



## Original Article

### In-Hospital Elderly Mortality in a Nigerian Tertiary Health Care Center

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#### ABSTRACT

##### Article history

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**Introduction:** The elderly represent a significant proportion of the populace and their mortality index is of public health significance. With dearth of vital registration, in-hospital based studies remains a desirable alternative. This study hopes to determine the epidemiologic pattern of elderly mortality with respect to sex, age, date and cause of death.

**Methods:** This is descriptive retrospective study of elderly deaths among hospitalized patients in a Nigerian Tertiary Care Center. The age, sex, date and causes of death were analyzed using SPSS 21 and results summarized in tables and figures.

**Results:** Elderly death constitute 24.7% of all hospital deaths with a crude mortality of 25.3%. Males constitute majority of the cases and 81.6% of the deaths occur within the 7th and 8th decades. Non-communicable diseases, communicable diseases and injuries constitute 80%, 12.5% and 7.6% of the cases respectively. Major specific causes of death include cerebrovascular accident, chronic kidney disease, chronic liver disease, sepsis, diabetes mellitus, road traffic accident, prostate and colorectal cancers accounting for 28.8%, 8.7%, 5.7%, 5.3%, 4.9%, 3.8%, 3.4% and 3.0% of all cases respectively.

**Conclusion:** Mortality rate among in-hospital elderly patients are relatively high. More male are affected than females with causes attributed, in descending order to non-communicable, communicable diseases and external injuries. Major specific causes of death include cerebrovascular accident, chronic liver disease, chronic kidney disease, diabetes mellitus, cancers, sepsis and road traffic injury. Understanding the disease pattern will go a long way guiding social policy and healthcare interventions on the elderly population.

**Keywords:** Mortality, Non-communicable, Communicable, Injury, Aging

#### Introduction

Nigeria, the most populous country in Africa has about 5.13% of its population aged  $\geq 60$  years (1). It is expected that this figure will increase proportionately over the Incoming years following improvement in living condition and advancement in health care.

Physiological changes across all organ system in this age group, characterized by degenerative changes, limited regenerative capacity and altered metabolism predisposes them to certain diseases, especially non-communicable diseases (2). Ageing has also been

shown to impose a higher risk and adverse clinical outcome on injuries (3).

Understanding the age-specific causes of death in this part of the world is of fundamental importance in enhancing the health outcome and improving longevity. With the inherent unavailability of population-based statistics, hospital based data remaining the best alternative source of data in such countries. This is the first of such study in this region that examines causes of in-hospital death among the elderly patients. Findings in this study will provide a

foundation for the needed intervention and policy reforms towards healthy ageing.

## Methods

### Research design

Delta State is an oil-rich State, located in the South-Southern part of Nigeria. It has many hospitals at different levels of care. Located within it are two tertiary healthcare centers, one of which is funded by the State (Delta State University Teaching Hospital DELSUTH). This hospital currently has 187-bed capacity but there is an on-going expansion of the facility to accommodate more patients. It serves as the apex hospital of the state and the major referral center to other hospitals operating at lower level within and around the state. The study is a descriptive, retrospective study of elderly patients that died while on admission in the hospital.

### Subject selection

The study includes all elderly patients admitted but died within the hospital from 1st January 2016 to 31st December, 2018. Patients above the age of 60 years were considered for this study.

### Data collection

The information for this study was retrieved from the record of the Department of Health Information Management of the Hospital. Cases with incomplete information were excluded from the study. Information such as age, sex, primary cause of death and the month of death were extracted from the mortality records of the records department of the institution. The causes of death were reclassified according to the International Classification of Diseases (10th revised edition).

### Data analysis

These data were analyzed using the SPSS, version 21. The results are summarized in tables and figures.

### Ethical considerations

Ethical approval was granted by DELSUTH prior to the commencement of the study (Reference number: DELSUTH/HREC/2019/021/0317).

## Results

Two hundred and sixty four deaths were encountered during the 3-year study period, accounting for 24.7% of all hospital deaths, a mean monthly mortality of 7.3 deaths and a crude mortality rate of 25.3%.

Table 1 shows the yearly distribution of in-hospital mortality according to their various age groups. The percentage of deaths in the 6th, 7th, 8th, 9th and 10th decades are 50.2%, 31.4%, 15.2%, 2.3% and 0.4% respectively. The number of deaths recorded in 2016, 2017 and 2018 are 58(22.0%), 102(38.6%) and 104 (39.4%) respectively.

The detail of sex-wise mortality trend from 2016-2018 is shown in figure 1, with an overall male to female ratio of 1.5:1, and a male to female ratio of 1.6:1, 1.6:1, and 1.4:1 in 2016, 2017 and 2018 respectively.

The detail of the annual distribution of mortality according to their classes is shown in table 2. Non communicable diseases (NCD), communicable diseases (CD) and external injuries accounted for 211 (80.0%), 33 (12.5%) and 20 (7.6%) of the cases respectively.

The details of the sex distribution of disease mortality are shown in table 3. The male: female ratios for NCD, CD and injuries are 1.3:1, 2:1, and 4:1 respectively.

Thirty-four cancer deaths were encountered in this study. The male to female ratio of cancer mortality is 1.8:1. Prostate, colorectal and hematological malignancies accounted for 9(40.9%), 5(22.7%) and 2(9.0%) respectively of the cancer mortality among males. Ovarian cancer, colorectal cancer and cervical cancer accounted for 4 (33.3%), 3 (25.0%) and 2 (16.7%) respectively of cancer deaths among females. The detail is depicted in table 4.

The details of the frequency of the specific diseases mortality is shown in table 5.

**Table 1. Yearly distribution of cases according to various age groups**

Age groups	Yearly distribution of death			Total
	2016	2017	2018	
<b>61-70</b>	30 (51.7%)	52 (51.0%)	52 (50.0%)	134 (50.2%)
<b>71-80</b>	18 (31.0%)	32 (31.4%)	33 (31.7%)	83 (31.4%)
<b>81-90</b>	8 (13.8%)	17 (16.7%)	15 (14.4%)	40 (15.2%)
<b>91-100</b>	1 (1.7%)	1 (1.0%)	4 (3.8%)	6 (2.3%)
<b>101-110</b>	1 (1.7%)			1 (0.4%)
<b>Total</b>	58 (100.0)	102 (100.0)	104 (100.0)	264 (100.0)

Mean age= 72.56 ± 8 .83

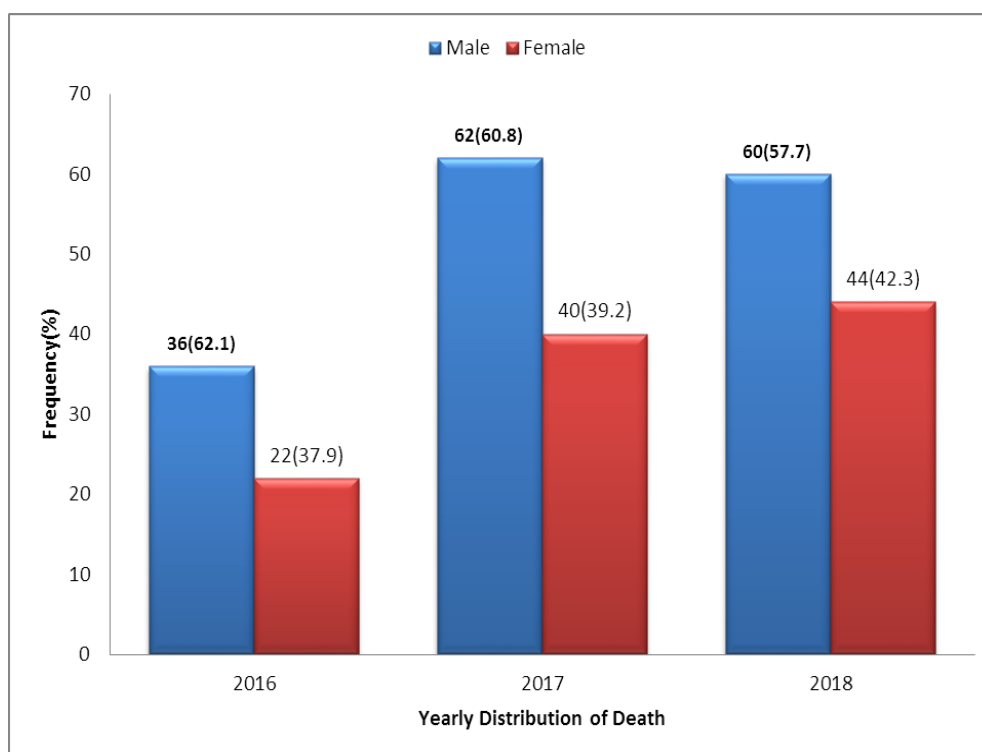


Figure 1. Sex-wise distribution of cases

Table 2. Year-wise distribution of disease and injury mortality 2016-2018

Cause of death		2016 (%)	2017 (%)	2018 (%)	Total
<b>Injuries</b>	Road traffic accident	4 (100.0)	4 (50.0)	2 (25.0)	6 (30)
	Fall		2 (25.0)	2 (25.0)	4 (20)
	Burns			2 (25.0)	2 (10)
	Blunt injury			2 (25%)	2 (10)
	Gun injury		1 (12.5)		1 (5)
	Suicide (organophosphate)		1 (12.5)		1 (5)
	Total	4 (100.0)	8 (100.0)	8 (100.0)	20 (100)
<b>Communicable infections disease</b>	CNS infections	4 (33.3)	1 (11.1)	2 (16.72)	7 (21.2)
	Urinary tract infection	1 (8.3)			1 (3.0)
	Sepsis	5 (41.7)	3 (33.3)	6 (50.0)	14 (42.4)
	Infectious respiratory disease	2 (16.7)	3 (33.3)	3 (25.0)	8 (24.2%)
	Sexual transmitted infection		2 (22.2)	1 (8.3)	3 (9.0)
	Total	12 (100.0)	9 (100.0)	12 (100.0)	33 (100)
<b>Non Communicable disease</b>	Cerebrovascular	15 (35.7)	32 (37.6)	29 (34.5)	76 (36.1)
	Cardiovascular	3 (7.1)	7 (8.2)	6 (7.1)	16 (7.6)
	Endocrine/metabolic disease	4 (9.5)	2 (2.4)	8 (9.5)	14 (6.6)
	Cancer	3 (7.1)	19 (22.4)	12 (14.3)	34 (16.1)
	CNS disease	1 (2.4)		2 (2.4)	3 (1.4)
	Gastrointestinal disease	3 (7.1)	7 (8.2)	6 (7.1)	16 (7.6)
	Genitourinary disease	2 (4.8)	7 (8.2)	6 (7.1)	15 (7.1)
	Genitourinary	7 (16.7)	6 (7.1)	11 (13.1)	24 (11.4)
	Hematological disease	1 (2.4)	2 (2.4)		3 (1.4)
	Respiratory disease	3 (7.1)	3 (2.4)	4 (2.4)	10 (4.7)
	Total	42 (100.0)	85 (100.0)	84 (100.0)	211 (100)

Table 3. Sex distribution of disease mortality

Disease/Injury entity		Sex		Total(%)
		Male (%)	Female (%)	
<b>Communicable disease</b>	CNS infection	5 (22.7)	2 (18.2)	7 (21.2)
	Infectious respiratory disease	6 (27.3)	2 (18.2)	8 (24.2)
	Urinary tract infection		1 (9.1)	1 (3.0)
	Sepsis	11 (50.0)	3 (27.3)	14 (42.4)
	Sexually transmitted infection (AIDS)		3 (27.3)	3 (9.1)
	Total	22 (100.0)	11 (100.0)	33 (100)
<b>Non Communicable disease</b>	Cerebrovascular disease	33 (27.5)	43 (47.3)	76 (36.0)
	CNS disease	3 (2.5)		3 (1.4)
	Respiratory disease	9 (7.5)	1 (1.1)	7 (3.3)
	Cardiovascular disease	8 (6.7)	8 (8.8)	16 (7.6)
	Metabolic disorder	8 (6.7)	6 (6.6)	14 (6.6)
	Hematological disease	2 (1.7)	1 (1.1)	3 (1.4)
	Genitourinary disease	19 (15.8)	5 (5.5)	24 (11.4)
	Gastrointestinal disease	9 (7.5)	7 (7.7)	16 (7.6)
	Hepatobiliary disease	7 (5.8)	8 (8.8)	15 (7.1)
	Cancers	22 (18.3)	12 (13.2)	34 (16.1)
	Total	120 (100.0)	91 (100.0)	211 (100)
<b>Injury</b>	Road traffic accident	9 (56.3)	1 (25.0)	10 (50.0)
	Fall	3 (18.8)	1 (25.0)	4 (20.0)
	Blunt injury/Physical assault	1 (6.3)	1 (25.0)	2 (10.0)
	Burns	1 (6.3)	1 (25.0)	2 (5.0)
	Suicide (organophosphate)	1 (6.3)		1 (5.0)
	Gun shot	1 (6.3)		1 (5.0)
	Total	16 (100.0)	4 (100.0)	20 (100)

Table 4. Sex-wise cancer distribution

Organ/region	Male	Female
<b>Pancreatic cancer</b>	1 (4.5)	
<b>Prostate cancer</b>	9 (40.9)	
<b>Colorectal cancer</b>	5 (22.7)	3 (25.0)
<b>Gastric cancer</b>	1 (4.5)	
<b>Head and neck tumour</b>	1 (4.5)	
<b>Hematological cancer</b>	2 (9.0)	
<b>Liver cancer</b>	1 (4.5)	
<b>Soft tissue cancer</b>	1 (4.5)	1 (8.3)
<b>Breast cancer</b>		1 (8.3)
<b>Cervical cancer</b>		2 (16.7)
<b>CNS tumour</b>	1 (4.5)	1 (8.3)
<b>Ovarian cancer</b>		4 (33.3)
<b>Total</b>	22 (100.0)	12 (100.0)

## Discussion

Granted that the study is a hospital-based study, its finding is very significant as it depicts elderly disease mortality trend in the region of the country served by the hospital. Besides, non-consistent

vital registration and rarity of census is an obvious challenge limiting data availability in most developing countries (4).

In this study, we observed a total of 264 deaths out of 1070 deaths, representing 24.7% of all deaths in the hospital and a crude mortality rate of 25.3%. Our report is intermediate between the values observed by Sanya et al. (22.4%) in Middle belt (5) and Arodiwe et al. (31.2%) in South Eastern Nigeria (6), but higher than values observed by Lamont et al. (20%) in USA (7), Shoko et al (17.7%) in Japan (8) and Silva et al. (16.4%) in Brazil (9). The discrepancy in crude mortality rate between high and low income countries may be attributed to limited healthcare resources as well as lack of experts in geriatric medicine in the later.

We observed an increase in number of mortality across the years. We think that this may be attributed to the ongoing expansion of the hospital facility and establishment of new departments, resulting in increase in number of referrals from peripheral primary and secondary healthcare centers.

Table 5. Specific disease causes of death

Disease	Frequency	Percentage
Cerebrovascular accident	76	28.8
Chronic kidney disease	23	8.7
Chronic liver disease	15	5.7
Sepsis	14	5.3
Diabetes mellitus	13	4.9
Road traffic accident	10	3.8
Prostate cancer	9	3.4
Coloectal cancer	8	3.0
Congestive cardiac failure	8	3.0
Peptic ulcer disease	8	3.0
Pneumonia	6	2.3
Meningitis/Encephalitis	6	2.3
Severe hypertension	5	1.9
Ovarian cancer	4	1.5
Chronic obstructive Airway disease	4	1.5
Intestinal obstruction	4	1.5
Fall from height	4	1.5
Retroviral disease	3	1.1
Cervical cancer	2	0.8
Sarcoma	2	0.8
Severe anaemia	2	0.8
Pneumonia	2	0.8
Acute asthmatic attack	2	0.8
Assault	2	0.8
Burns	2	0.8
Others	30	11.4
<b>Total</b>	<b>264</b>	<b>100</b>

The age distribution of the patients shows a mean age of 72 (6). Age range of 60-103 years, with 81.6% of the deaths within the 7th and 8th decade. This result closely tallies with those observed in the middle belt (68 years) (5) and south eastern Nigeria (69.9%) (6). This invariably depicts the population curve of the elderly populace and may be relevant in designing a mortality and population predicting model for old people in the backdrop of absent vital registration system (4). The dearth of government and institutional involvement in supporting the elderly population, and dependence on family members for their healthcare funding is the trend in most developing countries (10). The high cost of caring for the health need of the elderly populace may impact on their access to healthcare especially where the family members are not economically fit. In contrast, most developed countries have better welfare package for the elderly, better standard of living, and more sophisticated medical care all of which contribute to increasing longevity (11).

This study showed that male mortality is higher than that of the female among the elderly with a male to female ratio of 1.5:1. This is comparable with a ratio of 1.4:1 and 1.7:1 observed in Middle belt (5), and south eastern Nigeria (6) respectively. At global level, adult mortality has been shown to be naturally higher among the male

gender (12). The relatively higher life expectancy of adult females is attributed to inherent biological advantage, less involvement in risky behaviors or unhealthy lifestyles and lastly because they seem to benefit more from health policies (12).

We observed more death from NCDs than those from communicable diseases or external injuries, which is in agreement with studies in other parts of the country (5, 6, 13). This is also in line with the report that about 80% of NCDs occur in low and middle income countries and that 75% of global NCD-deaths occur among 60+ year's individuals (14). The high rate of NCD related mortality are rooted in unhealthy life-style changes and habit much earlier in the life cycle such as alcohol consumption, smoking, unhealthy eating habits, insufficient physical activity or even occupational risk factor exposures, and poor management of hypertension. Modification of exposure to these risk factors at younger age will invariably translate to headier elders in the society (15). In this study the most common causes of NCD mortality are cerebrovascular events, chronic kidney disease, chronic liver disease and diabetes mellitus. Leading causes in injury related mortality are road traffic accident and fall; while leading causes of infection mortality are sepsis, respiratory tract and central nervous system infections.

The single most common cause of death in this study is cerebrovascular accident (CVA) which accounted for 28.8% of all deaths. CVA has earlier been reported as the most common cause of elderly mortality by Uchendu et al. in South South, Sanya in Middle Belt and Arodiwe in South Eastern Nigeria representing 25.1%, 19.8% and 19.3% of deaths respectively (5, 6, 13). In a country with dearth of imaging equipment or specialists in geriatric medicine, under-diagnosis is likely, implying that proportion of CVAs quoted in these studies are likely to be an underrepresentation. Across the globe, stroke is the second single most common cause of death (after ischemic heart disease), accounting for 11.8% of all deaths (16). The role of hypertension and lifestyle cannot be overemphasized (15).

Cancer death accounted for 12.9% of deaths in this study, with the duo of prostatic and colorectal cancer being the most common causes in males while colorectal and ovarian cancer are the most common causes among females. Observation in this study is lower than the incidence observed by Uchendu and Forae in South Southern Nigeria (15.2%) (13), but higher than value reported in Middle belt (8.4%) (5) and South-Eastern Nigeria (4.6%) (6). From global perspective, studies has shown that 60% of diagnosed cancer cases and 70% of cancer mortality occur among the elderly populace (17). It is my opinion that cancer-related mortality will continue to rise with increasing population of the elderly, limited



availability of cancer screening techniques, late diagnosis and unavailability of specialized cancer treatment facilities; except if desirable steps are taken to reverse this trend.

Infections are relatively common in this study, accounting for 12.5% of the cases. Sepsis, central nervous system and respiratory infections accounted for most cases. Age-related decline in immune response, co-morbidities, functional impairment and increasing duration and number of hospital admission that characterize the elderly patients are the likely explanations.

Fatal external injuries are relatively common accounting for 7.5% of the cases which is higher than the value of 4.4% reported by Sanya et al. in the Middle belt zone of the country (5). Fatal injuries mortality has earlier been shown to be relatively high among the elderly populace in this study using autopsy data, the differences arising from difference in inclusion criteria used for both studies (18). In a study in South Eastern Nigeria, Onyemaechi reported that road traffic accident is the leading cause of injury-related hospital mortality (19). Fall, the second cause of fatal injury in this study, is also relatively common in this age group among European countries and US (20, 21). Only one case of suicide which was executed by ingesting organ phosphorus organophosphate poison was identified in this study, supporting the earlier report of rarity of suicide in this region (22).

## Conclusions

Mortality among in-hospital elderly patients are relatively high. More male are affected than females and causes are attributed, in descending order to non-communicable, communicable diseases and external injuries. Major specific causes of death include CVA, chronic liver disease, chronic kidney disease, Diabetes mellitus, cancers, sepsis and RTA. Understand the disease pattern will go a long way guiding social policy and healthcare interventions on the elderly population.

## Study limitations

Documentation of mortality by Hospital Staff is poor, leading to loss of data. Filing of patients' case notes is a serious problem. Also since this study is based on patients that utilize the hospital service, it may not be an exact representation of the true population statistics.

## Conflict of interest

The author has no conflict of interest to declare.

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## Authors' contributions

The entire research work from the conception to the end was executed by the Uchendu Jude Obiora.

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