



## Research article

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### Leading causes of hospitalization and mortality at a tertiary health facility in Nigeria: a ten-year (2001 – 2010) trend analysis

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#### ABSTRACT

**Background/Objective:** Records of hospitalization and within hospital mortality are vital indicators for disease burden and quality of care. **Methods/Design:** A ten-year clinical data was analyzed to identify changes in hospitalization and mortality as useful indicators of changes in disease burden and quality of health care delivery over time. **Results:** Between January 2001 and December 2010, 71,647 patients were hospitalized at the National Hospital in Abuja, Nigeria. This is composed of 29,666 (41.4%) male and 41,981 (58.6%) female. Leading causes of hospitalization were: infections, (n=21,491, 30.0%); respiratory diseases, (n=14,329, 20%); trauma, (n=12,897, 18%); cardiovascular diseases, (n=10,747, 15%); neoplasms (n=5,731, 8%) and others, constituting 9%. A total of 2,883 deaths were recorded in this ten-year period. Of those, infections accounted for 614 (21%) followed by neonatal deaths with 416 (16%) and trauma 363 (12%). Neoplasms and cardiovascular diseases each contribute 11% to death cases. Consistent decline in mortality were noted in endocrine and respiratory diseases while increases over time were observed in infectious, neoplastic, neonatal and trauma related deaths. **Conclusion:** Consistent increase in hospitalization and mortality due to the communicable, non-communicable and trauma related diseases indicates the needs for primary prevention program for measures to contain or mitigate the effect of these scourges.

**Keywords:** Hospital records; hospitalization; mortality; morbidity; tertiary hospital

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#### INTRODUCTION

Temporal trends in hospitalization and mortality due to various diseases serve as surrogates for disease worsening, increased health care utilization and allows for evaluation of mortality burden attributable to different diseases<sup>1,2</sup>. Hospital level admission and mortality data are also vital indicators of safety and quality of practice within hospitals<sup>3,4</sup>. The correlation

between the number of patients who die following admissions and treatments in a hospital and the number that would be expected to die on the basis of existing reference values given the patients characteristics and level of care, otherwise known as hospital standardized mortality ratio (HSMR) is used in several countries to measure within hospital quality of care<sup>5,6</sup>.

A summary hospital level mortality indicator

(SHMI) is another performance estimator that accounts for, in addition to within hospital mortality, death in the first 30 days following hospital discharge<sup>7-9</sup>. Adjusting for key patient characteristics and hospital factors affecting mortality, HSMR and SHMI have been used to compare performance between hospitals<sup>10,11</sup>. In-hospital mortality estimation is affected by patients' age (where older patients have higher risk of death), co-morbidities, average length of stay, diagnosis and socio-economic status while hospital size, admissions, specialties and level of care (primary, secondary or tertiary) are hospital characteristics that predict mortality<sup>12,13</sup>. Although there are questions and ongoing debates on the ability of these performance estimators to distinguish low from high quality facilities when hospitals are compared, their use however, as assessment tools for monitoring outcomes in individual hospitals over time for safety and quality improvement is gradually gaining popularity<sup>14-17</sup>.

Estimations of these indicators are only feasible in the presence of state or national comparative (reference) databases that provide the estimated reference or expected value to which hospital observed data are compared. In many developing and resource limited countries, comparative data are lacking. In the absence of comparative data on hospital mortality, temporal assessment of the pattern and trends of mortality over time affords decision makers the means to track changes in hospital mortality as a proxy of hospital performance. Changes in hospitalization due to diseases could serve as surrogates of their morbidities and burdens in communities. In this article we analyzed a ten-year hospitalization data to evaluate pattern and trends in hospitalization and mortality due to different disease conditions and rank the observed trends according to their public health relevance.

## METHODS

### Study setting

The National Hospital Abuja (NHA) is a 450 bed tertiary public hospital located in the cosmopolitan city of Abuja, the capital of Nigeria, a sub-Saharan country. The Federal Capital Territory is located in the geographical centre of Nigeria with a land area of almost 8000 km<sup>2</sup> within latitudes 70 20' North of the Equator and longitudes 60 45' and 70 39' (Demographia, 2015). The population of Abuja is estimated to be approximately 2 million. The NHA derives clientele mostly from the inhabitants of the Federal Capital and surrounding states of the federation, as well as referrals from other geographically distant states within the country such as Borno, Adamawa, and Bayelsa, to mention a few. It currently accommodates the National Trauma Centre and the National Radiotherapy Centre.

### Study design

The study is a retrospective, analytic review of morbidity and mortality involving all inpatients in the hospital over the period January 2001 to December 2010.

### Data access and records selection

A ten year de-identified admission data from 2001 to 2010 were obtained from the Department of Health Records, National Hospital, Abuja, Nigeria, with information on admission date, primary diagnosis, length of stay and status at discharge: alive or dead. Other data elements collected included information on patients' gender, age and location. Causes of death were classified based on ICD-10 coding and categorized as follows: infection, infestation, cardiovascular, respiratory, digestive, nervous system, congenital, neoplasm, pregnancy, childbirth, puerperium, genito-urinary, trauma, skin diseases, mental and behavioural. Diseases of similar systems

associated with few numbers of deaths were merged to create five leading causes of mortality. These include: infectious and parasitic, pregnancy, perinatal or congenital causes, blood-related and circulatory diseases, neoplasms, injury and external causes.

**Data analysis and management**

Data were cleaned; cases with missing frequencies and those whose status was not documented at the time of discharge were excluded from the analysis. Frequencies and proportions were tabulated to describe the pattern and evaluate trends in mortality over the 10-year period. In-hospital mortality was defined as the number of death per 1000 discharges per year. The proportion of death attributable to the different leading causes of death overall and in each year was assessed and changes over time evaluated.

**Ethics**

Necessary permissions were obtained to access already de-identified hospital statistical data and patient health records from the Department of Health Records, National Hospital, Abuja, Nigeria.

**RESULTS**

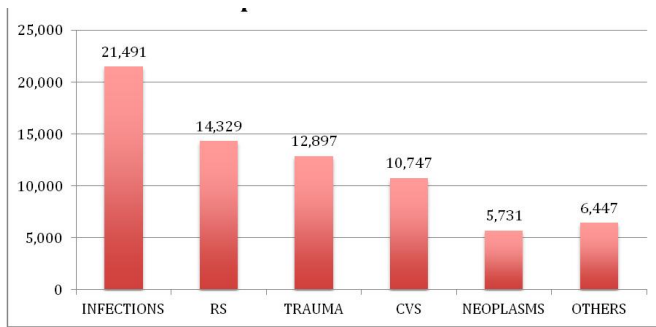
A total of seventy-one thousand six hundred and forty-seven (71,647) patients were hospitalized in National Hospital Abuja between 1st January 2001 and 31st December 2010 composed of 29,666 (41%) male and 41,981 (59%) female. The annual in-patient admissions ranged from 4,071 to 9,008 averaging 7,163 yearly as depicted in Table 1 below. From the table, while male mortality exhibited an almost two-fold increase from 2001 (n=103) to 2010 (n=205), female mortality showed only a smaller increase for the same period.

**Table 1: Inpatient admissions and deaths**

Year	ADMISSION			MORTALITY		
	Male	Fem	Total	Male	Fem	Total
2001	1514	2557	4071	103	74	177
2002	2171	3363	5534	200	101	301
2003	2957	3554	6511	202	112	314
2004	2204	3310	5514	181	108	289
2005	3020	4417	7437	177	125	302
2006	3484	5095	8579	69	31	100
2007	3488	4941	8429	117	73	190
2008	3727	5115	8842	307	217	524
2009	3731	5277	9008	216	156	372
2010	3370	4352	7722	205	119	324
<b>G/Tota</b>	<b>2966</b>	<b>4198</b>			<b>111</b>	
<b>l</b>	<b>6</b>	<b>1</b>	<b>71647</b>	<b>1777</b>	<b>6</b>	<b>2893</b>

The lowest hospitalization occurred in 2001 (n=4071) and the highest in-patient admission was in 2009 (n=9008). Leading causes of hospitalization for the decade of study were: infections, (n=21,491, 30%); respiratory diseases, (n=14,329, 20%); trauma, (n=12,897, 18%); cardiovascular diseases, (n=10,747, 15%); neoplasms (n=5,731, 8%) and others, constituting 9%. The other contributing systems, in albeit smaller proportion, include obstetric and perinatal disorders, nervous system, dermatological and endocrine disorders among others. This is depicted in Fig 1 below. Over the years, hospitalization followed an increasing trend while mortality has been relatively stable with an average of 290 per year. This is depicted in Fig 2.

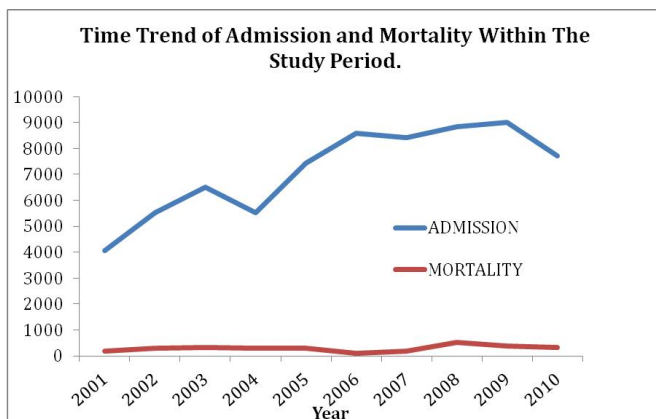
The total mortality for the period was 2,893 composed of 1,777 (61%) males and 1,116 (49%) females. The annual mortality averaged 291 ranging from 103 to 524 with a standard deviation (SD) of 115.29. The average age of the patients is 32.1 years with the age range from 0 to 112 years.



**Fig 1: Distribution of causes of hospitalization**

**Key:**

RS – Respiratory system, CVS – Cardiovascular system. Other causes of hospitalization included Endocrine nutritional and metabolic diseases, mental disorders, nervous system, hematologic and obstetric conditions among others.



**Fig 2: Time trend of admission and mortality in NHA in a decade**

A Crude Hospital Mortality Rate of 40.4 per 1000 admissions was obtained. Infection was the major cause of death (20%) followed by neonatal death (15.5%), trauma (12.1%) and cardiovascular causes (11.1%). Other causes of deaths include neoplasms, gastrointestinal diseases, respiratory system etc. as depicted in Table 1. The lowest mortality occurred in 2006 (n=100) and the highest, in 2008 (n=572). The modal age group is the 0 – 10-yrs category followed by the 41-50 year cohort. This is illustrated in Fig 3.

The majority of deceased patients (38%) died within the first 2 days of admission, the frequency decreasing as the number of days increased. This is depicted in Fig 4 below.

**DISCUSSION**

Hospital records are crucial source of information on the health status of the community. It provides information on the key components of morbidity patterns, disease prevalence, length of hospital stays, mortality and other health indices required for adequate health care policy formulation. These key components are markers of resource consumption and consequently, more often than not, pose huge challenges to most low and middle-income countries (LMIC) like Nigeria.

The findings in this study show female admissions and morbidity almost twice the male admissions. Mortality from all causes, on the other hand, is higher among males than females. This may be attributable to female likelihood of earlier health care consultations in the disease process than males. Lengths of hospital stays (LOS) before death are determined by various factors attributable to either nature of disease, patient or hospital. In our study, the length of hospital stay among the deceased was in most cases, less than a week reflecting, in our opinion, the severity of disease at the time of presentation in the majority of cases. Factors attributable to patients as expounded in the literature include older age, lack of immediate family support, low socio-economic status and severe co-morbidity<sup>18</sup>. Other studies suggest malnutrition, obesity and co-morbidities, as factors affecting duration of stay<sup>19-21</sup>. Hospital factors include availability of equipment, level of expertise, nosocomial infections as well as general operational policies of the hospital<sup>2,23</sup>.

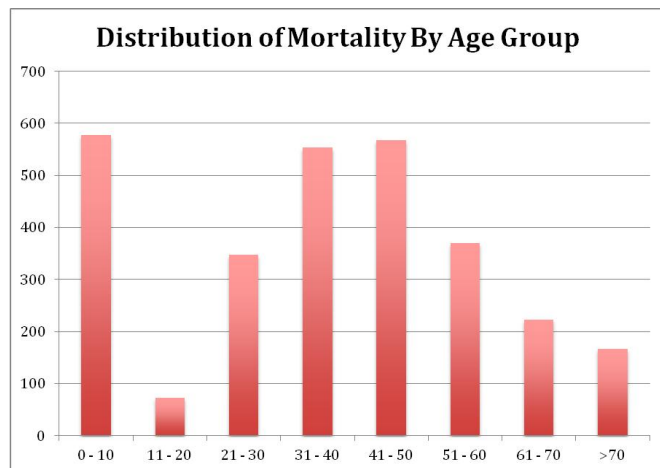
In particular, nosocomial infections with *Pseudomonas* or *acinobacter* species have been shown to cause considerable mortality in excess of that resulting from underlying diseases alone and consequently prolong the length of stay in hospital<sup>24</sup>. Over 68% of the inpatient mortality recorded in our study involved patient of 45 years

age or younger. This result contrasts sharply with a similar study in the US where 75% of the inpatient mortality involved patients of 65 years age or older<sup>25</sup>.

**Table 2: Ten commonest causes of death in NHA over a period of ten years (2001 – 2010)**

DISEASES	FREQUENCY	PERCENTAGE
Infections	614	20.5
Neonatal	462	15.5
Trauma	363	12.1
CVS	332	11.1
Neoplasm	316	10.5
GIT	189	6.3
RS	162	5.4
GUS	149	5
CNS	113	3.8
Others	106	3.5

**Note:** others include Endocrine diseases, hematologic and obstetric conditions with 98, 58 and 25 frequencies respectively



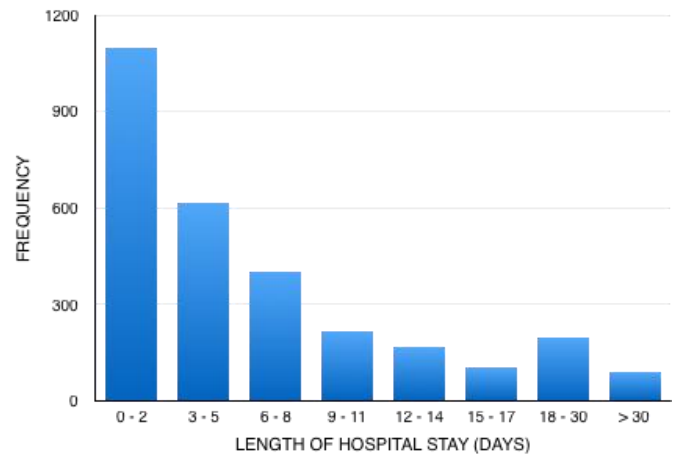
**Fig 3: Distribution of mortality according to age group in NHA over the period of study.**

**Study limitations**

Likewise, there were cases of incomplete records in this retrospective study.

**CONCLUSION**

There is a consistent female predominance in morbidity and a male predominance in mortality over the years in National Hospital, Abuja. Careful study of the health records provides an important surrogate marker for the assessment of morbidity and mortality of the society and helps in effective health care policy formulation.



**Fig 4: Length of hospital stay (LOS) of patients before death within the study period.**

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**Conflict of interest**

None declared.

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**Authors Contribution:** SMA conceived of the study, initiated its design, participated in literature search, data abstraction and collection, analysis and coordination and drafted the manuscript. GA, GNS and KIA participated in the design, literature search, technical process, data analysis and coordination and reviewed the final manuscript.