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### Mortality Pattern in Surgical Wards in Northwestern Nigeria: A Single-Center Study

*Modèle de Mortalité dans les Services de Chirurgie du Nord-Ouest du Nigeria : Une Etude Monocentrique*

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#### ABSTRACT

**BACKGROUND:** Surgical pathologies contribute to a huge portion of the global burden of diseases. Surgical needs therefore remain high and is projected to increase even further in the near future with increasing life expectancy and comorbidities, given the projection that 16% of the world's population will be older than 65 years by 2050. The outcome of patients with surgical pathologies could be influenced by several factors. Key amongst them is the quality of care. Mortality as an outcome is one metric that could be used to assess the quality of surgical care in a health facility, hence this study with the objective of determining the pattern of inpatient mortality in our surgical wards and suggesting possible ways of addressing identified gaps in their care delivery, which may also improve the care in other centers.

**PATIENTS AND METHODS:** A retrospective cohort study of surgical inpatients' mortality in the surgical wards of Ahmadu Bello university teaching hospital from January 1<sup>st</sup> 2016 to December 31<sup>st</sup> 2019. Data was analyzed using the Statistical Package for the Social Sciences (SPSS) version 20.0, and presented as descriptive statistics.

**RESULTS:** A total of 8862 admissions were made into the surgical wards, with 655 deaths, giving a crude mortality rate of 7.4%. Most of the deaths occurred in patients in the 46–60 years age group (217, 33.1%). Malignancy was the commonest surgical condition, 294 (48.7%, n=604). This was followed by trauma-related conditions, 96 (15.9%, n=604). Civil gunshot injury admissions showed an upward trend from 19 in 2017, with an exponential rise to 45 in 2019.

**CONCLUSION:** Although malignancy-related deaths predominated amongst our surgical inpatients, the incidences of deaths from road traffic and burns injuries, as well as septic surgical conditions are also worrisomely high. There is a rise in civil gunshot-related injury admissions and deaths. **WAJM 2022; 39(2): 162–169.**

**Keywords:** Surgical mortality, Trauma-related deaths, Gunshot-related deaths.

#### RÉSUMÉ

**CONTEXTE:** Les pathologies chirurgicales contribuent à une part énorme du fardeau mondial des maladies. Les besoins chirurgicaux restent donc élevés et devraient encore augmenter dans un avenir proche avec l'augmentation de l'espérance de vie et des comorbidités que 16 % de la population mondiale aura plus de 65 ans en 2050. L'issue des patients atteints de pathologies chirurgicales peut être influencé par plusieurs facteurs. Parmi ceux-ci, la qualité des soins. La mortalité en tant que résultat est une mesure qui pourrait être utilisée pour évaluer la qualité des soins chirurgicaux dans un établissement de santé. Cette étude a pour objectif de déterminer le modèle de mortalité des patients hospitalisés dans nos services de chirurgie et de suggérer des solutions possibles de remédier aux lacunes identifiées dans leur prestation de soins, ce qui pourrait également améliorer les soins dans d'autres centres.

**PATIENTS ET MÉTHODES:** Une étude de cohorte rétrospective de la mortalité des patients hospitalisés en chirurgie dans les services de chirurgie de l'hôpital universitaire d'Ahmadu Bello Ahmadu Bello, du 1er janvier 2016 au 31 décembre 2019. Les données ont été analysées en utilisant la version 20.0 du progiciel de statistiques pour les Sciences (SPSS, et présentées sous forme de statistiques descriptives.

**RÉSULTATS:** Un total de 8862 admissions ont été faites dans les services de chirurgie, avec 655 décès., soit un taux de mortalité brut de 7,4 %. La plupart des décès sont survenus chez des patients de la tranche d'âge 46-60 ans (217, 33.1%). La malignité était l'affection chirurgicale la plus fréquente, 294 (48.7%, n=604). Elle était suivie par les affections liées à un traumatisme, 96 (15.9%, n=604). Les admissions civiles pour blessure par balle ont connu une tendance à la hausse, passant de 19 en 2017, avec une augmentation exponentielle à 45 en 2019.

**CONCLUSION:** Bien que les décès liés à la malignité aient prédominé prédominaient parmi nos patients hospitalisés en chirurgie, l'incidence des décès dus aux de la circulation routière et des brûlures, ainsi que des états chirurgicaux septiques sont également inquiétantes. Il y a une augmentation des admissions et des décès liés à des blessures civiles par balle. **WAJM 2022; 39(2): 162–169.**

**Mots-clés:** Mortalité chirurgicale, Décès liés à un traumatisme, Décès liés à une arme à feu.

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Abbreviations: SPSS, Statistical Package for the Social Sciences.

## INTRODUCTION

Surgical pathologies contribute to a huge portion of the global burden of diseases. Surgical needs account for 28–32% of the overall global burden of diseases, and is projected to increase even further in the near future with increasing life expectancy and comorbidities, given the projection that 16% of the world's population will be older than 65 years by 2050.<sup>1–3</sup> At least 77.2 million disability-adjusted life-years (DALYs) are avoidable by appropriate surgical care.<sup>4</sup>

Surgical mortality could arise directly from the pathophysiological process of the surgical pathology, a complication of the necessary surgical procedures/ anaesthesia or from co-morbidities. Research in the area of surgical mortality has therefore been studied from different perspectives by different authors.<sup>5–7</sup> Although, Surgeon's factor is one that could be important in some complex surgical procedures requiring wealth of experience gained from high volume of a particular procedure previously performed,<sup>8</sup> the overall quality of inpatient care is a key factor that could tilt the balance between survival and mortality, especially in low-risk surgical pathologies including those with moderate injuries. Such inpatient care include: quality nursing care, availability of advanced laboratory support/ radio-diagnostic/therapeutic facilities, and physiotherapy. Therefore, low-risk surgical patients who do not need intensive care unit admissions should have better outcome in our inpatient's surgical wards than patients with high-risk surgical pathologies, all things being equal. More often than not, we tend to be engrossed in the outcome of the seriously ill patients admitted into the I.C.U, that we take the outcome of those admitted into the surgical wards for granted.

Against the foregoing, we did a study of the inpatient mortality pattern in our surgical wards, with the aim of determining the overall pattern, identifying any gap in their care delivery, and suggesting possible ways of addressing identified gaps.

## PATIENTS AND METHODS

A retrospective cohort study of surgical inpatient mortality in the surgical wards of Ahmadu Bello university teaching hospital from January 1<sup>st</sup> 2016 to December 31<sup>st</sup> 2019. The hospital receives referrals from the adjoining states of the north-western, north-central and north-eastern Nigeria, having been designated a center of excellence in radio-oncology. In all, it has about 1000 beds, about half of which are for surgical patients. We have specialist surgeons in all major surgical sub-specialties including seven General surgeons, each one of whom has a bias in one of four General surgical areas of Gastro-intestinal, Breast/ Endocrine, Hepato-biliary, and Surgical oncology. We also have six Orthopaedic/ trauma surgeons, two Plastics /reconstruction surgeons, three Cardio-thoracic surgeons, four Urologists, four Maxillo-facial surgeons, two Oto-rhino-laryngologists, two Neurosurgeons, two Paediatric general surgeons, and four Ophthalmologists. However, we do not have a trained vascular surgeon, and the cardio-thoracic surgeons undertake some vascular surgeries within the limits of their capabilities. We have an average of two nurses taking care of an average of 30 inpatients per ward per duty shift, with only one or two of them per ward (usually the Matron-in-charge) being specialty trained in the specialty she/ he works. Our radio-diagnostic facilities offer 24-hour service. Our Laboratories run call duties outside the normal working hours and weekends. We also have inpatient physiotherapy unit attached to the wards. A registrar and a senior registrar of each surgical specialty team on call sleep in for emergency calls.

Following ethical clearance, we reviewed all inpatient deaths from surgical pathologies in all the surgical wards, except the ophthalmology and paediatric general surgical wards. Also excluded were deaths in the emergency room in surgical patients who have not been admitted into the wards, deaths in patients with dominant medical conditions with concomitant surgical conditions in the medical wards, and deaths in surgical patients in intensive care unit (I.C.U). The eligible surgical

deaths were identified from the nurses' admission /discharge registers, and death certificates in the wards; and their case notes were retrieved and reviewed. Only retrieved case notes with complete documentations were reviewed. We attributed each death to the disease condition/ specialty care. In the case of multidisciplinary team care, the death was counted for the admitting specialty service which is usually one who manages the system with the most pathological burden as evidenced by the severity of symptoms/signs. Data regarding their demography, surgical diagnosis, whether surgically or non-surgically treated before death, comorbidity if any, and mode of admission, were collated. Also yearly data on all inpatients admitted for trauma and the causes of such trauma were collated and analyzed using the Statistical Package for the Social Sciences (SPSS) version 20.0 (SPSS Inc., Chicago, IL., USA) and presented as descriptive statistics. Quantitative data were summarized as frequencies and percentages and presented as tables and figures.

## RESULTS

A total of 8,862 admissions made into the surgical wards were considered during the 4-year period reviewed. Of these, 655 deaths were recorded, giving a crude mortality rate of 7.4%. There were 371 males and 284 females. Forty-three (6.6%) of the deaths occurred in children below 16 years of age. Most of the deaths occurred in patients in the 46–60 years age group (217,33.1%). The age distribution by service specialty is shown in Table 1. The yearly crude mortality rate by service specialty showed that orthopaedic service had the least mortality rate over the four-year period reviewed (1.9%, 3.2%, 2.6%, and 3.5% respectively in years 2016 to 2019), while the cardiothoracic surgical service had the highest mortality rate in three years (14.9%, 10.5%, and 12.6% respectively in year 2016, 2018 and 2019), Table 2. However, only 604 of the dead patients had traceable case notes with intact documentations of their clinico-pathological information and thus were reviewed in detail. The surgical diagnosis of the patients by disease categories and

service specialties are shown in Table 3. Malignancy was the commonest surgical condition, 294 (48.7%, n=604). This was followed by traumatic conditions, 96 (15.9%, n=604), and infective surgical conditions, 72 (11.9%, n=604). Acute abdominal conditions accounted for 42 (7.0%, n=604) deaths. The acute abdominal conditions and their associated mortalities are shown in Figure 1.

The commonest cause of malignancy-related deaths was breast cancer 97 (33.0%, n=294), followed by cancer of the head of pancreas 35 (11.9%, n=294), Table 4.

The most common cause of trauma-related deaths was traumatic brain injury, 33 (34.4%, n=96), followed by burns, 29 (30.2%, n=96), and penetrating abdominal injuries 11 (11.5%, n=96), Table 5. The

most common aetiology of trauma-related deaths was motor-vehicular crashes, 52 (54.2%, n=96), followed by flame burns 18 (18.8%, n= 96), and civil gunshots 14(14.6%, n=96), Figure 2.

The yearly distribution of inpatients trauma admissions by service specialty are shown in Table 6. Neuro-surgical specialty had the highest trauma admissions in 2016 and 2017, while

**Table 1: Age Distribution Of Mortality By Service Specialty**

Age	Mortality								Total	%
	Ortho	Neurosurg	Urology	Cardio-thoracic	General Surgery	Plastics/Reconst.	Maxillofacial	Oto-rhino-laryngology		
0 – 15	0	15	3	1	2	16	3	3	43	6.6
16 – 30	2	12	10	7	43	7	14	3	98	15.0
31 – 45	6	14	18	11	92	16	9	3	169	25.8
46 – 60	8	11	31	22	117	13	7	8	217	33.1
61 – 75	8	5	7	7	55	6	5	1	93	14.2
76 – 90	7	1	1	4	0	3	2	1	33	5.0
>90	1	0	0	1	323	0	0	0	2	0.3
Total	32	58	70	53		60	40	19	655	

**Table 2: Yearly Mortality by Service Specialty**

Service Specialty	Mortality Rates (%)											
	2016			2017			2018			2019		
	M	A	MR	M	A	MR	M	A	MR	M	A	MR
Orthopedics & Trauma Surgery	3	156	1.9	5	159	3.2	9	340	2.6	15	432	3.5
Neurosurgery	14	274	5.1	15	290	5.2	14	294	4.8	15	328	4.6
Urology	22	273	8.1	17	263	6.5	13	279	4.7	18	426	4.2
Cardiothoracic Surgery	13	87	14.9	11	119	9.2	11	105	10.5	18	143	12.6
Maxillo-facial Surgery	10	228	4.4	8	220	3.6	12	251	4.8	10	270	3.7
General Surgery	77	830	9.3	75	742	10.1	81	819	9.9	90	1054	8.5
Oto-rhino-laryngology	5	67	7.5	4	76	5.3	6	70	8.6	4	75	5.3
Plastics/Reconstructive Surgery	6	80	7.5	18	128	14.1	13	163	8.0	23	202	11.4

M, Mortality; A, Admissions; MR, Mortality Rate

**Table 3: Clinical Diagnosis By Disease Categories**

Disease Category	Mortality								Total	%
	Ortho	Neurosurg	Urology	Cardio-thoracic	General Surgery	Plastics/Reconst.	Maxillofacial	Oto-rhino-laryngology		
Injury-related	10	37	3	2	11	31	2	0	96	15.9
Malignancy-related	6	2	32	27	229	6	8	13	294	48.7
Non-malignant tumours	2	4	20	3	13	0	2	2	46	7.6
Infections/Inflammatory	6	1	8	8	3	23	24	4	72	11.9
Fistulae (Non-malignant)	0	0	1	1	14	0	0	0	16	2.6
Vascular disease/ Vascular gangrene	8	0	0	5	2	0	0	0	15	2.5
Gastrointestinal bleeding (Non-malignant)	0	0	0	2	5	0	0	0	7	1.2
Acute Abdomen	0	0	0	0	42	0	0	0	42	7.0
Congenital Anomalies	0	10	0	5	0	0	1	0	16	2.6

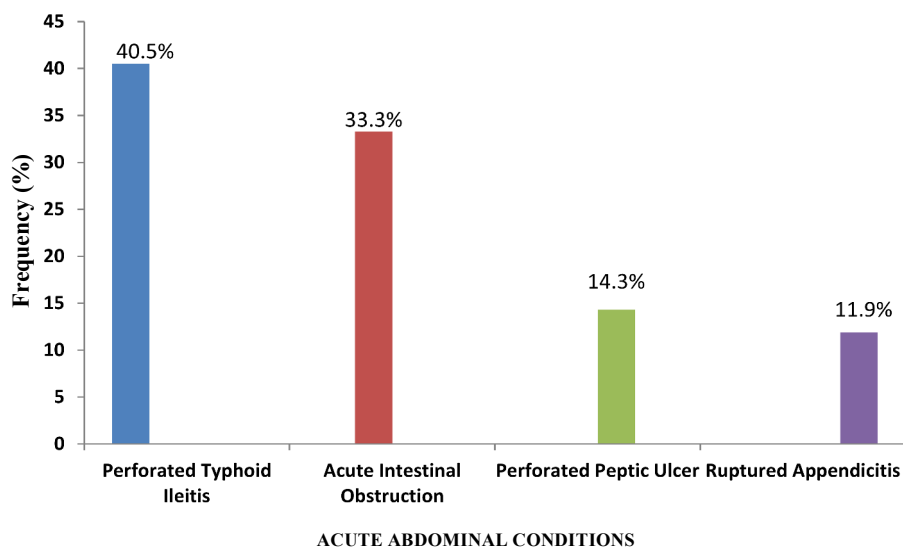


Fig. 1: Mortality Caused by Acute Abdominal Conditions.

Table 4: Distribution Of Malignancy- Related Deaths

Malignancy	Frequency	% (N=294)
1. Breast Cancer	97	33.0
2. Cholangiocarcinoma	1	0.3
3. Cancer of head of Pancreas	35	11.9
4. Periampullary Carcinoma	1	0.3
5. Adenoid Cancinoma	1	0.3
6. Prostate Cancer	16	5.4
7. Bladder Carcinoma	12	4.1
8. Renal Cell Carcinoma	3	1.0
9. Leomyosarcoma of the Oesophagus	1	0.3
10. Oesophageal Carcinoma	13	4.4
11. Soft tissue sarcoma	4	1.4
12. Colorectal Carcinoma	28	9.5
13. Anal Carcinoma	5	1.7
14. Hepatocellular Carcinoma	4	1.4
15. Thyroid Carcinoma	4	1.4
16. Carcinoma of the Gallbladder	1	0.3
17. Neurofibrosarcoma of the Jaw	1	0.3
18. Maxillary Anthral Carcinoma	3	1.0
19. Nasopharyngeal carcinoma	8	2.7
20. Sinonasal Carcinoma	2	0.7
21. Gastric Carcinoma	21	7.1
22. Bronchogenic Carcinoma	4	1.4
23. Rhabdomyosarcoma	5	1.7
24. Malignant Melanoma	3	1.0
25. Osteosarcoma	1	0.3
26. Chondrosarcoma	2	0.7
27. Squamous Cell Carcinoma	5	1.7
28. Parotid Cancer	2	0.7
29. Lyphoma	8	2.7
30. Odontoid Carcinoma	1	0.3
31. Retroperitoneal tumours	2	0.7
32. Orbital Cancer	1	0.3

orthopaedics/ trauma service specialty had the highest in 2018 and 2019. Motor vehicular crash was the most common cause of inpatients trauma admissions yearly, 301, 315, 408 and 552 respectively, and flame burn was the second commonest cause in 2016, assault stab/ machete injury was the second commonest cause in 2017, while civil gunshot was the second commonest in 2018 and 2019, Table 6.

Cervico-facial space infection was the most common cause of death from infective surgical pathology 23 (31.9%), followed by chronic ulcers, 12 (16.2%); and necrotizing fasciitis, 11 (14.9%), Table 7.

One hundred and thirty-nine (23.0%) of the patients had comorbidities, of which anemia was the commonest 84 (60.4%); followed by hypertension, 29 (20.9%); and diabetes, 16 (11.5%), Figure 3.

Three hundred and eighty-one (58.2%) of the patients were admitted as emergencies, while 274 (41.8%) were admitted electively. Majority, 406 (62.0%) patients, had no surgical intervention before death, while 249 (38.0%) had various surgical procedures.

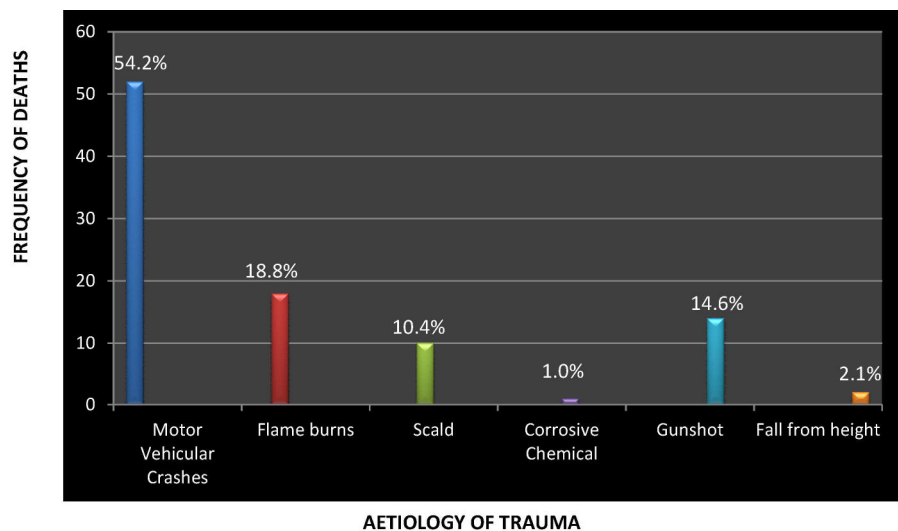
## DISCUSSION

Inpatient surgical mortality audit is an important tool for quality assurance. We recorded a high crude mortality rate, a steady rise in trauma-related deaths from ever increasing road traffic crashes, and exponential rise in civil gunshots, and unacceptable high deaths from common surgical septic conditions.

Our overall crude mortality rate of 7.4% is comparable to those reported from other parts of Nigeria and developing countries of Africa. Ihegihu, *et al*<sup>9</sup> in Nnewi, Nigeria reported a mortality rate of 8.3%, while Chukwuezi and Nwosu<sup>10</sup> in a similar study at Owerri, Nigeria reported a rate of 9.14%. Also, in similar studies, Onyemaechi, *et al*<sup>11</sup> in Markurdi, Nigeria, reported a mortality rate of 6.6%, while Ayoade, *et al*<sup>12</sup> in Sagamu, south-western Nigeria reported a rate of 5.09%. A study in Ethiopia reported a mortality rate of 7%.<sup>13</sup> Our mortality rate is however, much higher than those reported in developed countries. Semel, *et al*<sup>14</sup> in a similar study

**Table 5: Distribution of Trauma-Related Deaths**

Injuries	Frequency	% (n=96)
1. Urethral trauma with Urinary Retention	2	2.1
2. Burns / Post- burns contractures	29	30.2
3. Traumatic Brain Injuries	33	34.4
4. Penetrating Abdominal Injuries secondary to Gunshot	11	11.5
5. Blunt Abdominal injuries	2	2.1
6. Major bone Fractures	5	5.2
7. Rectal Impalement Injuries	1	1.0
8. Cervical Spine Injuries	4	4.2
9. Traumatic Laceration of the Axillary Artery Secondary to gunshot	1	1.0
10. Multiply injured with Intraperitoneal bladder rupture	1	1.0
11. Penetrating Chest injury secondary to gunshot	2	2.1
12. Multiply fractured	3	3.1
13. Maxillofacial Injuries	1	1.0
14. Mangled injury to the lower limb	1	1.0



**Fig. 2: Aetiology Of Trauma Deaths**

in United States of America even reported a declining mortality rate from 1.68% in 1996 to 1.32% in 2006, though their study was mainly on deaths after surgery. McDonald, *et al*<sup>15</sup> in Southampton, United Kingdom reported a mortality rate of 2.3%. This difference in our mortality rate and those of developed countries could be attributed to differences in the leading surgical conditions contributing to mortality between the developing and developed countries. While trauma and septic surgical conditions, which ranked second and third highest, respectively, amongst the causes of our inpatient mortality contributed to a large proportion of our mortality and those of

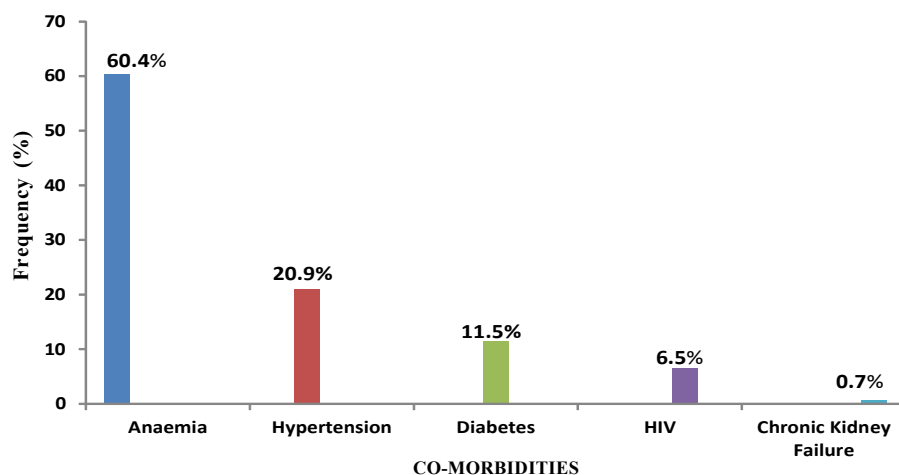
studies from other parts of Nigeria, this is not the case in developed countries.<sup>14,15</sup> The high contribution of injuries, especially from road traffic crashes, 54.2% and burns, 30.2% to the overall mortality in our study, is comparable to the findings of studies from other parts of Nigeria.<sup>9-12,16</sup> Onyemaechi, *et al*<sup>11</sup> reported 89.6% deaths from road traffic crashes; while Ayoade, *et al*<sup>12</sup> reported 38.5% of deaths from burns injuries. This could be due to the bad state of our roads, which is the popular and most affordable means of transportation of both human and goods in our country, since the railways are almost moribund, and the airlines are out of the reach of

majority of the citizens, resulting in high rate of motor-vehicular crashes.<sup>17,18</sup> The high rate of motor-vehicular crashes on our roads could also explain the finding of traumatic brain injuries as the leading clinical condition amongst our inpatient trauma admissions.<sup>19,20</sup> Flame burns injuries was another clinical condition that contributed significantly to our trauma admissions and deaths. A plausible factor that may have contributed to the high incidences of this in our setting about three years back, was the adulteration of petroleum products, in a petroleum producing nation where a large proportion of her citizens buy and keep small quantities of fuel for domestic use to power their electricity generators and run their small scale businesses due to the epileptic power supply, resulting in explosions and burns.<sup>21</sup> This epidemiological pattern of injuries is in contrast to the situation in the developed countries.<sup>14,15</sup>

A worrisome observation in this study was the rising rate of civil gunshot injuries and deaths amongst our inpatients over the four-year review period, in comparison to flame burns which recorded a steady decline over the same period, even as the scale of injuries from motor- vehicular crashes on our roads remained unabated. This pattern of inpatient trauma admissions also reflected on the overall pattern of trauma deaths found in this study. The exponential rise in inpatient admissions from civil gunshot injuries in the last two years of the present study is a reflection of the increasing violent state of our society and rising insecurity in recent years, caused by the activities of armed bandits/terrorists and armed robbers who now operate brazenly both in the rural and urban parts of northern Nigeria.<sup>22</sup> The decline in inpatient admissions from flame burns over same period could be a reflection of the declining incidences of petroleum tanker explosions/ fuel explosions from adulterated petroleum products harbored at homes commonly seen during fuel scarcity periods. This could be due to the relatively stable supply of petroleum products and improved power supply in the past two to three years in our region, compared to the situation three to five years ago. A

**Table 6: Yearly Distribution of Inpatients Trauma Admissions By Service Specialty and Aetiology of Trauma Admissions**

Specialty Service	Admission Frequency				Total	%
	2016	2017	2018	2019		
Orthopaedics and Trauma Surgery	84	89	157	261	591	30.1
Neurosurgery	146	133	126	141	546	27.8
Urology	4	3	6	9	22	1.1
Cardiothoracic	13	29	31	46	119	6.1
Maxillo-facial Surgery	71	69	80	102	322	16.4
General Surgery	15	17	16	19	67	3.4
Oto-rhino-laryngology	5	3	3	10	21	1.1
Plastics/ Reconstructive Surgery	45	59	78	94	276	14.1
<b>Aetiology of Trauma</b>						
Scald	12	14	10	14	50	2.5
Flame burns	21	18	16	13	68	3.5
Corrosive Chemical	2	6	3	7	18	0.9
Electrical burns	2	1	1	2	6	0.3
Gunshot	20	19	26	45	110	5.6
Assault Stab/ Machete	19	26	22	20	87	4.4
Motor Vehicular Crashes	304	315	408	566	1593	81.1
Blast	1	0	1	0	2	0.1
Fall	3	3	10	14	30	1.5

**Fig. 3: Frequency of Co-Morbidities****Table 7: Distribution of Infection/ Inflammation- Related Deaths**

Clinical Diagnosis	Frequency	% ( n=72)
1. Necrotizing Fasciitis	11	15.3
2. Chronic Ulcers	12	16.7
3. Empyema Thoracis	4	5.6
4. Infected Hydrocele	1	1.4
5. Obstructing Adenotonsillitis	4	5.6
6. Liver Abscesses	2	2.8
7. Cervico-facial space Infection/ Ludwig Angina	23	31.9
8. Fourniers Gangrene	3	4.2
9. Cancrum Oris	1	1.4
10. Urosepsis Secondary to Bladder Outlet Obstruction	5	6.9
11. Osteomyelitis/ Septic Arthritis	2	2.8
12. Constrictive Pericarditis	2	2.8
13. Cerebral Abscesses	1	1.4
14. Burst Abdomen	1	1.4

stable petroleum product supply and good power supply do not give room for adulteration by racketeers, and storing of products in and around homes for use in personal power generators, thus reducing the incidences of fuel explosions and burns.

Septic surgical conditions were the third most common cause of death in our study and contributed significantly to our mortality, like studies from other parts of Nigeria.<sup>9-12</sup> Cervico-facial space infections were the most common conditions diagnosed, followed by chronic ulcers and necrotizing fasciitis. This is an unfortunate tale for conditions that could be easily nipped in the bud with good antibiotics. Such deaths are often due to poverty and late presentation. There is high rate of late presentations for medical care in our country, a menace that is partly due to poverty, belief and accessibility to medical facility.<sup>23,24</sup> In contrast, death from septic surgical conditions is an uncommon event in developed countries.<sup>14,15</sup>

Despite the high contributions of injuries and septic surgical conditions to our overall mortality which are largely responsible for the difference between our mortality rate and those of the developed countries, malignancy was the most common cause of mortality in this study. The high incidences of malignancy-related deaths could have been due to the poor prognosis associated with malignancies, especially in developing countries, resulting from late presentation and poor diagnostic/ treatment facilities, and partly due to the designation of our hospital as a center of excellence in radio-oncology in our region and the associated referrals that come from the adjoining states for oncological services. It however contrasts with findings from hospitals in other parts of Nigeria which do not have such status and such high volume oncological referrals.<sup>9-12</sup>

Most of the deaths in this study occurred in patients in the middle age group, followed by young adults. This is also a reflection of the predominant surgical conditions contributing to mortality. Most of the deaths in the middle age group were due to malignancies,



while those that occurred in young adults were predominantly due to injuries and acute abdominal conditions. This is similar to the age group pattern reported in other studies within Nigeria.<sup>9,11</sup>

Orthopaedics/trauma surgical service had the least mortality rate year-by-year over the four-year review period, while the cardio-thoracic and general surgical services recorded the highest and second highest mortality rates respectively over the same period. This could be due to the fact that most patients of the orthopaedics/ trauma service without significant co-morbidities admitted into the surgical wards are not quite ill, as they rarely have significant pathophysiological, metabolic and nutritional derangements from their conditions nor do they need complicated high risk surgical procedures, in contrast to those of the cardio- thoracic and general surgical services. In other words, most orthopaedics/ trauma inpatients could be rationally said to have higher physiological, metabolic, nutritional and immune reserves compared to patients of most other services like the cardio-thoracic and general surgical services. Another plausible explanation to the low mortality amongst inpatients admitted under the orthopaedics surgical service compared to the other specialty services could be the relatively very low incidences of malignancy-related deaths amongst patients of the orthopaedic specialty service compared to most other surgical specialties. The orthopaedic malignancies are not as common as those that occur in general surgery, urology, or plastics/ reconstructive surgical specialties for example. A third plausible reason for the low mortality rate consistently recorded by the orthopaedics surgical service, could be the low incidence of potentially fatal surgical infections amongst patients of the orthopaedic/ trauma surgical service reviewed, having excluded patients with diabetic foot infections from our study population. This is because they are usually admitted into the medical wards where they are primarily managed by the physicians for their often associated uncontrolled diabetes, while the orthopods are invited for the foot sepsis. It is possible that the mortality rate of the

orthopaedic service could have been higher than what we found in this group of patients being considered. Lastly, an aspect of inpatient care that could have also influenced their outcome is the factor of nurses' specialty training.<sup>25</sup> Most of our nurses do not have specialty training on the peculiar nursing care of surgical patients in the specialty they serve. The male and female orthopaedics surgical wards have an advantage over other wards in this regard, with a total number of four specialty trained nurses, which is the highest number of specialty trained nurses in any surgical specialty ward, while the Neurosurgical, Oto-rhinolaryngology and Maxillo-facial surgical wards have none. The plastics/ reconstruction surgical ward has only one burns and plastics trained nurse who also doubles as the matron in-charge.

In this study, 18.5% of the deaths had documented co-morbidities. This is less than that reported by Dandena, *et al* in Ethiopia.<sup>26</sup> A similar study from Australia revealed even higher proportion (91%) of co-morbidities.<sup>27</sup> This could be attributed to differences in the mean age groups of our patients, as a society with high older population is likely to have higher co-morbidities. Anemia accounted for about a quarter of the co-morbidities in our study. This is similar to the findings in other studies.<sup>26,28</sup> Most of these came as a chronic complication of their surgical conditions, such as bleeding upper or lower gastro-intestinal conditions, bleeding prostate/bladder lesions, and burns/ burns wound dressing.

Slightly more than half of the deaths were admitted as emergencies. Patients admitted as emergencies are usually more ill, with low physiological, metabolic and/ or nutritional reserve that could make them succumb to their conditions or surgical procedures. Ingraham *et al*,<sup>29</sup> also reported a higher mortality from emergency surgical admission in their comparative study. This was also corroborated by O'Leary, *et al*<sup>30</sup> who reported 87.3% mortality from their 37% emergency admissions.

From the findings of this study, we recommend some inducement and encouragement for nurse specialty training as this will also rub off on the

patient care. Also, we recommend similar study in other centres in order to identify their areas of deficiencies/need. For instance, this study has revealed a yawning gap in neuro-surgical and the need for more neurosurgeons to be employed into our work-force. Lastly, tighter gun control especially through proper manning of our porous borders with our neighbouring countries, and aggressive fight against banditry should stem down the spate of civil gunshot injuries and deaths.

Our study has a limitation. We excluded the paediatric general surgical ward from our study due to missing admission/ discharge register. This exclusion may be significant as the paediatric surgical service also attend to a significant patient population that could have changed some of the demographics reported in this study if they were included. Also, the retrospective nature of the study with the attendant inadequate/ missing documentations is another limitation of this study.

## CONCLUSION

Our surgical inpatients mortality rate is high. Even though malignancy-related deaths predominated, the contributions of injuries from road traffic crashes and burns, and septic surgical conditions are also worrisomely high. Even more worrisome is the steady rise in civil gunshot admissions and deaths.

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