ORIGINAL ARTICLE

Medical causes of death in a teaching hospital in South-Eastern Nigeria: A 16 year review

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Abstract

Background: Most developing regions of the world are undergoing gradual epidemiological transition resulting in high burden of both communicable and noncommunicable diseases. This affects the pattern of death in this region.
Objective: The objective of this study is to determine the causes of death in the medical wards of the University of Nigeria Teaching Hospital, Ituku/Ozalla, Enugu, South-East Nigeria from 1995 to 2010.
Materials and Methods: Data were collected retrospectively from January 1995 to December 2010.
Statistical Analysis Used: Statistical Package for Social Sciences (SPSS Inc. Chicago, IL, USA) version 17.0 was used. Simple descriptive statistics were done. Student's *t*-test was used to compare means of continuous variables, while Chi-square test was used to test significance of differences between two proportions.
Results: The mortality rate was 22.8% (6250/27,514) admissions. The male to female ratio was 1.7:1. Infections (20.2%) were the most common cause of death. However, chronic kidney disease was the single most common disease entity causing death (12.3%). Other important causes of death in order of prevalence were cerebrovascular accident (10.5%), acquired immune deficiency syndrome and tuberculosis either alone or as co-infection (10.3%), heart failure (8.8%), chronic liver disease (7.0%), septicemia (6.5%), respiratory failure (5.3%), diabetes mellitus (4.6%), cardiac arrhythmias (2.9%), and primary liver cell carcinoma (2.7%). There were few deaths from tetanus, malaria, typhoid fever, and coronary artery disease.
Conclusion: Mortality is high in our medical wards and reflects the emerging trend of mixed disease spectrum comprising communicable and noncommunicable diseases.

Key words: Chronic kidney disease, infections, medical wards, mortality, Nigeria

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Introduction

Recent population studies have shown that the most developing regions of the world are undergoing gradual epidemiological transition resulting in high burden of both communicable and noncommunicable diseases.[1]

Although reliable information could be obtained from a comprehensive analysis of death register of a community, a lot of useful information could be obtained also from periodic reviews of morbidity and mortality in a medical institution. These may provide information for the planning and evaluation of health care delivery services of a country.

Most mortality reviews came from the South-West,[2-5] Middle Belt[6] and Northern[7,8] parts of Nigeria. There is a paucity of relevant data on mortality pattern in the whole of South-East and South-(Niger delta) regions of Nigeria.

It is the purpose of this article therefore to fill this gap by reviewing the pattern of causes of death in the medical wards of a teaching hospital in South-East Nigeria. It will also discuss how these compared with mortality pattern in other developing and developed countries.

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Materials and Methods

This study was conducted at the University of Nigeria Teaching Hospital, Ituku/Ozalla, Enugu, South-East Nigeria. The hospital is a tertiary health institution strategically located in the South-East zone of Nigeria. Among the Ibo speaking tribes of Nigeria. It contributes to serving approximately a quarter to a third of the Nigerian population, currently estimated to be 158.2 million.[9] The hospital receives patients from Enugu state (where it is located), and from neighboring states of Kogi, Anambra, Ebonyi, Abia, and Imo.

The patients who died in the adult medical wards from January 1995 to December 2010 were included in the study. Data were obtained from hospital death register, death certificates and case records of all patients who died during this period. There was no autopsy report on most these patients.

Data collected include primary causes of death (classified according to the International Classification of Diseases-10),[10] demographic information such as age, sex, and period of death.

All the data were entered into personal computer. Analysis was performed using the Statistical Package for Social Sciences (SPSS Inc. Chicago, IL, USA) version 17.0. Mean ± standard deviation was generated for continuous variables. Student's *t*-test was used to compare means of continuous variables, while Chi-square was used to test significance of differences between two proportions. $P < 0.05$ was considered as statistically significant.

Results

A total of 27,514 patients were admitted into the medical wards during the period of study. Of this, 6250 (62.9% males and 37.1% females) died, giving a mortality rate of 22.8%. The male to female ratio was 1.7:1. Mortality rate was significantly higher in males, 14.3% than in females 8.4%, $P < 0.001$. The age range of the deceased patients was 18–102 years, with a mean of 48.3 ± 17.8 years. The mean age for deceased male patients (48.8 ± 17.6 years) was significantly higher than that for females (47.3 ± 18.1 years), $t = 3.171$, $df = 6237$, $P = 0.003$.

Table 1a shows the age and sex distribution of the patients.

While 3.6% of the patients were below the age of 20 years, majority (65.6%) were in their third to fifth decade of life (20-59 years). 15.2% were 70 years and above. The age distribution was similar between male and female patients. Table 1b, shows the distribution of systemic causes of death within the different age groups. Infectious diseases were

the most common causes of death in the second, third, and fourth decades of life. Renal diseases (especially chronic kidney disease [CKD]) were the most common causes of death in the first decade of life, and the second most common cause of death within the second, third, and fourth decades of life, showing it's predilection to young and middle aged groups in our environment. Diseases of the nervous system (particularly cerebrovascular accident) were the most common cause of mortality in the fifth, sixth, and seventh decades of life accounting for 2.8%, 3.4%, and 3.6% of all death, respectively. Cardiovascular diseases (especially heart failure from hypertensive heart disease) were the second most common cause of death in these age groups too.

The causes of death according to the various systems in male and female patients were presented in Table 2.

Infectious diseases were the overall leading cause of death, accounting for 20.2%. Diseases of the genitourinary system (15.4%), cardiovascular system (15.3%), nervous system (14.4%), gastrointestinal system and liver (13.0%), respiratory system (9.6%), hematological and immunological system (5.5%), and endocrine disorders (5.4%), followed them. Other miscellaneous disorders accounted for 1.2% of all deaths.

The 10 most common disease entities causing death were shown in Table 3.

Chronic kidney disease was the single most common disease entity causing death. It accounted for 12.3% of all the deaths. Cerebrovascular accident (10.5%) and human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS) with or without tuberculosis (TB) (10.3%) followed it. Heart failure, accounted for 8.8% of deaths, while primary liver cell carcinoma (PLCC) accounted for 2.7%.

Other less important causes of death were shown in Figure 1. Meningitis (2.4%), acute kidney injury (2.0%) and the leukemia's (1.7%) were the first three among these. The others were anemia's, lymphomas, and acute pulmonary edema, each accounting for 1.3% of deaths. Acute

Age group (years)	Number (%)		Total	Percentage
	Males	**Females**		
10-19	130 (2.1)	96 (1.5)	226	3.6
20-29	505 (8.1)	373 (6.0)	878	14.0
30-39	704 (11.3)	448 (7.2)	1152	18.4
40-49	749 (12.0)	328 (5.2)	1077	17.2
50-59	640 (10.2)	361 (5.8)	1001	16.0
60-69	589 (9.4)	375 (6.0)	964	15.4
≥70	613 (9.8)	339 (5.4)	952	15.2
Total	3930 (62.9)	2320 (37.1)	6250	100

Table 1a: Age and sex distribution of the patients

pulmonary embolism (1.2%), organic brain syndrome, space occupying lesion, encephalitis, and acute viral hepatitis each accounted for 1.0%, respectively.

Only 0.3% of the patients had an autopsy examination.

Discussions

Although hospital data may not represent national health statistics, they provide useful indicators of the health status of a community. Population-based mortality data are scarce in sub-Saharan Africa and most developing countries. Hospital-based mortality analysis becomes important and can help assess burden of diseases, quality of health care delivery, and provide approximate measure of mortality. Our study revealed that a higher number of males died than females (62.9% and 37.1%, respectively). This is not unusual in most studies from Africa, which show that men are more likely to be admitted into the hospital than women are. African men may not be as health conscious as women, with the result that most women report for treatment early without waiting for their health to degenerate to the extent of requiring hospitalization, while men only attend to their health when complications have set in.
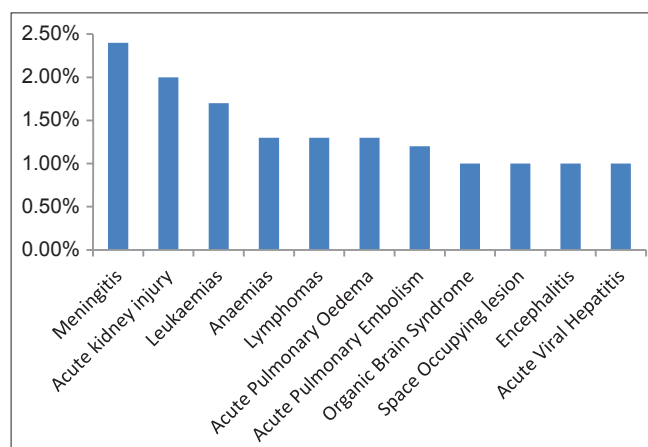

Figure 1: Other causes of death

Majority of the deaths (65.6%) occurred within the 20-59 years age group. This is the most active and economically vibrant age group. This observation is common in most studies emanating from Africa, especially sub-Saharan Africa where the life span is short.[4-8] Infections were the overall most common cause of death. This has continued to be the pattern in most low-income countries.[5,6,11,12] This is especially due to the HIV/AIDS pandemic with associated upsurge in TB.[13] Ignorance, poverty, overcrowding, and unhygienic environment are the other factors that fuel the high burden of infections in our environment. Among the infectious diseases causing death in this study, HIV/AIDS with or without TB accounted for most of the deaths followed by septicemia.

Recent studies strongly indicate that death from noninfectious diseases is increasingly being recognized as significant causes of morbidity and mortality.[14] However, the resurgence of HIV and TB pandemic has altered this trend with infections still causing most of the deaths.[13] The high prevalence of septicemia may be due to inability of patients to present early to appropriate health care facilities in our environment. A related study showed that up to 97% of patients were found to have received one form of medication or the other before presenting to hospital. This often involved the use of self-medication and indiscriminate use of antimicrobial agents which encourage bacterial drug resistance.[6] Complications of noncommunicable diseases such as CKD, cerebrovascular accident, and heart failure; however, constituted the first, second, and fourth most common disease entities causing death in our center. These accounted for 31.6% of the 10 leading causes of death. It is important to note that CKD is the single most common disease entity causing death in our center, accounting for 12.3% of all deaths in the medical wards. This is the First time this pattern is observed from this part of the world that is, Africa. Some studies in Nigeria have implicated either systemic hypertension or cerebrovascular accident as the most common leading noncommunicable disease causing death in adults.[1,3,6,7,15] Clinical estimates

Table 1b: Age group distribution of systemic causes of death

Age group (years)	Diseases according to systems *n* (%)								
	Infs.	Resp.	Cns.	Cvs.	Endo.	Git/liver	Hem.	Renal	Miscl.
10-19	43 (0.7)	12 (0.2)	10 (0.2)	42 (0.7)	3 (0.0)	25 (0.4)	38 (0.6)	56 (0.9)	1 (0.0)
20-29	234 (3.7)	57 (0.9)	53 (0.8)	120 (1.9)	16 (0.3)	137 (2.2)	76 (1.2)	168 (2.7)	16 (0.2)
30-39	370 (5.9)	86 (1.4)	88 (1.4)	132 (2.1)	30 (0.5)	159 (2.5)	63 (1.0)	206 (3.3)	20 (0.3)
40-49	263 (4.2)	93 (1.5)	131 (2.1)	123 (2.0)	61 (1.0)	147 (2.4)	54 (0.9)	194 (3.1)	13 (0.2)
50-59	147 (2.4)	106 (1.7)	174 (2.8)	155 (2.5)	73 (1.2)	144 (2.3)	50 (0.8)	142 (2.3)	11 (0.2)
60-69	97 (1.6)	108 (1.7)	212 (3.4)	190 (3.0)	74 (1.2)	123 (2.0)	38 (0.6)	111 (1.8)	5 (0.1)
≥70	109 (1.7)	140 (2.2)	227 (3.6)	195 (3.1)	78 (1.3)	77 (1.2)	24 (0.4)	88 (1.4)	10 (0.2)
P value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.123
Total	1263 (20.2)	602 (9.6)	897 (14.4)	957 (15.3)	335 (5.4)	812 (13.0)	343 (5.5)	965 (15.4)	76 (1.2)

Infs=Infections; Resp=Respiratory; Cns=Central nervous system; Cvs=Cardiovascular system; Endo=Endocrine; Git=Gastrointestinal; Hem=Hematological system; Miscl=Miscellaneous

Table 2: Systemic distribution of the causes of death

Causes of death	Number (%)		
	Males	Females	Total
Infections	740 (11.8)	523 (8.4)	1263 (20.2)
Genitourinary	626 (10.0)	339 (5.4)	965 (15.4)
Cardiovascular	574 (9.2)	383 (6.1)	957 (15.3)
Nervous system	547 (8.8)	350 (5.6)	897 (14.4)
Gastrointestinal/ liver	578 (9.2)	234 (3.7)	812 (13.0)
Respiratory	383 (6.1)	219 (3.5)	602 (9.6)
Hematological	211 (3.4)	132 (2.1)	343 (5.5)
Endocrine	217 (3.5)	118 (1.9)	335 (5.4)
Miscellaneous	54 (0.9)	22 (0.4)	76 (1.2)
Total	3930 (62.9)	2320 (37.1)	6250 (100)

Table 3: Ten most common disease entities causing death

Disease entity	Frequency	Percentage
Chronic kidney disease	771	12.3
Cerebrovascular disease	656	10.5
HIV/AIDS/TB	646	10.3
Heart failure	547	8.8
Chronic liver disease	438	7.0
Septicemia	407	6.5
Respiratory failure	331	5.3
Diabetes mellitus	290	4.6
Cardiac arrhythmias	183	2.9
Primary liver cell carcinoma	170	2.7

TB=Tuberculosis; HIV=Human immunodeficiency virus; AIDS=Acquired immune deficiency syndrome

of CKD prevalence in South-Eastern Nigeria is particularly high and appears to be increasing.[16] Death from renal diseases of which majority were CKD explained 22% of all medical deaths in this hospital in a previous study.[16] The high prevalence of the APOL 1 risk allele among Ibos of South-Eastern Nigeria has been implicated in part for the high prevalence of CKD among this group.[17] This risk allele has been shown to be strongly associated with increased risk of nondiabetic kidney disease including HIV-associated nephropathy, primary nonmonogenic focal segmental glomerulosclerosis, and hypertensive nephropathy among African ancestry populations in the United States of America.[18-20] These indicate that South-Eastern Nigeria represents a region of Africa with an intense burden of kidney diseases. The clinical end result is often tragic. At best ~20% of patients have access to dialysis, and there is no facility for kidney transplantation.[16] This hospital has nephrologists, but inadequate number of dialysis machines. Most patients also present late with complications. All these account for the high mortality rate of CKD here.

Hypertensive nephropathy is a common cause of CKD in Nigeria, although chronic glomerulonephritis (CGN), also reflecting the burden of infectious diseases in our environment remain the most common cause of CKD in our environment.[21-23] CGN is the final common pathway of various diseases affecting the glomerulus. The etiology varies from place to place. In sub-Saharan Africa, one of the most common contributing etiologic agents is infections of various types including HIV.[24]

Over 80% of deaths from noncommunicable diseases worldwide are estimated to occur in low- and middle-income countries[25] like Nigeria. A community with such high levels of communicable and noncommunicable disease burden will likely have the kidney being the target organ for complications of these diseases. An interplay of CGN, hypertension and diabetes mellitus (the later also increasing in incidence in our environment), could easily play out their sinister roles on the kidneys.

Several studies have demonstrated a high incidence of CKD among black Americans. Unfortunately, there are no reliable statistics in Africa. However, there is a general impression that CKD is at least 3-4 times more frequent than in more developed countries and affect younger age groups.[26] This study showed CKD as the most common cause of death in the first decade and the second most common cause of death in the second, third, and fourth decades of life.

Cerebrovascular accident (stroke) was the second most common cause of death accounting for 10.5% of all death. The high mortality from stroke seen in this study may be a consequence of increased prevalence of type 2 diabetes mellitus and hypertension, which are often diagnosed when the patients present with complications of the disease. Hypertension and diabetes are mostly responsible for the increasing cardiovascular disease burden in our environment.[27-29]

Heart failure, the fourth most common cause of death, accounted for 8.8% of all deaths. Hypertension and diabetes mellitus are the two most common causes of noncommunicable diseases in our patients.[6] The magnitude of their effect can be seen in the high mortality caused by CKD, stroke, and heart failure. Recent studies in Nigeria have hinted that there is gradual worsening of cardiovascular risk profiles because of improved living standards, westernization of our lifestyles, and sedentary lifestyles.[26,30]

Human immunodeficiency virus/acquired immune deficiency syndrome with or without TB was the third most common cause of death. This is not surprising, as HIV/AIDS and TB have been reported as leading causes of both morbidity and mortality in sub-Saharan Africa. In most centers, they were the most common causes of death.[6,13,17,31] The high inpatient mortality rates among HIV-infected patients combined with the limited spectrum of diagnosis emphasizes the need for improved inpatient

management and diagnostic services. Expansion of HIV testing is warranted. Despite the rollout of antiretroviral therapy, there remains a significant need for treating HIV-infected individuals.[32]

Chronic liver disease was an important cause of mortality in our work, accounting for 7% of all death. Hepatitis B and C virus infection and chronic ethanol abuse are common in Nigeria.[33] These constitute the most common cause of chronic liver disease in our environment and tropical Africa. Vaccination rate for hepatitis is also low coupled with the fact that many people still patronize quack medical practitioners where injections are given with improperly or even unsterilized needles. It is also important to note that PLCC was the only cancer that made the list of 10 most common causes of death among adults. It accounted for 2.7% of all death. This is attributable to the high prevalence of hepatitis B virus infection and alcohol use and abuse in our environment. It is expected that the recent inclusion of hepatitis B vaccination as part of routine immunization of children in Nigeria will reduce the number of deaths from liver diseases.

Respiratory failure accounted for 5.3% of deaths. Increasing use of tobacco and increasing atmospheric pollution because of rapid urbanization could be responsible for this. Some of them were because of improperly treated pneumonias due to self-medication, patronization of patent medicine dealers and late presentation to hospital.

Diabetes mellitus was an important cause of death, accounting for 4.6% of all deaths in the adult medical ward. Various studies in our environment have shown that diabetes mellitus is a common cause of morbidity and mortality in our environment.[28,34,35] Cardiac arrhythmias were responsible for 2.9% of death. These are usually from complications of hypertension, cardiomyopathies, valvular diseases, and infective endocarditis, which are common causes of cardiovascular morbidity and mortality in Nigeria and sub-Saharan Africa.[36-38]

It is important to note that ischemic heart diseases following coronary artery disease was an uncommon cause of death in this study. This has been the pattern in similar studies in our environment[6-9,12] although some have reported an increasing pattern in Africa.[39,40] Diseases such as malaria, typhoid fever, and tetanus that used to be important causes of mortality[1,3] were not among the important causes of death in our study.

Limitations

Majority of the causes of death were based on clinical and ancillary investigations. Postmortem examinations would have helped in confirming the causes of death in some cases that may not be obvious. Postmortem examinations are vehemently rejected by our patients because of cultural and religious beliefs and remain very unpopular.

Conclusion

Infections especially from HIV/AIDS and TB either alone or as co-infection and septicemia, were the most common causes of death in our medical wards. However, CKD was the single most common disease entity causing death in our center. Noncommunicable diseases like stroke and heart failure together with complications arising from CKD constituted 31.6% of all the deaths. These three disease entities share a common factor, hypertension and/or diabetes and their complications. It is noteworthy that chronic liver disease is a common cause of death in our environment. The above findings underscore the urgent need for community interventions targeted at interrupting HIV, TB and hepatitis B and C transmission with interventions like free treatment for patients infected with these diseases and early immunization. Population screening for early detection of hypertension, diabetes mellitus, and CKD and cancers especially PLCC in the early asymptomatic stages should be vigorously pursued.

Public enlightenment on the importance of maintaining healthy lifestyle for people living in urban sub-Saharan Africa should be intensified. These measures include dietary adjustments like avoiding the rapidly increasing fast food joints, and regular exercises required to reduce risks of death from cardiovascular and cerebrovascular diseases in the population. A campaign targeted at religious, traditional, and even political leaders should be stressed in our environment. They should be educated on the importance of postmortem examination as a useful tool in confirming the cause of death, especially where this is not obvious. Centralization and regionalization of specialist centers involved in screening and managing these newly emerging causes of death in sub-Saharan Africa has become imperative.[5]

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