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ORIGINAL ARTICLE

# Mortality Pattern of Hospitalized Surgical Patients in a Nigerian Tertiary Hospital

**Ndubuisi O.C. Onyemaechi · Sunday O. Popoola · Alexander Schuh · Alex T. Iorbo · Itodo C. Elachi · Kehinde S. Oluwadiya**

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**Abstract** There is paucity of reports describing the pattern of surgical mortality in Nigeria. The aim of this study was to determine the incidence and pattern of mortality associated with surgical care in our hospital and to identify areas of improvement. The records of all patients who died after admission for surgical care at the Federal Medical Centre Makurdi between January 2009 and December 2011 were studied retrospectively. Data extracted were patients' demographics, surgical diagnosis, co-morbidity, surgical procedures performed, duration of hospital admission and outcome of treatment. Data were analyzed with SPSS version 17. There were 2,273 admissions into the surgical wards within the study period. During this period, there were 151 deaths with a crude mortality rate of 6.6 %. Ninety-four (62.3 %) patients were males and 57 (37.7 %) were females (M:F=1.6:1). The age of the patients ranged from 8 days to 95 years with a mean age of 36.1±20.1 years. Acute abdomen (37, 24.5 %), traumatic brain injury (32, 21.2 %) and malignancy (28, 18.5 %) were the commonest surgical diagnosis. Trauma-related deaths accounted for 48 (31.8 %) of all the deaths. Road traffic crash (89.6 %) was the commonest cause of injury. Surgical operations were performed in 75 (49.7 %) of the patients who died, while 76 (50.3 %) did not have any operative intervention. Mortality in patients admitted into the surgical ward was 6.6 %. Trauma-related death was the commonest. Traumatic brain injury, typhoid perforation of the bowel and malignancy were the leading causes of surgical death in our centre.

**Keywords** Surgical mortality · Pattern · Hospitalized patients · Nigeria

N. O. Onyemaechi (✉)
Department of Surgery, University of Nigeria Teaching Hospital Ituku-Ozalla Enugu, Enugu, Nigeria
e-mail: bisionyemaechi@yahoo.com

S. O. Popoola · K. S. Oluwadiya
Department of Surgery, Ekiti State University Teaching Hospital Ado-Ekiti, Ado-Ekiti, Nigeria

A. Schuh
Musculoskeletal Center, Neumarkt Clinic, Neumarkt, Germany

A. T. Iorbo
Department of Surgery, Federal Medical Centre Makurdi, Makurdi, Nigeria

I. C. Elachi
Department of Surgery, Benue State University Teaching Hospital Makurdi, Makurdi, Nigeria

## Introduction

Surgical care is an integral part of health care throughout the world with an estimated 234 million operations performed annually [1]. Approximately 4,000 surgical procedures per 100,000 populations in many countries and up to 11,000 procedures per 100,000 populations are carried out in high-volume countries annually [1]. Although surgical care can improve the quality of life and prevent loss of life or limb, it is also associated with considerable risk of complications and death.

Mortality may result directly from the disease process necessitating surgical care, from a complication of the surgical procedure and anaesthesia or from other co-morbidities. In developing countries, late presentation, delay in diagnosis and treatment as well as limited health facilities and poor infrastructure may contribute significantly to mortality during surgical care. A study of the pattern of mortality in surgical care involves a systematic, critical analysis of the quality of surgical care and the outcome of the treatment. It can identify areas of surgical care that require improvement or modification.

In-hospital surgical mortality is traditionally defined as death occurring within 30 days of admission for surgical care

[2]. This definition, however, does not distinguish deaths that are not related to surgical care occurring during this period and mortality from surgical care occurring after 30 days which are potential sources of overestimation and underestimation of surgical death rates, respectively.

There are many studies from developed countries on various aspects of surgical mortality especially disease-specific and procedure-specific mortality rates [3–5]. However, there is paucity of reports on this subject from developing countries. Death rates from surgical care tend to be lower in the developed countries. McDonald et al. [6] reported a mortality rate of 2.3 %, while Glass and Thomas [7] reported 3.1 % in their study. Conversely, Chukuezi and Nwosu [8] in Owerri and Ihegihu et al. [9] in Nnewi (both in Eastern Nigeria) reported mortality rates of 9.14 and 8.3 %, respectively. Ayoade et al. [10] reported a crude mortality rate of 5.09 % in Shagamu, Southwest Nigeria. Biluts et al. in Addis Ababa, Ethiopia, reported a mortality rate of 7.0 % [11].

The pattern of mortality from surgical care varies in many parts of the world. While disseminated cancer is a common cause of death in developed countries [6, 12], trauma-related deaths are more common in developing countries [8–10].

This study is intended to address the dearth of information on mortality arising from surgical care in Nigeria. The objective of this study was to determine the incidence and pattern of deaths associated with surgical care in our hospital. This study was also aimed at identifying areas in which surgical care of patients could be improved.

## Materials and Methods

Records of patients who died after surgical admission at the Federal Medical Centre Makurdi, Nigeria, between January 2009 and December 2011 were reviewed. The hospital is a 350-bed-capacity tertiary health facility in Makurdi, the capital city of Benue State, North Central Nigeria. It has three functional theatres and a three-bed intensive care unit (ICU). It has specialists in general surgery, urology, orthopaedics and traumatology, plastic surgery, paediatric surgery, ophthalmology and otorhinolaryngology. Trauma patients requiring neurosurgical management are initially managed by the orthopaedic and trauma surgeons before referral, if necessary. The records of all the patients who were admitted into the surgical wards with surgical conditions who subsequently died while on admission were reviewed. Patients who had incomplete records were excluded from the study. Data extracted included demographics, surgical diagnosis, co-morbidity, length of hospital admission, mode of admission and surgical treatment. Surgical deaths in the accident and emergency unit that have not been formally admitted into the wards were excluded from the study. The data obtained were analyzed using SPSS version 17. Categorical variables were compared using Pearson's chi-square test. The level of significance was set at a $p$ value less than 0.05.

## Results

The total admission in the surgical wards for the 3-year period (2009–2011) was 2,273. Males were 1,238 and females were 1,035. During this period, there were 151 deaths giving a crude mortality rate of 6.6 %. Ninety-four (62.3 %) were males and 57 (37.7 %) were females (M:F=1.6:1). The age of these patients ranged from 8 days to 95 years (mean±SD= 36.1±20.1 years). The distribution of the patients by age is shown in Fig. 1. There were 31 children below 18 years (20.5 %), and among them, 6 (3.9 %) were infants.

Table 1 shows the clinical diagnosis of the patients. Traumatic injuries (48, 31.8 %) were the most common clinical condition of the patients. This was followed by acute abdomen (37, 24.5 %) and malignancy (28, 18.5 %). The commonest cause of injury was road traffic crash, accounting for 43 (89.6 %) of all trauma-related deaths. Gunshot injuries occurred in 3 (6.2 %) and fall from height in 2 (4.2 %) trauma-related deaths. Head injury (32, 21.2 %) was the commonest injury. Multiple fractures (7, 4.6 %), cervical spine injury (4, 2.6 %), soft tissue injuries (3, 1.9 %) and abdominal injury (2, 1.3 %) were the other types of injuries (Table 2).

Typhoid perforation of the bowel was the commonest cause of acute abdomen. It accounted for 16 (10.6 %) of all surgical deaths. Acute intestinal obstruction occurred in 15 (9.9 %) patients. The other causes of acute abdomen were perforated peptic ulcer disease (4, 2.6 %) and ruptured appendicitis (2, 1.3 %).

Breast cancer (8, 5.3 %), colorectal cancer (7, 4.6 %) and prostate cancer were the commonest malignant conditions (Table 3).

Forty-seven (31.1 %) patients had co-morbid conditions, of which diabetes mellitus (14, 9.3 %) was the commonest co-morbidity. Other co-morbid conditions were hypertension (13, 8.6 %), HIV (8, 5.3 %), peptic ulcer disease (6, 4.0 %), chronic kidney disease (4, 2.6 %), obesity (1, 0.7 %) and epilepsy (0.7 %). Majority of the patients (102, 67.5 %) were admitted as emergencies, while 49 (32.5 %) were elective admissions. Seventy-six (50.3 %) of the patients were treated non-operatively, while 75 (49.7 %) had surgical procedures. The mean duration of hospital admission was 12.6±26.7 days with a range of 1 to 300 days.

There was a significant association between age and diagnosis, and co-morbidity ($p$=0.001). The relationship of certain variables and duration of admission is shown in Table 4.

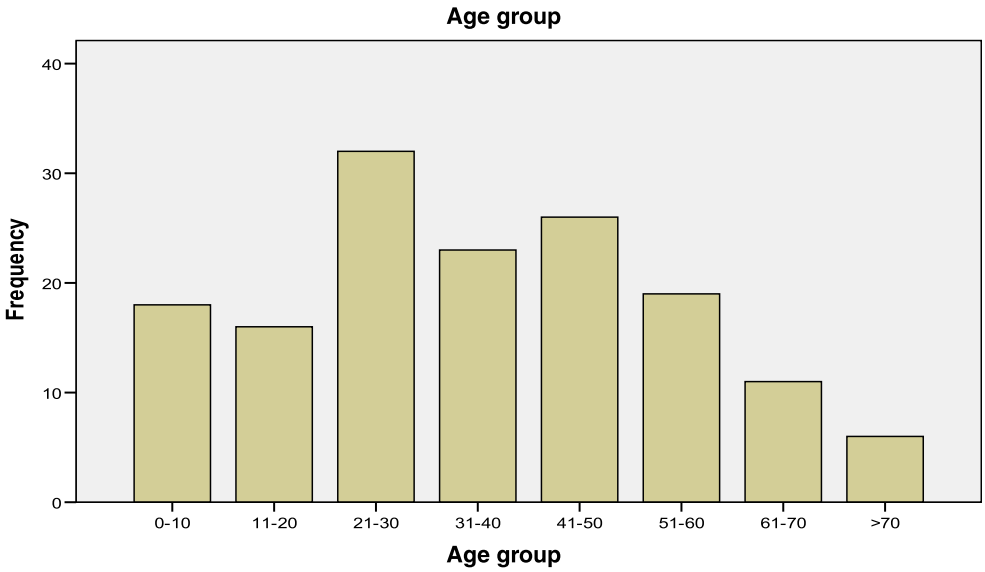


**Fig. 1** Age distribution of mortalities

## Discussion

The mortality in patients admitted into surgical wards in our study was 6.6 %. This figure is comparable to that in reports from other parts of Nigeria. In a similar study at Federal Medical Centre Owerri, Chukuezi and Nwosu [8] reported a surgical mortality rate of 9.14 %. Ihegihu et al. [9] at Nnewi, Nigeria, noted an in-hospital surgical mortality rate of 8.3 %, while Ayoade et al. [10] in a 5-year retrospective review of mortality pattern in surgical wards at Olabisi Onabanjo Teaching Hospital, Sagamu, Nigeria, reported a mortality rate of 5.09 %. In contrast, reports from developed countries show much lower surgical mortality rates. McDonald et al. [6] in a 10-year review of surgical mortality in Southampton, UK, reported a mortality rate of 2.3 %, approximately one third of the death rate in our study. Similarly, Semel et al. [13] in a nationwide survey of surgical deaths in the USA noted a declining inpatient surgical mortality of 1.68 % in 1996 to 1.32 % in 2006. This significant difference in surgical mortality rates between resource-poor and developed countries may be due to the late presentation of surgical diseases, poverty, limited resources and poor infrastructure that are prevalent in resource-poor nations.

We observed two peak age groups in our study. The first peak was the third decade while the second peak was the fifth decade of life. Trauma-related deaths and acute abdomen were responsible for the first peak, while majority of patients in the second peak age group had malignancies. The correlation between the age of the patients and the clinical diagnosis was significant ($p$=0.001). The mean age of our patients was 36.1 years, and majority (76.2 %) of the deaths occurred below 50 years. This pattern had earlier been reported by previous authors in Nigeria [8, 10] and corroborates the fact that the life expectancy in Nigeria is about 47 years. In developed countries, where life expectancies are higher, the mean age of surgical death as reported by McDonald et al. [6] and Semmens et al. [14] is much higher and may be a reflection of their socioeconomic development and advanced health care services.

The three most common clinical conditions leading to death were trauma (31.8 %), acute abdomen (24.5 %) and malignancy (18.5 %). Head injury constituted the most

**Table 1** Clinical diagnosis of the patients

| Diagnosis | Number | Percentage |
|---|---|---|
| Malignancy | 28 | 18.5 |
| Burns | 6 | 4.0 |
| Acute abdomen | 37 | 24.5 |
| Head injury | 32 | 21.2 |
| Musculoskeletal injuries | 16 | 10.6 |
| Congenital anomaly | 6 | 4.0 |
| Infection/inflammation | 6 | 4.0 |
| Gangrene | 9 | 6.0 |
| Enterocutaneous fistula | 11 | 7.3 |
| Total | 151 | 100 |

**Table 2** Distribution of traumatic injuries

| Injury | Number | Percentage |
|---|---|---|
| Head injury | 32 | 66.7 |
| Multiple fractures | 7 | 14.6 |
| Cervical spine injury | 4 | 8.3 |
| Abdominal injury | 2 | 4.2 |
| Soft tissue injuries | 3 | 6.3 |
| Total | 48 | 100 |

**Table 3** Distribution of malignancies

| Malignancy | Number | Percentage |
|---|---|---|
| Breast cancer | 8 | 28.6 |
| Colorectal cancer | 7 | 25 |
| Prostate cancer | 5 | 17.8 |
| Soft tissue sarcoma | 2 | 7.1 |
| Malignant melanoma | 1 | 3.6 |
| Bladder cancer | 1 | 3.6 |
| Osteosarcoma | 1 | 3.6 |
| Cancer of the pancreas | 1 | 3.6 |
| Oropharyngeal cancer | 1 | 3.6 |
| Cholangiocarcinoma | 1 | 3.6 |
| Total | 28 | 100 |

common trauma-related mortality in our series. It has been reported as the most common injury condition leading to death in many studies [15–17]. This was followed by spinal injury and gunshot injuries. The predominant cause of trauma-related death was road traffic crashes (89.6 %), which constituted 28.5 % of the total number of deaths. Road crashes and head injuries have been identified by previous authors as major causes of surgical mortality in our environment [15, 16].

Typhoid perforation of the bowel was the commonest cause of acute abdomen in our study. This was closely followed by acute intestinal obstruction. The irregular supply of potable water in Makurdi and the neighbouring cities may be responsible for this finding. The unhealthy sources of drinking water and poor sanitation may predispose the residents to enteric fever and its complications.

The commonest malignancy in our series was breast cancer. This predominance is a global pattern [18, 19]. Majority of the cancer patients presented with advanced diseases which adversely affected the outcome.

Only 31.1 % of our patients had a significant co-morbidity. Semmens et al. [14] in a similar study in Australia reported that 91 % of their patients had significant co-morbidities that increased the risk of death. The reasons may be because the patients in their cohort had a higher mean age than ours, and it is well known that older patients have higher co-morbidity rates. The other reason may be because there are more trauma cases in our cohort. Finally, they are more likely to diagnose co-morbid conditions because of their more advanced health care services. However, we observed that the presence of co-morbidity increased the duration of hospital admission ($p$= 0.003).

Majority of the patients (67.5 %) were admitted as emergencies. O'Leary et al. [12] reported that emergency admissions accounted for 37 % of all surgical admissions but 87.3 % of surgical deaths. The mortality rate for elective admissions and emergency admissions was 0.31 and 3.6 %, respectively, in their study, and they noted that co-morbidity and emergency admissions were major contributors to mortality in surgical units. Our finding is corroborated by Symons et al. [20] who reported significantly higher death rates following emergency surgical admissions in England. They noted that hospitals with greater intensive care beds and made greater use of ultrasound and CT scan tended to have lower mortality rates.

There was a strong association between the mode of admission and duration of hospital admission ($p$=0.001). The patients who died shortly after admission were mostly those admitted as emergencies. Late presentation and lack of emergency services may be responsible for this observation. These findings underscore the need for provision of emergency services and infrastructure required to support high-risk emergency patients requiring surgical care in all tertiary hospitals in developing countries. This may help reduce the surgical mortality rates.

More patients were in the non-operative group who did not have any surgical procedure. Poverty, lack of access to health insurance and presentation in advanced stages of surgical diseases were responsible for this observation. These factors may have adversely affected the surgical mortality rate in this study.

**Table 4** Cross tabulation of certain variables with duration of admission

| | Admission duration (days) | $p$ value |
|---|---|---|
| Co-morbidity | | |
| Present | 21.9 | 0.003 |
| Absent | 8.4 | |
| Mode of admission | | |
| Emergency | 7.9 | 0.001 |
| Elective | 22.5 | |
| Class of disease | | |
| Trauma | 6.8 | |
| Malignancy | 15.8 | 0.32 |
| Infective | 9 | |

## Conclusion

Our surgical mortality rate is comparable to that of other reports from other parts of Nigeria and other developing countries. Trauma, particularly head injury, typhoid perforation and malignancies were the most common clinical conditions leading to death. There is a need to develop neurosurgical and oncological services at the tertiary hospitals to cope with the attendant specialty-related deaths emphasized in this study. Aggressive public enlightenment campaigns on prevention of road traffic crashes, health education, provision of potable water, alleviation of poverty as well as provision of health care facilities and improved coverage of national health

insurance will reduce in-hospital surgical mortality rates in developing countries.

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**Ethical approval** The study was approved by the research and ethics committee of the hospital.

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