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### Research Article

## Retrospective Analysis of Surgical Case Volume and Disease Patterns in a Nigerian Tertiary Health Facility

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### ABSTRACT

Surgical workload and disease patterns in Nigerian tertiary hospitals remain poorly characterized, despite their central role in healthcare delivery. Understanding demographic and specialty-specific trends is vital for optimizing surgical service planning. The study analyzed the surgical workload, demographic characteristics, and specialty distribution of surgical cases at Modibbo Adama University Teaching Hospital (MAUTH), Yola, from 2022 to 2024. A retrospective descriptive study was conducted using data from theatre registers, admission logs, and patients' case notes. All surgical cases during the study period were included. Data were analyzed using SPSS version 26. Results were summarized using descriptive and inferential statistics, including Chi-square and ANOVA tests, with significance at  $p < 0.05$ . A total of 650 surgical cases were reviewed. Orthopedic surgery accounted for the largest proportion (33.8%), followed by Urology (18.3%) and Neurosurgery (12.0%). The mean patient age was  $33.0 \pm 18.4$  years, and males constituted 69.8%. Mean age differed significantly ( $F = 52.81$ ,  $p < 0.001$ ,  $\eta^2 = 0.33$ ), with urology patients being older and pediatric patients younger than other groups. Gender distribution also varied ( $\chi^2 = 18.46$ ,  $p = 0.005$ , Cramer's  $V = 0.17$ ), reflecting male predominance in trauma and urologic cases. Surgical workload at MAUTH was dominated by trauma- and urology-related cases, reflecting a dual burden of injury and non-communicable diseases. Strengthening trauma prevention, data management, and resource allocation is essential for improving surgical care.

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## INTRODUCTION

Surgical care is an essential component of any health system, addressing conditions such as trauma, malignancies, congenital anomalies, and complications of infectious and non-communicable diseases. The *Lancet Commission on Global Surgery* estimated that nearly 5 billion people lack access to safe, affordable surgical care, particularly in low- and middle-income countries (LMICs) (Meara et al., 2022). Surgical conditions account for almost 30% of the global disease burden (Weiser et al., 2021).

In sub-Saharan Africa, surgical deficits remain acute due to limited infrastructure, workforce shortages, and weak perioperative systems (Namirembe et al., 2022). Nigeria, with a population exceeding 220 million, faces similar challenges, including high trauma rates from road traffic accidents, infectious diseases, and rising non-communicable diseases such as cancer, diabetes, and cardiovascular disorders (Adewunmi et al., 2023; Okoye et al., 2022).

Studies have documented increasing surgical volumes across Nigerian tertiary hospitals, though patterns vary due to workforce constraints and infrastructural limitations (Ojo et al., 2023). In North-Central Nigeria, common surgical admissions include trauma, urologic disorders, and congenital anomalies (Ibrahim et al., 2023). The northeastern region, including Adamawa State, faces additional barriers from insecurity, limited infrastructure, and conflict-related injuries. MAUTH, as a regional referral center, provides complex surgical care across multiple specialties.

However, systematic data on surgical workload and disease distribution at MAUTH are lacking. This gap limits the capacity to inform surgical planning toward achieving *Global Surgery 2030* targets (Meara et al., 2022). Therefore, this study aimed to analyze surgical case volumes, disease patterns, and demographic characteristics of patients managed at MAUTH, Yola, between 2022 and 2024.

This study is grounded in two complementary theoretical models that explain the burden, accessibility, and systemic challenges of surgical care in resource-limited settings: the Global Burden of Disease (GBD) Framework and the Met, Unmet, and Unmeetable Surgical Need Model.

According to the Institute for Health Metrics and Evaluation (IHME, 2023), the Global

Burden of Disease framework quantifies health loss using standardized population-level metrics such as Disability-Adjusted Life Years (DALYs), Years of Life Lost (YLLs), and Years Lived with Disability (YLDs). It highlights conditions with significant health burdens that can be alleviated through surgical intervention, such as trauma, obstructed labor, congenital anomalies, and certain cancers<sup>12</sup>. By identifying diseases with high DALY values, the GBD Framework emphasizes the integration of surgical services into national health strategies, especially in LMICs.

The Met, Unmet, and Unmeetable Surgical Need Model, proposed by Bickler et al. (2010), divides surgical demand into three categories: Met need (conditions effectively managed with available surgical resources); Unmet need (treatable conditions lacking adequate access to surgical services); and Unmeetable need (conditions that remain untreatable due to technological or infrastructural limitations). In northeastern Nigeria, where health infrastructure and referral systems are limited, this model offers a practical framework for evaluating the capacity of the healthcare system to meet surgical demand.

## Materials and Methods

**Research Design:** This study employed a retrospective descriptive research design to analyze existing hospital records and evaluate surgical case volumes, disease trends, and patient demographics. This approach enabled the systematic review of data already documented in hospital registers and operating theatre logs at Modibbo Adama University Teaching Hospital (MAUTH), Yola, over a three-year period from January 2022 to December 2024.

**Research Setting:** The study was conducted at Modibbo Adama University Teaching Hospital, Yola, a federal tertiary health institution located in Adamawa State, northeastern Nigeria. Established in 1999 as the Federal Medical Centre Yola, the facility was upgraded to a teaching hospital in 2021 following its affiliation with Modibbo Adama University. MAUTH serves as a center for clinical training, research, and specialized medical services, and functions as a referral hub for patients from Adamawa State and neighboring regions, including Taraba, Borno, Gombe, and parts of northern Cameroon.

**Study Population and Sampling:** The study population comprised all patients who underwent surgical procedures in the main operating theatre at MAUTH between January 1, 2022, and December 31, 2024. This included individuals across all age groups, genders, and socioeconomic backgrounds. A total enumeration sampling technique was employed, whereby all eligible surgical cases documented during the study period were included.

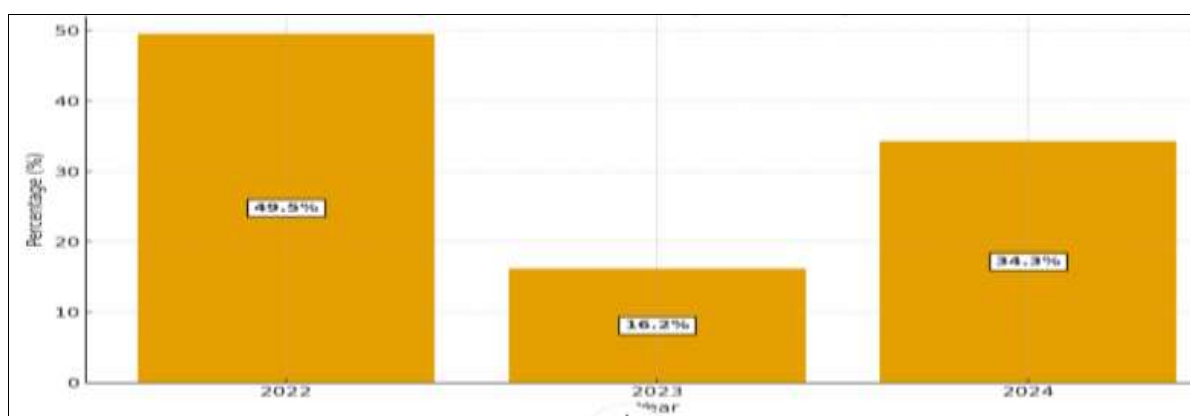
**Inclusion and Exclusion Criteria:** Records were included if they documented patients of any age who underwent surgical intervention in the main operating theatre and contained complete information on demographics, diagnosis, and surgical procedures. Records were excluded if they were irretrievably incomplete, duplicated, or involved diagnostic procedures without surgical intervention. Surgeries performed in the obstetrics and gynecology theatre or minor outpatient procedures were also excluded.

**Data Collection, Management, and Analysis:** Data were extracted using a structured data abstraction checklist developed in alignment with the study objectives. Following formal approval from hospital authorities, trained research assistants reviewed the main theatre registers and operating logs to identify eligible cases. Each record was assigned a unique identification code to maintain confidentiality and ensure systematic data organization. The data collection process was conducted meticulously to enhance reliability and uphold the integrity of the dataset.

## RESULTS

Extracted data were cleaned and entered into Microsoft Excel, where they were checked for completeness, consistency, and missing values. Statistical analysis was performed using IBM SPSS version 26. Descriptive statistics, including frequencies and percentages for categorical variables and means for continuous variables, were used to summarize the data. Annual surgical volumes and specialty distributions were presented using tables and charts to facilitate interpretation. Although this study was primarily descriptive, exploratory statistical tests were applied to better understand demographic variation across surgical specialties. One-way ANOVA was used to compare mean patient ages between specialties, while chi-square analysis examined associations between gender and specialty distribution. These tests were not intended to test predefined hypotheses but rather to illustrate patterns within the dataset that may have operational relevance for service planning.

**Ethical Considerations:** Ethical approval for the study was obtained from the Hospital Research and Ethics Committee (Ref No: MAUTHY/HREC/25/413). Given the retrospective nature of the study, informed consent was not required. However, strict confidentiality was maintained throughout the research process. No personal identifiers were included in the analysis or reporting, and all data were securely stored and accessed exclusively by the research team.



**Figure 1:** The annual surgical distribution.

A total of 650 surgical cases were recorded during the three-year period under review. The yearly distribution showed that 2022 had the highest number of surgical procedures (49.5%), followed by 2024 (34.2%), while 2023 recorded the lowest (16.3%) (**Figure 1**).

**Table 1:** Surgical Volume by Specialty and Year

Specialty	2022	2023	2024	Total (n)	Percent (%)
Orthopedic	109	36	75	220	33.8%
Urology	59	19	41	119	18.3%
Neurosurgery	39	13	26	78	12.0%
Pediatrics	36	12	25	73	11.2%
Maxillofacial	31	10	22	63	9.7%
General Surgery	28	10	20	59	9.1%
ENT	19	6	13	38	5.8%
<b>Total</b>	<b>322</b>	<b>106</b>	<b>222</b>	<b>650</b>	<b>100%</b>

**Source:** Field Data, 2025

Table 1 presents distributions of surgical cases across specialties. Orthopedic surgery contributed the highest proportion of cases (33.8%), with a total of 220 (33.8%) procedures performed over the three years.

This was followed by urology (18.3%), neurosurgery (12.0%), and pediatric surgery (11.2%). Maxillofacial surgery, general surgery, and ENT accounted for 9.7%, 9.1%, and 5.8% of total cases, respectively.

**Table 2:** Disease Patterns and Surgical Interventions

No.	Diagnosis / Condition	Procedure(s) Performed	<i>f</i>	%
1.	Orthopedic trauma & fractures	Fracture fixation, implant insertion/removal	98	15%
2.	Diabetic foot & peripheral vascular disease	Limb amputation, stump revision	78	12%
3.	Congenital neurosurgical anomalies	Reconstructive neurosurgery	65	10%
4.	Head trauma & intracranial hemorrhage	Emergency cranial procedures	52	8%
5.	Prostatic disease/bladder outlet obstruction	Prostatectomy, urethral surgery	46	7%
6.	Urologic stone disease	Endoscopic stone removal, lithotripsy	39	6%
7.	Abdominal emergencies	Exploratory laparotomy, bowel surgery	39	6%
8.	Maxillofacial tumors & facial fractures	ORIF, reconstructive maxillofacial surgery	33	5%
9.	Benign soft-tissue masses/ganglion	Excision, wound closure	33	5%
10.	Hernia & groin pathology	Herniorrhaphy, herniotomy	26	4%
11.	Pediatric congenital anomalies	Pediatric corrective surgery	26	4%
12.	Chronic wounds/ulcers	Skin grafting, wound reconstruction	20	3%
13.	ENT conditions (adenotonsillar disease, foreign body)	Tonsillectomy, adenoidectomy, foreign body removal	20	3%
14.	Oncologic limb or soft-tissue tumors	Amputation, excision	13	2%
15.	Osteomyelitis / peripheral limb infection	Debridement, implant revision	13	2%
<b>Total</b>			<b>650</b>	<b>100%</b>

**Source:** Field Data, 2025

**Table 2** summarizes the major disease patterns and corresponding surgical interventions recorded at MAUTH during the study period. Orthopedic trauma and fractures were the

leading indications, accounting for 15% of all procedures, primarily involving fracture fixation and implant work. Diabetic foot complications and peripheral vascular disease

followed closely (12%), reflecting the growing burden of chronic metabolic disorders that often necessitate limb amputation. Congenital neurosurgical anomalies (10%) and head trauma requiring emergency cranial procedures (8%) highlight the demand for specialized neurosurgical services. Urologic conditions, including prostatic disease (7%) and stone disease (6%), represented a significant share of the workload among older male patients. Abdominal emergencies (6%) and maxillofacial injuries or tumors (5%)

further illustrate the diversity of surgical demand. Less frequent but notable categories included hernias, pediatric congenital anomalies, chronic wounds requiring grafting, ENT conditions, oncologic limb tumors, and osteomyelitis, each contributing between 2–4% of cases. This distribution emphasizes the dual burden of trauma and non-communicable disease management, while also highlighting the need for subspecialty capacity in pediatrics, maxillofacial surgery, and ENT.

**Table 3:** Demographics by specialty

Specialty	Cases	Mean Age	Male (Count %)	Female (Count %)
Orthopedic	220	36.6	172 (75%)	48 (25%)
Urology	119	52.0	91 (73%)	28 (27%)
Neurosurgery	78	31.0	53 (64%)	25 (36%)
Pediatrics	73	4.9	54 (70%)	19 (30%)
MFU	63	26.4	37 (55%)	26 (45%)
General Surgery	59	27.8	27 (46%)	32 (54%)
ENT	38	26.5	20 (52%)	18 (48%)
<b>Overall</b>	<b>650</b>	<b>Mean 33.0</b>	<b>454 (69.8%)</b>	<b>196 (30.2%)</b>

**Source:** Field Data, 2025

Demographically, **Table 3** provides a breakdown of the mean ages and gender proportions across the various surgical specialties. The mean age of surgical patients was  $33 \pm 18.4$  years, with notable variation across specialties. Pediatric surgeries involved the youngest group, with a mean age of 4.9 years, while urology recorded the highest mean age at 52 years. Patients in orthopedic, neurosurgery, maxillofacial, ENT, and general surgery were predominantly young to middle-aged adults.

There was a clear male predominance, with 454 males (69.8%) and 196 females (30.2%)

undergoing surgery during the study period, yielding a male-to-female ratio of approximately 2.3:1. The highest proportions of male patients were recorded in orthopedic (75%), urology (73%), neurosurgery (64%), and pediatric surgery (70%). In contrast, general surgery showed a slight female majority (54%), while ENT reflected a more balanced distribution with 52% males and 48% females. Maxillofacial procedures also demonstrated relatively even gender representation.

**Table 4:** One-Way ANOVA of Mean Age across Surgical Specialties

Source of Variation	SS	df	MS	F	p-value	$\eta^2$
Between Groups	125,420.7	6	20,903.45	52.81	< 0.001	0.33
Within Groups	254,673.2	643	396.00			
<b>Total</b>	<b>380,093.9</b>	<b>649</b>				

The ANOVA revealed a statistically significant difference in mean age across surgical specialties ( $F = 52.81$ ,  $p < 0.001$ ). The effect size ( $\eta^2 = 0.33$ ) indicates a large

practical difference, with age accounting for 33% of the variance between groups. Urology patients were significantly older, while pediatric patients were significantly younger.

**Table 5:** Chi-Square Test of Association between Gender and Surgical Specialty

Variable	$\chi^2$	df	p-value	Cramer's V
Gender $\times$ Surgical Specialty	18.46	6	0.005	0.17

The Chi-square test showed a significant association between gender and surgical specialty  $\chi^2 = 18.46$ ,  $p = 0.005$  (Table 5). The effect size (Cramer's  $V = 0.17$ ) suggests a small-to-moderate relationship. Male predominance was most pronounced in orthopedic, urology, and pediatric surgery, while general surgery and ENT showed more balanced gender distributions.

### DISCUSSION

This retrospective analysis provides a three-year overview of surgical workload and demographic distribution at MAUTH, Yola. The dominance of orthopedic and urology surgeries highlights the dual burden of trauma and non-communicable disease-related conditions in northeastern Nigeria (Abdur-Rahman et al., 2022; Ibrahim et al., 2023). Similar distributions have been reported in other Nigerian tertiary hospitals, emphasizing persistent structural and epidemiologic drivers of surgical demand across the country (Okoye et al., 2022; Ojo et al., 2023).

The high orthopedic case volume aligns with findings from Enugu and Ilorin, where trauma and fractures were the leading causes of surgical admissions (Chukwuma et al., 2022; Okeke et al., 2021). Nigeria continues to experience high trauma incidence due to road traffic accidents, occupational injuries, and limited prehospital care (Abdur-Rahman et al., 2022; Nwanna-Nzewunwa et al., 2023). These patterns reflect broader public health challenges, including poor road safety enforcement and insufficient emergency response systems.

Similarly, the rising urology caseload underscores the growing prevalence of prostate enlargement and urinary tract diseases among aging male populations (Namirembe et al., 2022; Okoye et al., 2022). These findings mirror reports from other Nigerian tertiary centers, confirming a shift toward chronic, noncommunicable surgical conditions. Neurosurgical and pediatric congenital anomalies further emphasize the need for subspecialty surgical capacity, consistent with reports from other African centers (Namirembe et al., 2022; Sambo et al., 2022).

The relatively smaller proportions of general surgery and ENT procedures may result from specialization trends and outpatient management, as observed in other tertiary hospitals (Ojo et al., 2023; Massawe et al., 2023). Despite overall fluctuations, the decline in surgical volume in 2023 and recovery in 2024 likely reflect operational disruptions associated with post-pandemic constraints, staffing gaps, or supply chain issues (Massawe et al., 2023; Wong et al., 2022).

Disease pattern analysis showed trauma-related conditions and diabetic foot complications as the top surgical indications. Trauma remains a leading cause of morbidity in Nigeria and other LMICs due to poor infrastructure and weak enforcement of road safety laws (Abdur-Rahman et al., 2022). The prominence of diabetic foot and peripheral vascular disease reflects the epidemiologic transition toward chronic metabolic disorders (Adewunmi et al., 2023; Abdur-Rahman et al., 2022). These conditions require complex surgical management and long-term rehabilitation.

The mean patient age (33 years) reflects the youthful demographic of the Nigerian population and suggests that surgical diseases predominantly affect economically active adults. The significant difference in age across specialties is consistent with findings that urologic diseases predominantly affect older adults, while pediatric surgical needs are confined to congenital and early-life conditions (Namirembe et al., 2022; Sambo et al., 2022). This demographic variation calls for age-specific service planning, such as orthopedic rehabilitation for young trauma patients and chronic disease management for older adults.

The study also revealed a significant gender disparity, with male predominance in trauma-related and urologic specialties, consistent with previous regional studies (Chukwuma et al., 2022; Nwanna-Nzewunwa et al., 2023). This may reflect men's higher exposure to road traffic, occupational hazards, and prostate-related illnesses. Balanced gender representation in ENT and general surgery aligns with the broader pattern of appendicitis,

hernia, and ENT infections affecting both sexes equally (Okeke *et al.*, 2021).

Overall, the findings of this study are consistent with the priorities outlined in Global Surgery 2030, which emphasize the importance of robust surgical data systems, equitable access to care, and context-specific service planning (Meara *et al.*, 2022). When interpreted through the Global Burden of Disease framework and the Met, Unmet, and Unmeetable Surgical Need Model, the results highlight both the progress made and the persistent gaps in meeting surgical needs in northeastern Nigeria (Bickler *et al.*, 2010; Weiser *et al.*, 2021). Strengthening trauma prevention strategies, improving chronic disease surveillance, and investing in subspecialty surgical capacity are critical steps toward achieving resilient and equitable surgical care at MAUTH and similar tertiary institutions, which support Nigeria's progress toward international surgical targets.

#### Limitations:

This study has several limitations that should be acknowledged. First, the analysis was restricted to cases performed in the main operating theatre, excluding obstetric and gynecologic surgeries that are managed in separate specialty theatres. While this ensured consistency of data sources, it inevitably underestimates the overall surgical workload at MAUTH, given the major contribution of obstetric and gynecologic procedures in Nigerian tertiary hospitals. Second, minor procedures and surgeries performed in outpatient or subspecialty theatres were excluded, which may bias the findings toward major operations and limit generalizability to the full spectrum of surgical activity. Third, the retrospective design relied on existing hospital records, which may contain incomplete or inconsistently documented information. Finally, as a single-center study, the results reflect the specific catchment population and service scope of MAUTH and may not be directly comparable to other tertiary hospitals with different referral patterns. Despite these limitations, the study provides valuable facility-specific evidence that can inform surgical service planning and resource allocation in northeastern Nigeria.

#### CONCLUSION

This study provides a facility-specific overview of surgical workload at Modibbo Adama University Teaching Hospital, Yola,

highlighting the predominance of orthopedic, urologic, and neurosurgical procedures. The findings reflect a dual burden of trauma and non-communicable disease management in northeastern Nigeria, with trauma cases affecting younger, economically active adults and urologic conditions concentrated among older men. While statistical differences in age and gender distributions were observed, their practical relevance lies in guiding service planning, workforce allocation, and age-specific interventions. By situating these results within the Global Burden of Disease and Met/Unmet Need frameworks, the analysis underscores the importance of strengthening trauma prevention, chronic disease surveillance, and subspecialty surgical capacity. Ultimately, this work contributes local evidence to Nigeria's surgical system strengthening efforts and supports progress toward Global Surgery 2030 goals by emphasizing the need for improved data systems, equitable resource distribution, and resilient surgical infrastructure in resource-limited settings.

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