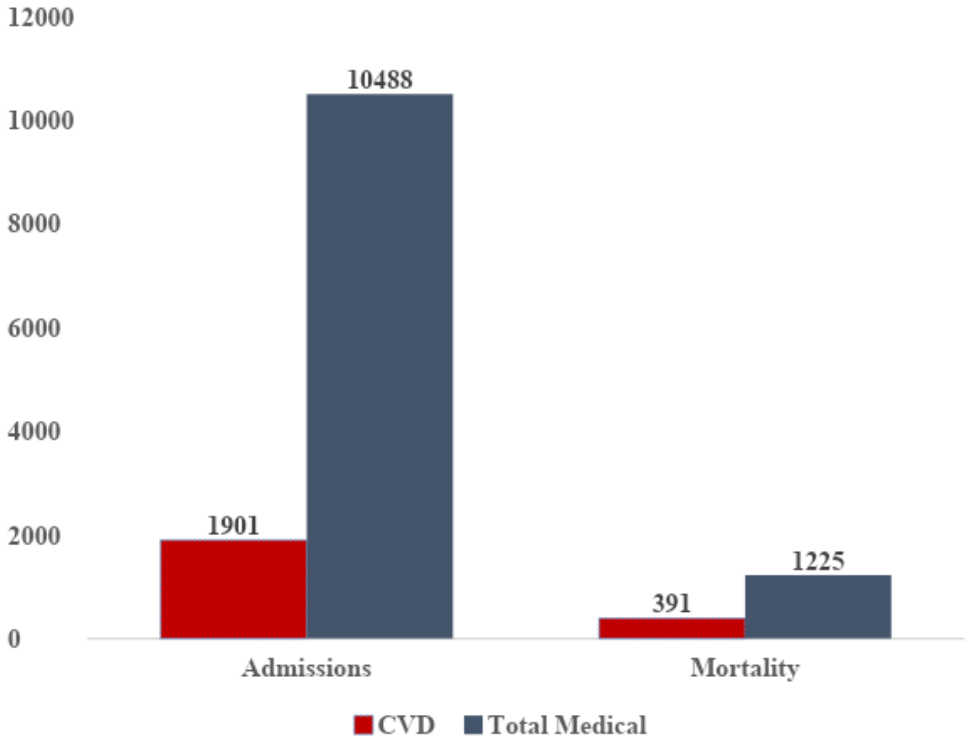

Fig 1. Proportion of cardiovascular and total admission within the duration of the study

The cardiovascular causes of admissions included heart failure, cerebrovascular accident, hypertensive crisis, acute coronary syndrome, pulmonary embolism, arrhythmias, peripheral vascular disease and pericarditis. Stroke and heart failure accounted for majority of the cases at 44.9% and 39.4% respectively. Peripheral vascular disease, arrhythmias, and pericarditis accounted for the least causes of CV admissions at 0.1%, 0.3% and 0.3% respectively. (Table 2) The total mortality over the period of study was 20.6% (391 patients) comprising 206 males and 185 females with a male to female ratio of 1:0.9. The mean age of cardiovascular deaths was 59.33±14.77years. The commonest cause of death from cardiovascular disease was Cerebrovascular accident accounting for 152 (38.9%), closely followed by heart failure 125 (32%) and then hypertensive crisis 96 (24.6%), Pulmonary embolism 11 (2.8%), Peripheral vascular disease 5 (1.3%) and Pericarditis 2 (0.5%). (Figure 2) no need repeating this in figure when it has been written out in prose.

Table 2. Sex based differences on diagnosis on admission

Variables	Sex		Total	Chi square	p-value
	Male (n=1063)	Female (n=838)			
Diagnosis					
Heart failure	505 (47.5)	244 (29.1)	749 (39.4)	85.138	0.001*
Cerebrovascular accident	436 (41.0)	417 (49.8)	853 (44.9)		
Hypertensive crisis	86 (8.1)	107 (12.8)	193 (10.2)		
Acute coronary syndrome	11 (1.0)	15 (1.8)	26 (1.4)		
Pulmonary embolism	18 (1.7)	48 (5.7)	66 (3.5)		
Arrhythmias	3 (0.3)	3 (0.4)	6 (0.3)		
Peripheral vascular disease	2 (0.2)	0 (0.0)	2 (0.1)		
Pericarditis	2 (0.2)	4 (0.5)	6 (0.3)		

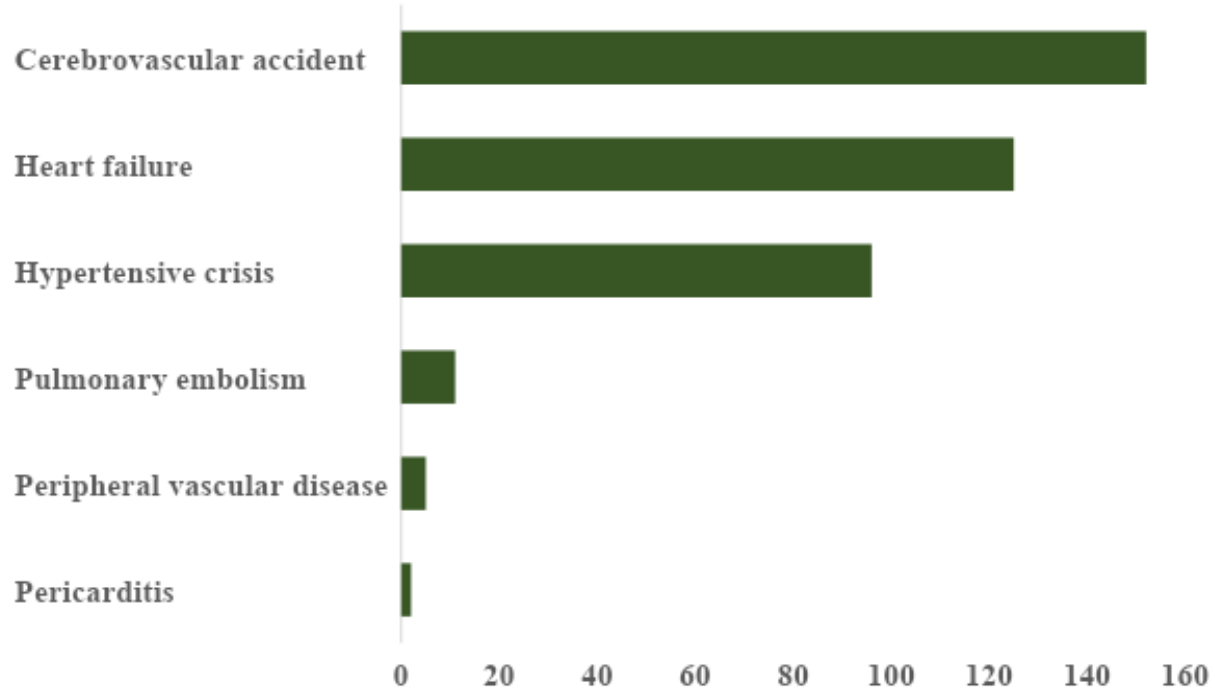

Fig 2. Cause of cardiovascular related death among patients during study period

Most deaths occurred in patients aged 50- 69yrs of age. About 65% of deaths occurred in patients between 40 - 69 years who could have been in the workforce. Deaths from cerebrovascular accident was equivalent in both males and females (38.8% and 38.9% respectively) (Table 3). Hypertension was significantly associated with increased mortality (p value = 0.036). Hypertension was seen in 60.1% of patients who died and Type II D.M was seen in 15.3%. (Table 4)

A shorter duration of admission was associated with higher mortality. Death occurred in 199 (51.6%) patients admitted for < 5days while a duration of admission of >10days accounted for 22.5% of the deaths. About 77% of patients were discharged (1462 patients), Death occurred in about one-fifth (20.6%) of the total admissions, 36 patients signed against medical advice while 2 (0.1%) absconded and 10 (0.5%) were transferred out. (Table 4).

Table 3. Gender-based differences in the causes of mortality

Variables	**Sex**		**Total N=391**	**Chi square**	**p-value**
	Male (n=206)	**Female (n=185)**			
Cause of mortality					
Heart failure	71 (34.5)	54 (29.2)	125 (32.0)	6.409	0.268
Cerebrovascular accident	**80 (38.8)**	**72 (38.9)**	**152 (38.9)**		
Hypertensive crisis	50 (24.3)	46 (24.9)	96 (24.6)		
Pulmonary embolism	4 (1.9)	7 (3.8)	11 (2.8)		
Peripheral vascular disease	1 (0.5)	4 (2.2)	5 (1.3)		
Pericarditis	0 (0.0)	2 (1.1)	2 (0.5)		

Table 4. Association between outcome of admission with age and medical history

Variables	Died		Total	Chi square	p-value
	Yes (n=391)	No (n=1510)			
Age group					
<29 years	7 (1.8)	55 (3.7)	62 (3.3)	16.474	0.021*
30-39 years	29 (7.4)	146 (9.7)	175 (9.2)		
40-49 years	67 (17.2)	305 (20.3)	372 (19.6)		
50-59 years	85 (21.8)	368 (24.4)	453 (23.9)		
60-69 years	100 (25.6)	342 (22.7)	442 (23.3)		
70-79 years	68 (17.4)	204 (13.5)	272 (14.3)		
80-89 years	29 (7.4)	76 (5.0)	105 (5.5)		
90-99 years	5 (1.3)	10 (0.7)	15 (0.8)		
Mean ± SD	59.33±14.77	55.89±14.66		t=4.122	0.0001*
Days on admission					
<5 days	199 (51.6)	358 (24.2)	557 (29.8)	112.22	0.0001*
5-10 days	100 (25.9)	522 (35.2)	622 (33.3)		
>10 days	87 (22.5)	602 (40.6)	689 (36.9)		
History of hypertension					
Yes	217 (55.5)	926 (61.3)	1143 (60.1)	4.397	0.036*
No	174 (44.5)	584 (38.7)	758 (39.9)		
History of Diabetes					
Yes	60 (15.3)	196 (13.0)	256 (13.5)	1.491	0.222
No	331 (84.7)	1314 (87.0)	1645 (86.5)		

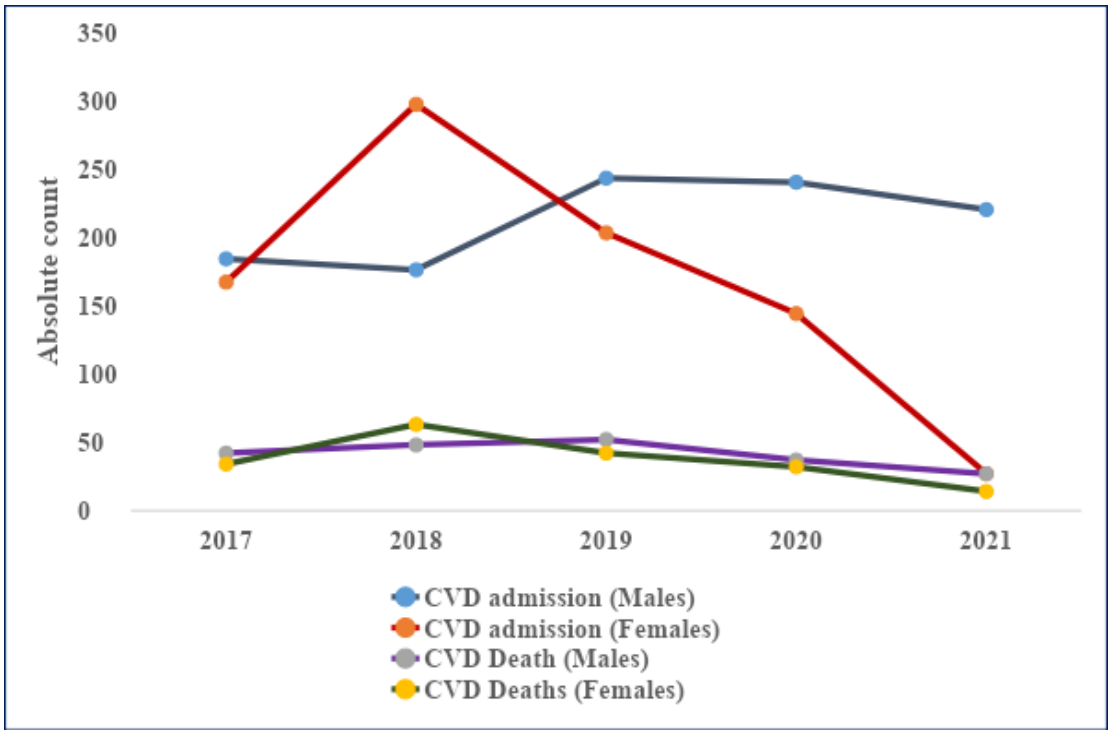

Fig 3. Quadrilinear trend in CVD admissions and deaths in males and females from 2017–2021.

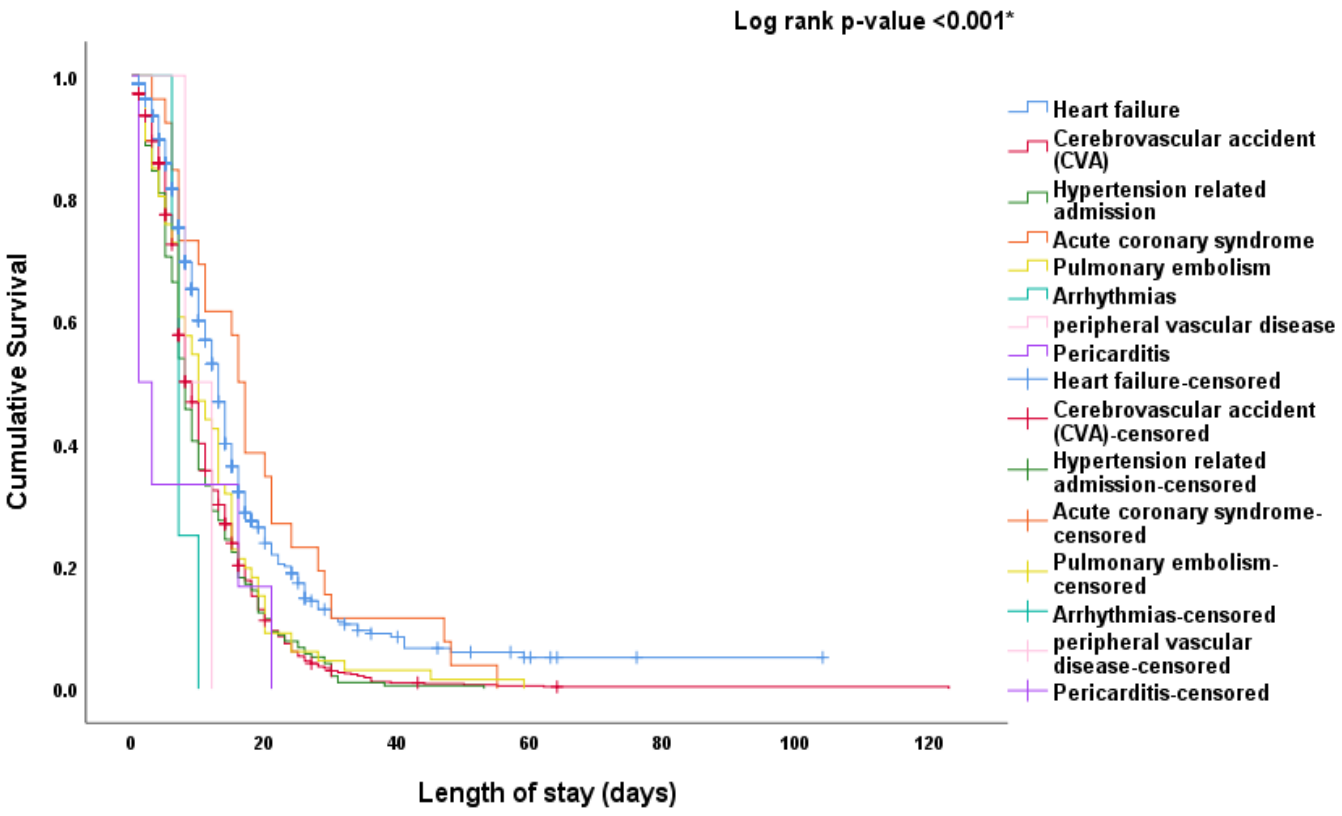

Fig 4. Kaplan–Meier curves of time to mortality in CVD types

Discussion

Non communicable diseases (NCD's) are on the increase in developing countries, with cardiovascular diseases becoming a leading cause of mortality. In time past, Sub-Saharan Africa had more of infectious diseases but with rapid urbanization, change in diet and a westernized lifestyle we now face a double burden of disease. [22]

This study was aimed as assessing the cardiovascular disease spectrum and mortality in a tertiary hospital in Southern Nigeria between 2017 and 2021. The mean age for the study was 56.60 years. From this study there was a mortality rate of 20.6% among cardiovascular related

admissions and this figure accounted for about 1/3rd of all medical mortality during this period. Such high rate was similar with another study in Ekiti State, Southwestern Nigeria where about 21.4% death were of cardiovascular origin.[21] Ansa et al [19] in Uyo also found a similar mortality rate of 19.4%. A previous study on the pattern of non-communicable disease done in index center about 14years ago found cardiovascular admissions to be about 36%.[17] Cardiovascular related deaths was found to be about 29% in a study conducted in Rivers State University Teaching Hospital and a similar total CVD mortality rate found in the United States.[18][23] The high burden of cardiovascular disease, lack of standardized medical amenities as well as irregular medical checkups due to poor health seeking behavior of patients may explain this sustained rise in CV mortality. The mean age of cardiovascular related admissions and CV-related mortality was about 59 years. This indicates that age was not a major determinant of death from heart failure, cerebrovascular accident etc. table 4 shows an association with age and mortality. Among the cardiovascular deaths, there were slightly more males than females at 53% vs 47% respectively.

The admission pattern showed that males had a slightly higher incidence of CV deaths than their female counterparts (male: female ratio = 1.3:1). Other local studies by Osuji et al in Nnewi [24], Mukadas et al in Kano [24] and Mbakwem et al in Lagos [16] found a similar sex prevalence. Heart diseases is the leading cause of death in men of most racial and ethnic group in the United States, 1 in 14 (7.1%) have coronary artery disease. Hypertension is a major risk factor for stroke and heart diseases in men. Moreso, the presence of other comorbidities such as diabetes, dyslipidemia, smoking & alcohol intake further increases the risk of CVD and mortality from CV disease.

The commonest indication for admission in this study was CVA seen in about half of the admitted patients. Similar findings were reported by Osuji et al [24] and Mbakwem et al [16] with CVA accounting for 46.7% and 51.1% respectively. This is however at variance with an earlier study, by Nwafor et al [26] done in the University of Port-Harcourt Teaching Hospital about 4-years prior where heart failure accounted for the highest indication for cardiovascular admission in a 2-year review period (2013-2014).

Cerebrovascular accidents (CVA) were the commonest cause of mortality accounting for more than 1/3rd of cases closely followed by heart failure. Several local studies have also found CVA to be the most common cause of cardiovascular mortality at 68.6%, 61.8 and 35.7% respectively with heart failure also being the next most common. [16, 21 ,23] The high burden of stroke in the sub-Saharan Africa is associated with several modifiable risk factors like hypertension, dyslipidemia and obesity as stated in the INTERSTROKE study [27]. More than half of the study cohorts were hypertensive, and this remains the most common modifiable risk factor associated with stroke. Awareness of hypertension has improved tremendously over the last few decades; however, treatment and control rates remain low and consequently increases the risk of CVA and HF. Ulasi et al [28] in their study found low awareness and poor adherence to anti-hypertensive medications.

This study reported a yearly increase in cardiovascular mortality over the 5-year review period starting at 8% to 18% then 21% and 25% over the study period, suggesting that CV mortality significantly increased over the study period and not decreasing in developing countries like Nigeria. This exponential increase in cardiovascular mortality was also found by Mbakwem et al [16] This sustained rise of cardiovascular mortality can be attributed to lack of adequate medical facilities and widespread health insurance resulting in many patients paying out of pockets.

A significant association was found between the number of days spent on admission before CV-related death in this study. Over half of CV related deaths occurred in less than five (5) days of admission and another 25% occurred in less than 10days. Late hospital presentation has been associated with superstitious beliefs about medical condition, ignorance and poverty. Presentation to the hospital is usually after treatment by traditional medical practitioners which results in a delay in emergency treatment hence resulting in the increased mortality associated with the short duration of admission. can you cite this? Garko et al. also found a 56% CV mortality by the 5th day on admission in a study done in the Northern part of Nigeria.[29]

Conclusion

Cardiovascular diseases are a major cause of mortality in developing countries like Nigeria and its incidence is progressively increasing. Cerebrovascular accident and heart failure are major contributors to CV mortality. Health Awareness and Promotion about CV risk factors through regular programs and outreaches in the established rural health centers and community are essential for primordial, primary and secondary preventions. An increase in the budgetary allocation to the health sector and improvement in our health insurance policies would also play a major role in ultimately reducing cardiovascular mortality.

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