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Epidemiology of Cardiovascular Emergencies in the Adult Emergency Department of a Tertiary Hospital in a Resource-constrained Setting of South-Eastern Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author GUPI designed the study, wrote the protocol and wrote the first draft of the manuscript. Authors COAA and ANA managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background: Despite significant progress and advances in the management of cardiovascular (CV) emergencies and the knowledge of its determinants globally, cardiovascular diseases (CVDs) constitute a significant cause of emergency department (ED) hospitalizations especially in a resource-constrained environment.
Aim: The study was aimed at reviewing epidemiology of cardiovascular emergencies in the adult emergency department of a tertiary hospital in a resource-constrained setting of South-eastern Nigeria.
Study Design: This was a retrospective cohort study.
Place and Duration of Study: The study was conducted on patients who presented with diagnoses of CVDs to the ED of Federal Medical Centre, Umuahia, Nigeria over a five year period from January 2008 to December 2012.

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Methods: Data sources were from patients' case notes, medical records, nurses report books and ED admission registers. Information extracted included age, sex, place of the incidence, time of presentation to the ED, month (season) of occurrence and the type of CVDs. Operationally, time of presentation to the ED was categorized into two periods of time: day time was defined inclusively as time period from 6.00 am to 6.00 pm while night time referred exclusively to the time period from 6.00 pm to 6.00 am Nigerian time.

Results: A total of 868 patients were reviewed. There ages ranged from 30 to 95 years with mean age of 62.6±14.4 years. There were 52.9% males and 47.1% females. The incidence of CV illnesses predominantly occurred at home (66.7%), 603 (69.5%) presented during the night time, and 473 (54.5%) occurred during dry season. The three most common CV emergencies were hypertensive crises syndrome (35.9%), acute hypertensive heart failure (32.1%) and acute stroke syndrome (30.7%). Ischemic heart disease constituted 1.3% of the ED hospitalizations.

Conclusion: This study has demonstrated that CV emergencies with hypertensive crises syndrome as well as complications of hypertension (heart failure and stroke) were the most common CV emergency and ischemic heart disease was the least in our centre. The patients affected were predominantly males and elderly patients. Most of the patients lived at home and presentations appeared to occur more frequently during dry season and most presented during the night. The findings of this study signal the urgent need for enhanced and proactive interventions for prevention of hypertension in these groups.

Keywords: Adult Nigerians; cardiovascular diseases; emergency department; epidemiology.

1. INTRODUCTION

Cardiovascular disease is a leading cause of morbidity and mortality from non-communicable diseases worldwide and a major contributor to emergency hospitalizations particularly in nations undergoing ecological, epidemiological, demographic, lifestyle transitions and globalization [1-4]. Cardiovascular disease (CVD) is the umbrella term for a group of diseases of the heart and vascular system, and the major CVDs among global adult population include hypertension, heart failure, ischemic heart disease, cerebrovascular accident and peripheral artery disease [5,6].

Globally, in 2002, cardiovascular disease accounted for an estimated 16.7 million deaths from non-communicable diseases particularly from coronary artery disease, cerebrovascular disease and hypertensive heart disease [5]. Of these deaths 7.2 million were due to myocardial infarction, 5.5 million due to stroke and 3.9 million due to hypertensive heart disease. About 75% of these cardiovascular disease deaths occur in low income countries (LIC) and middle income countries (MIC) that have limited resources to manage the disease conditions. In 2008, cardiovascular diseases constituted 17 million of non-communicable disease death accounting for 48% of all global death [7]. About 90% of these deaths occur in low income countries and middle income countries. If the current trend is allowed to continue, by 2025, a projected 20 million people will die from cardiovascular diseases mainly from myocardial infarction and strokes, again low and middle income countries (LMICs) will be hit hardest.

Globally, cardiovascular disease has been characterized by acute episodes and chronic expressions resulting in morbidity, disability and death which significantly impact on the health of the population [8,9]. Vision 2025 of World Health Organization aims to achieve global reduction of the burden of cardiovascular diseases by 25% by the year 2025. The emphasis is on targeting the non-constitutional cardiovascular risk factors and the cardiovascular diseases. With few years to the planned year 2025, the impact of the program for cardiovascular diseases has been variable globally with favourable effects reported in advanced nations [9-18].

Among Nigerian Africans, cardiovascular diseases have become a major clinic and public health problem that is characterized by high rates of disability, mortality and preventable deaths [19-21]. The Nigerian national survey [22] and recent research findings [23,6,24-28] have demonstrated that the prevalence of cardiovascular diseases is increasing in all regions of the country.

In recent years, cardiovascular diseases have been reported across different parts of the country and are the leading admission diagnosis in the Emergency Department [23,26,27,29], and

medical ward admissions [30-32]. Although cardiovascular diseases are among the most widely researched disease entity globally but availability of data from emergency departments in Nigeria is limited. Of great interest in Nigeria is that complications of cardiovascular diseases constitute a cardinal indication for doctor and healer shopping and patronage of traditional medical practitioners [23,6]. Effective reductions of emergency department presentations of cardiovascular diseases in adult Nigerians therefore depend to a large extent on understanding its epidemiology and developing proactive interventions focusing on prevention. This study therefore provides a preview of the epidemiological situation of cardiovascular disease in the emergency department of a tertiary hospital in Nigeria and could serve as the basis for evaluating measures targeting acute manifestations of cardiovascular disease in the study area over a five year period.

2. MATERIALS AND METHODS

2.1 Study Design

This was a retrospective study that involved all cases of cardiovascular disease that presented at the Emergency Department of Federal Medical Centre, Umuahia, Nigeria from January 2008 to December 2012.

2.2 Study Area and Setting

The study was carried out at the Emergency Department of Federal Medical Centre, Umuahia which is located in the metropolitan City of Umuahia, capital of Abia State, South-East of Nigeria. Abia State is endowed with abundant mineral and agricultural resources with supply of professionals, skilled, semi-skilled and unskilled manpower. Recently, Umuahia metropolitan City has witnessed a socio-economic shift towards adopting a western life style with greater availability to fast food and individuals engaging in less physical activity.

The Emergency Department of Federal Medical Centre, Umuahia, Nigeria serves as a medical unit within the setting of the tertiary hospital. All cases of cardiovascular emergencies are first seen at the Emergency Department of the Medical Centre before they are admitted into the hospital wards for further management.

2.3 Selection Criteria

The inclusion criteria were the availability of required data on the case notes of patients who were managed for major adult cardiovascular emergencies (hypertensive crises syndrome, acute stroke syndrome, ischemic heart disease and hypertensive heart failure) while disease patients with cardiovascular disease were excluded from the study.

2.4 Methods

Data collection was done using data collection schedule form which was developed for the study by the authors through detailed review of literature on epidemiology of cardiovascular diseases and cardiovascular emergencies [1-4,6,11,12,14,15,19,22,24,25,33-41]. The secondary sources of data were Emergency Department admission registers and case folders of patients who were managed for cardiovascular emergencies. These were supplemented with data from nurses report note books. The epidemiological profile of patients who had diagnoses of cardiovascular emergencies were focused on patient's age, sex, place of occurrence, time of presentation to the ED of the hospital, season (month) of presentation and type of cardiovascular emergencies.

Diagnoses of hypertensive crises syndrome [23,36], acute hypertensive heart failure [37], acute stroke syndrome [31,33,38] and ischemic heart disease [39-41] were collected using standard clinical criteria based on the available clinical information from the patients case notes. However, acute stroke syndrome wasn't classified into its sub-types and ischemic heart disease wasn't identified separately as acute myocardial infarction, angina or ischemic cardiomypathy.

2.5 Operational Definition of Research Variables

Adult patients were classified based on their age into young adults who were aged 18-59 years and elderly patients who were aged 60 years and more. The seasons of occurrence and presentation to the hospital were categorized into dry or *harmattan* season is the time period from November to March while rainy season refers to the time period from April to October [33]. The time of presentation to the ED was divided into two time intervals: day time was the period from

6.00 am to 6.00 pm while night time was the period from 6.00 pm to 6.00 am [33]. Hypertensive crises refer to severe hypertension with blood pressure of ≥ 180/110 mmHg with or without target organ damage.

2.6 Statistical Analysis

The results generated were analyzed using software Statistical Package for Social Sciences (SPSS) version 13.0, Microsoft Coperation, Inc. Chicago, IL, USA for the calculation of mean, frequencies, percentages and standard deviations.

3. RESULTS

The age of the patients with cardiovascular emergencies ranged from 30 years to 95 years with mean age of 62.6±14.4 years. There were 459 (52.9%) males and 409 (47.1%) females with male to female ratio of 1.1: 1 [Table 1].

Table 1. Age and sex distribution of patients with cardiovascular emergencies

Age group (years)	Sex	
	Male Number (%)	Female Number (%)
18 – 59	193(42.0)	167(40.8)
≥ 60	266(58.0)	242(59.2)

Five hundred and seventy nine (66.7%) of the cardiovascular emergencies occurred at home while two hundred and eighty nine (33.3%) occurred outside the home [Table 2].

Table 2. Distribution of the cardiovascular emergencies by place of occurrence

Place of occurrence	Number (%)
Home environment	579(66.7)
Outside home environment	289(33.3)

Six hundred and three (69.5%) of the patients presented during the night time (6 pm-6 am exclusive, Nigeria time) while two hundred and sixty five (30.5%) presented during the day time [Table 3].

Four hundred and seventy three (54.5%) of the cardiovascular emergencies occurred during dry (harmattan) Nigeria season while three hundred and ninety five (45.5%) happened during rainy season [Table 4].

Table 3. Distribution of the cardiovascular emergencies by time of presentation to the Emergency Department

Time of presentation to ED	Number (%)
Day time (6 am – 6 pm inclusive)	265(30.5)
Night time (6 pm – 6 am exclusive)	603(69.5)

Table 4. Distribution of cardiovascular emergencies by season of occurrence

Season of occurrence of cardiovascular emergencies	Number (%)
Dry (Harmattan)	473(54.5)
Rainy	395(45.5)

Three hundred and twelve (35.9%) of the cases of cardiovascular emergencies were due to hypertensive crises syndrome, two hundred and seventy nine (32.1%) was acute hypertensive heart failure, two hundred and sixty six (30.7%) was acute stroke syndrome and eleven (1.3%) was due to ischemic heart disease [Table 5].

Table 5. Types of cardiovascular emergencies among the patients

Cardiovascular emergencies	Number (%)
Hypertensive crises syndrome	312(35.9)
Acute hypertensive heart failure	279(32.1)
Acute stroke syndrome	266(30.7)
Ischemic heart disease	11(1.3)

4. DISCUSSION

This study has shown the variability in the occurrence of cardiovascular emergencies among young adults and the elderly patients in the ED of the hospital. The age group that was affected mostly was the elderly patients aged 60 years and more with a mean age of 62.6±14.4. The age of occurrence of cardiovascular emergency in this study is in consonance with the global epidemiological pattern for non-infectious cardiovascular diseases with lifetime risk of developing cardiovascular disease increasing with advancing age [2,23,42-44] and could be a reflection of the epidemiological description that longevity prolongs the time of exposure to risk factors of cardiovascular disease and clustering of risk factors in the elderly resulting in greater probability of

cardiovascular diseases [3,4,23,43]. However, the finding of this study is in agreement with age predilection for cardiovascular diseases described for sub-Saharan Africa with cardiovascular disease occurring a decade earlier in life in developing countries than developed nations [3,4] and being more severe and closely related to adverse cardiovascular endpoints such as heart failure, left ventricular hypertrophy, ischemic heart disease and stroke [2,4,45]. The lower mean age of occurrence of cardiovascular emergency in this study compared to developed nations may be attributed to various reasons such as population structure of Nigerian Africans where Nigerian population is younger compared to older population of high income countries, lower expectation of life in Nigeria, poor standard of cardiovascular disease care among other factors such as nutritional, ecological, epidemiological and lifestyle variables which affect cardiovascular health of Nigerian population [23,6,17,18,34,46]. The higher burden of cardiovascular emergencies among the elderly patients in the study area is likely a function of age as well as untreated risk factors including hypertension, diabetes mellitus and dyslipidaemia. [6,34,35,46-48]. The finding of this study therefore underscores the need for primary preventive interventions for cardiovascular diseases supplemented with education that should be applied through an individual life time, particularly from the younger population and maintained up to older ages. These measures will help to establish priorities in the interventions to improve cardiovascular health of Nigerian population who are living in a resource-constrained environment.

This study has shown that males had higher prevalence of cardiovascular disease compared to their female counterparts. Although gender differences and similarities have been reported for various types of cardiovascular diseases in different parts of the world, males bear greater burden of cardiovascular disease and its sequaele [33,49]. The finding of higher prevalence of cardiovascular emergencies among male gender in this study is in agreement with global gender epidemiological pattern for cardiovascular diseases [1,2] and in line with higher prevalence of cardiovascular diseases among males relative to the females reported in Nigeria [23,30,50]. The higher prevalence of cardiovascular emergencies among male gender could be due to socio-economic and cultural factors such as poor health seeking behaviours [51-53], non-adherent with prescribed medications and are more likely to engage in behavioural and lifestyle activities like smoking, excessive alcohol consumption that could precipitate and provoke occurrence of cardiovascular disease [23,33,54-56]. More so, women who had cardiovascular emergencies in the study area have inclination and tendency to seeking healing from spiritual homes and religious houses which are commonly found in the study area [23,33].

Five hundred and seventy nine (66.7%) of the cardiovascular emergencies occurred at home. The higher frequency of occurrence of cardiovascular emergencies at home could be a reflection of the socio-demographic features of the group that bears the greater burden of cardiovascular disease especially the age predilection for the cardiovascular diseases which affect the older adults [23,6,33,35,46].

This study has shown that four hundred and seventy three (54.5%) of cardiovascular emergencies occurred during *harmattan* or dry season in Nigeria. Globally, the incidence of cardiovascular emergencies varies from one geo-ecological region to another and from time to time but nothing is known about the seasonality or secularity in the occurrence of cardiovascular emergencies in the Nigeria [33]. This will provide more detailed and updated data on the seasonality of cardiovascular disease and its various predispositions in the sub-region.

Six hundred and three (69.5%) cases of cardiovascular emergencies presented to the Emergency Department at night time (6pm-6am exclusive). This night presentation to the ED could be due to delay in decision to go to hospital resulting from self-medications and patronage of patent medicine vendors and dealers or delay in pre-hospital transfer of cardiovascular emergencies and delay in inter-hospital transfer of patients due to poorly equipped and limited peripheral private and public hospital resources [23,33,57,58]. Development of specific cardiovascular emergency unit as well as establishment of functional, effective, dedicated and rapid response team for cardiovascular emergencies as well as expanding preventative measures including education in salt restriction, weight reduction and informing patients the importance of consistent use of blood pressure lowering medication is critical.

This study has demonstrated that the most common cardiovascular emergency was hypertensive crises syndrome as well as

complications related to untreated hypertension (heart failure and stroke). This finding is in agreement with the global epidemiological pattern of cardiovascular disease with hypertension accounting for substantial cause of morbidity and mortality from cardiovascular diseases especially in developing nations [1,2,59,60]. Although the burden of hypertension is declining in high income countries, they are increasing virtually in every other regions of low and middle income countries [4,23,6,16]. An increase that is attributed to rapid changes in traditional lifestyles and accumulation of cardiovascular risk factors [1,2,6,61-64]. Of great worry in Nigeria is poor awareness and knowledge of blood pressure status among the population [23,6,65] Despite the poor awareness and knowledge and notion about hypertension among the Nigerian populace, adequate blood pressure control is attainable in Nigeria [54,55]. The significant prevalence of hypertensive crisis is therefore a strong wake up call to action for patient, physician, other health professionals and the general society to embrace integrated approach at ensuring blood pressure management and control of hypertension in the sub-region [66].

Eleven (1.3%) of the cardiovascular disease was due to ischemic heart disease (IHD). Generally, IHD has acute manifestations such as acute coronary syndrome. The finding of this study is in tandem with the epidemiological prediction that in the next few decades IHD may become the leading cardiovascular disease in developing nations including Nigeria whilst the incidence is likely to decrease in some advanced countries [2,3,67]. This predictive change is attributed to transition in coronary risk profile and rapid accumulation of cardiometabolic risk factors. The low prevalence of ischemic heart disease in this study however, could be due to under-diagnosis and lack of available cutting edge diagnostic facility for IHD in the study centre. Although IHD has array of subjective complaints or warning symptoms that may antedate the occurrence of IHD the odds associated with diagnostic utility of warning symptoms should always be considered how common or rare a diagnosis of IHD is made in Nigeria patient population. The low prevalence of IHD in this study could also be related to the age distribution of the study population who were predominantly elderly whose cardiovascular decompensation is characterized by hypertension, valve calcification and degeneration and heart failure when compared with IHD which is predominantly found in middle age adults [2]. A high index of suspicion remains essential for preventing future IHD especially acute coronary syndrome since repeat acute myocardial infarction is often more serious than index or previous heart attack.

5. STUDY IMPLICATIONS

Cardiovascular disease is the leading causes of emergency department hospitalizations among adult Nigerians and contributes principally to the health care costs. Of great concern in the study area is the myth that death whether sudden or protracted from myocardial infarction or stroke is frequently attributed to spells on the family. More so, much attention hasn't been given to cardiovascular disease emergencies despite the fact that it is emerging as an important cause of death from emergency hospitalization in the study area. The rising burden of cardiovascular diseases in the study area is attributed to largely modifiable cardiovascular risk factors. Greater awareness of uncontrolled and undiagnosed hypertension is necessary for effective implementation of preventative care strategies. Emergency department physicians and other health professionals attending to patients who presented with cardiovascular emergencies in the study area should be aware of these epidemiological profiles as this may affect the quality of care rendered to patients that presented with cardiovascular emergencies.

6. LIMITATIONS OF THE STUDY

The limitations that are inherent in retrospective study using secondary data sources such as deficient record keeping and lack of complete clinical information. The under diagnosis of ischemic heart disease in our hospital can be attributed to lack of state-of-art and cutting edge cardiovascular diagnostic procedures and facilities in the study centre is appreciated by the researchers. Another limitation is the lack of standardization of our record keeping in some instances discrepancies in admission date and time of discharge or referral from the hospital needed to be verified independently and may be subject to inaccuracy.

7. CONCLUSION

This study demonstrates an important need for greater awareness of cardiovascular disease emergencies including complications related to hypertension among males, elderly patients, those that live at home. The period of time for

which we can focus our awareness would be during dry season and counsel our patients who present to the hospital during the night. The findings of this study signal the urgent need for enhanced and proactive interventions for acute manifestations and chronic expressions and sequaele of cardiovascular diseases in the study area.

CONSENT

It is not applicable.

ETHICAL APPROVAL

Ethical certificate was obtained from the Health Research and Ethics Committee of the hospital.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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