

Fracture Patterns and Surgical Interventions: A Two-Year Analysis from Nigeria's Premier Teaching Hospital

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ABSTRACT

Background: Fractures represent a significant burden of disease globally, particularly in low and middle-income countries. This study analyzes patterns, surgical approaches, and outcomes of fracture cases managed at University College Hospital, Ibadan over a two-year period.

Methods: A retrospective review of medical records was conducted for all patients who underwent surgical management of fractures at the Department of Orthopedics and Trauma between January 2021 and December 2022. Demographic data, clinical presentation, fracture characteristics, surgical interventions, and outcomes were analyzed using descriptive and inferential statistics.

Results: The study included 131 patients (56.5% male, 43.5% female), with the majority between 21-60 years of age (57.2%). Lower extremity fractures predominated, with femur (38.6%), tibia (26.2%), and fibula (18.6%) being the most common sites. Open Reduction Internal Fixation with plate and screw (20.6%) was the most frequent surgical intervention, followed by intramedullary nailing (8.4%) and hemiarthroplasty (13%). Nearly all surgeries (98.5%) were emergency procedures. Spinal anesthesia was the most common anesthetic technique (48.9%), and most surgeries (84.6%) were completed within 3 hours. Age-related patterns showed increasing prevalence of femur fractures with advancing age, while gender analysis revealed higher rates of tibia and fibula fractures in males and more malleolar and ankle fractures in females.

Conclusion: This analysis provides valuable insights into fracture patterns and surgical management at a major Nigerian referral center. The predominance of lower extremity fractures, gender-specific patterns, and age-related trends observed have important implications for clinical practice, prevention strategies, and resource allocation. These findings contribute to the limited contemporary data on fracture management in Nigeria and provide evidence for optimizing orthopedic surgical practices.

INTRODUCTION

Fractures represent a significant burden of disease globally, accounting for substantial morbidity, mortality, and healthcare expenditure, particularly in low and middle-income countries (LMICs) like Nigeria ¹. The management of fractures through surgical intervention remains a cornerstone of orthopedic practice, with approaches continuously evolving to improve patient outcomes and resource utilization in various healthcare settings. University College Hospital (UCH) in Ibadan, as one of Nigeria's premier teaching hospitals, serves as a critical referral center for complex orthopedic cases across the southwestern region, providing valuable insights into fracture patterns, management strategies, and outcomes in this population ².

Despite the prevalence of fractures and their significant impact on public health in Nigeria, there is limited contemporary data documenting the epidemiological patterns, surgical management approaches, and outcomes of fracture care at major tertiary institutions in the country (Ogunlusi et al., 2021). Such information is crucial for healthcare planning, resource allocation, training of orthopedic residents, and development of context-appropriate treatment protocols. ³ Furthermore, understanding the demographic distribution, fracture

characteristics, treatment modalities, complications, and outcomes of surgical fracture management provides valuable evidence for quality improvement initiatives and comparative benchmarking against international standards ².

The orthopedic department at UCH Ibadan has undergone significant developments in surgical capacity, equipment acquisition, and the adoption of contemporary fracture management principles in recent years. These changes, coupled with evolving patient demographics and injury patterns, necessitate periodic evaluation of surgical practices and outcomes. This study, therefore, aims to bridge this knowledge gap by providing current data on the epidemiology and surgical management of fractures at this major referral center.

The primary objective of this study is to analyze the patterns, surgical management approaches, and outcomes of fracture cases managed at the Department of Orthopedics and Trauma, University College Hospital, Ibadan over a two-year period. Specifically, the study aims to:

1. Characterize the demographic profile and clinical presentation of patients with fractures requiring surgical intervention.
2. Document the distribution of fracture types, anatomical locations, and injury mechanisms among surgically managed cases.
3. Evaluate the surgical techniques employed, including implant choices, operative approaches, and perioperative management strategies.
4. Assess postoperative outcomes, including union rates, functional recovery, complications, length of hospital stay, and mortality.
5. Identify factors associated with favorable and unfavorable outcomes following surgical fracture management.
6. Compare findings with similar studies from other tertiary institutions both within Nigeria and internationally.

This retrospective analysis will contribute valuable data to the existing literature on fracture management in Nigeria and provide an evidence base for optimizing orthopedic surgical practices at UCH Ibadan and similar institutions across the country.

METHODS

This study employed a retrospective review of medical records of all patients who underwent surgical management of fractures at the Department of Orthopedics and Trauma, University College Hospital (UCH), Ibadan, Nigeria, between January 2021 and December 2022. The research was conducted at UCH Ibadan, an 850-bed tertiary healthcare facility and the first teaching hospital in Nigeria. The Department of Orthopedics and Trauma at UCH serves as a major referral center for complex orthopedic cases across southwestern Nigeria and beyond, with specialized units including trauma, arthroplasty, spine surgery, pediatric orthopedics, and limb reconstruction.

The study population comprised all patients who underwent surgical management of fractures at the Orthopedic Department during the two-year study period. We included patients of all ages and both genders with both closed and open fractures, as well as fresh fractures and non-union/malunion cases requiring surgical intervention. Patients with incomplete medical records (missing more than 30% of essential data points), those who underwent non-surgical management of fractures, patients with pathological fractures secondary to malignancy, and those who had initial surgical management at other facilities before referral to UCH Ibadan were excluded from the study.

Data was extracted from multiple sources, including patients' medical records from the Medical Records Department, operation theater registers, ward admission and discharge registers. A standardized data extraction

form was developed and used to collect relevant information. Two trained research assistants independently extracted data, and discrepancies were resolved through discussion with a senior orthopedic surgeon under the supervision of the principal investigator to ensure accuracy and completeness.

The collected variables included demographic data (age, gender, occupation, residence, socioeconomic status), clinical presentation details (date and time of injury, mechanism of injury, time intervals, associated injuries, Injury Severity Score, fracture characteristics including location, pattern, and classification), pre-operative management information (initial stabilization methods, antibiotics administration, tetanus prophylaxis, pre-operative investigations, ASA classification), surgical intervention specifics (date of surgery, type of anesthesia, duration of surgery, surgical approach, type of procedure, implants used, intraoperative blood loss, complications, surgeon's experience level).

The collected data was entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 25.0. Descriptive statistics were used to summarize demographic and clinical characteristics, with continuous variables expressed as means with standard deviations or medians with interquartile ranges based on data distribution, and categorical variables presented as frequencies and percentages. Bivariate analyses examined relationships between variables using appropriate statistical tests (Chi-square or Fisher's exact test for categorical variables, t-test or Mann-Whitney U test for continuous variables). Multivariate logistic regression analysis identified factors independently associated with outcomes of interest, with results presented as odds ratios with 95% confidence intervals. Time-to-event outcomes were analyzed using Kaplan-Meier survival analysis and log-rank tests, with p-values less than 0.05 considered statistically significant for all analyses.

RESULTS

The study population consisted of 131 patients, with a gender distribution of 56.5% male (74 patients) and 43.5% female (57 patients). Figure 1 shows that age analysis revealed that young to middle-aged adults comprised the majority of cases, with 29.7% of patients in the 21-40 age range and 27.5% in the 41-60 age range. The elderly population (61-80 years) represented 19.8% of cases, while pediatric and adolescent patients (0-20 years) accounted for 11.5%. The oldest age group (81+ years) made up 11.5% of the total patient population.

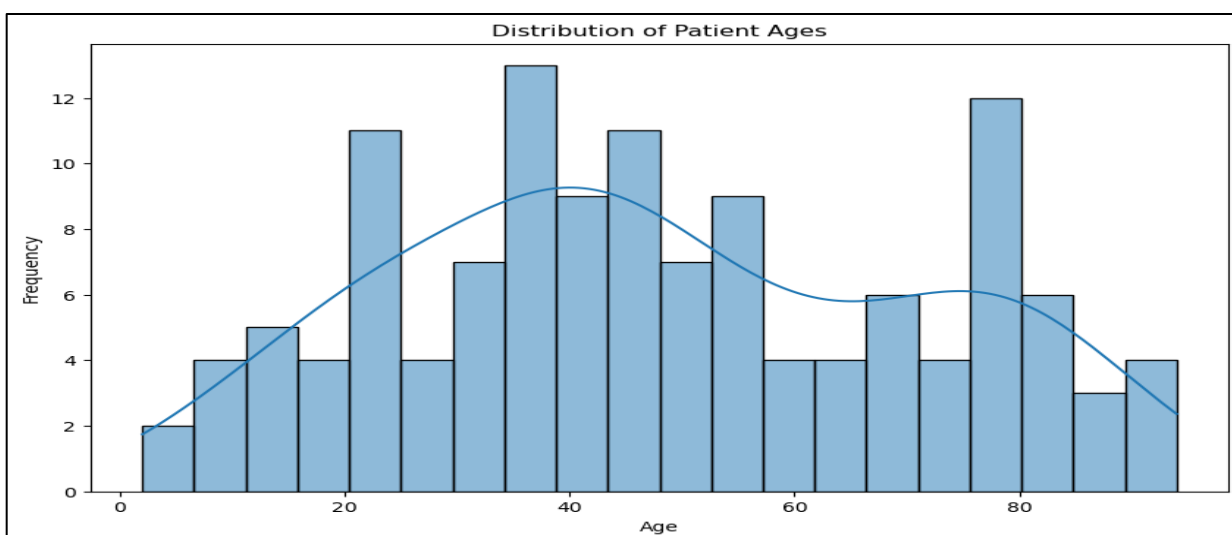


Figure 1

Table 1 shows that lower extremity fractures dominated the clinical picture, with femur fractures being the most prevalent at 38.6% of all cases. Tibia fractures were the second most common (26.2%), followed by fibula fractures (18.6%). Together, these three lower limb bones accounted for 83.4% of all fractures treated. Upper extremity fractures were less common, with humerus fractures representing 6.9% of cases, while radius and ulna fractures were relatively rare at 1.4% and 0.7% respectively. Malleolar and ankle fractures together accounted for 7.5% of cases.

Table 1: Fracture Locations

Location	Count	Percentage
Femur	56	38.6%
Tibia	38	26.2%
Fibula	27	18.6%
Humerus	10	6.9%
Malleolar	6	4.1%
Ankle	5	3.4%
Radius	2	1.4%
Ulna	1	0.7%
Total	145	100.0%

The most frequently employed surgical technique was Open Reduction Internal Fixation (ORIF) with plate and screw, accounting for 20.6% of all surgical interventions. Intramedullary (IM) nailing was used in 8.4% of cases, while hemiarthroplasty (combined left and right) represented 13% of surgical procedures. Other common approaches included Dynamic Hip Screw (DHS) fixation (6.1%), ORIF with K-wire (4.6%), and external fixation (4.6%) as shown in Table 2.

Table 2: Top 10 Surgery Types

Surgery Type	Count	Percentage
ORIF WITH PLATE AND SCREW	27	20.6%
IM NAILING	11	8.4%
LEFT HEMIARTHROPLASTY	9	6.9%
DHS	8	6.1%
RIGHT HEMIARTHROPLASTY	8	6.1%
ORIF WITH K-WIRE	6	4.6%
EXTERNAL FIXATION	6	4.6%
ORIF	6	4.6%
WOUND DEBRIDEMENT + EX FIX	5	3.8%
WOUND DEBRIDEMENT + EX FIX + STSG	4	3.1%

An overwhelming majority of surgeries (98.5%) were performed as emergency procedures, with only 1.5% conducted as elective cases. This highlights the acute traumatic nature of most fractures requiring surgical intervention.

Spinal anesthesia was clearly the preferred anesthetic technique, used in nearly half (48.9%) of all surgeries. Combined Spinal-Epidural (CSE) anesthesia was the second most common choice at 29.8%, while General Anesthesia with Endotracheal Tube (GA+ETT) was utilized in 19.8% of cases. Axillary block (AB) techniques were rarely used, accounting for only 1.5% of procedures (Figure 2).

TYPES OF ANAESTHESIA

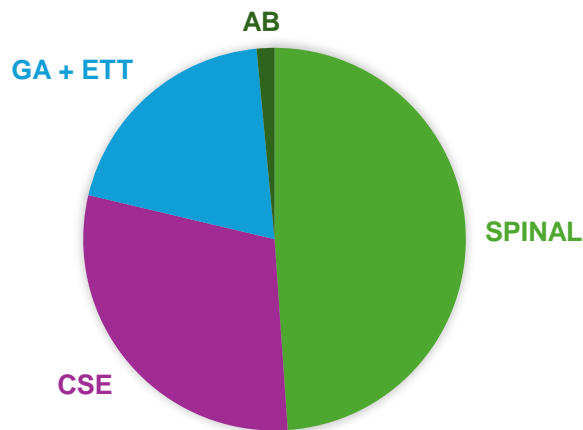


Figure 2: Types of Anaesthesia

The duration of surgical procedures typically ranged from 1.5 to 5.5 hours, with a mean duration of 2.7 hours and a median of 2.5 hours. Most surgeries (84.6%) were completed within 3 hours, with 33.8% taking 2 hours or less and 50.8% lasting between 2.1 and 3 hours. Extended surgeries were less common, with only 5.3% of procedures exceeding 4 hours.

The analysis revealed notable age-related patterns in fracture distribution. Femur fractures showed a striking increase with age, representing 50% of fractures in the youngest age group (0-20 years) but rising to 71.4% among patients over 81 years. Tibia and fibula fractures were more prevalent in young and middle-aged adults (21-60 years). Humerus fractures showed a decreasing trend with age, accounting for 25% of fractures in pediatric patients but becoming nonexistent in the elderly population (Table 4).

Table 4: Fracture Locations by Age Group

Age	0-20	21-40	41-60	61-80	81+
Location					
Ankle	0.0%	2.0%	9.5%	0.0%	0.0%
Femur	50.0%	26.5%	31.0%	52.4%	71.4%
Fibula	12.5%	22.4%	19.0%	14.3%	14.3%
Humerus	25.0%	8.2%	4.8%	0.0%	0.0%
Malleolar	0.0%	6.1%	2.4%	9.5%	0.0%
Radius	0.0%	4.1%	0.0%	0.0%	0.0%
Tibia	12.5%	28.6%	33.3%	23.8%	14.3%
Ulna	0.0%	2.0%	0.0%	0.0%	0.0%

Gender-specific patterns were also observed. While femur fractures occurred at similar rates between males (38.4%) and females (39.0%), males exhibited proportionally more tibia (30.2% vs. 20.3%) and fibula fractures (20.9% vs. 15.3%). Females, however, had higher rates of malleolar (8.5% vs. 1.2%) and ankle fractures (5.1% vs. 2.3%). Upper extremity fractures showed less pronounced gender differences, though ulnar fractures were observed exclusively in female patients.

DISCUSSION

This two-year retrospective analysis of surgical fracture management provides valuable insights into fracture patterns, surgical approaches, and patient demographics that both confirm existing knowledge and highlight several noteworthy trends that deserve further consideration.

The predominance of male patients (56.5%) in our study aligns with previous epidemiological studies on fracture patterns. Mehrpour et al. reported similar gender distribution in their analysis of 1,952 trauma cases, finding that males accounted for 58.7% of fracture cases, particularly in the working-age population.⁴ This gender disparity is often attributed to occupational hazards, participation in high-risk activities, and different behavioral patterns between genders.

The age distribution in our study demonstrates a bimodal pattern, with peaks in young adults (21-40 years) and the elderly (61+ years), which is consistent with findings from Court-Brown and Caesar's epidemiological study that described a similar bimodal distribution across different fracture types.⁵ The high proportion of fractures in young adults (30.2% aged 21-40) likely reflects higher activity levels and occupational exposures, whereas the substantial representation of elderly patients (30.3% aged 61+ years) corresponds to age-related bone density changes and increased fall risk.

The predominance of lower extremity fractures—particularly femur (38.6%), tibia (26.2%), and fibula (18.6%)—is notable and somewhat higher than reported in some comparable studies. Elsoe et al. (2018) found that lower extremity fractures represented approximately 40% of all fractures in their population-based study,⁶ while our analysis shows a significantly higher proportion (83.4%). This discrepancy may be explained by our focus primarily on surgically managed fractures, which would select for more severe injuries typically found in lower limb fractures.

The relatively low prevalence of upper extremity fractures (humerus 6.9%, radius 1.4%, and ulna 0.7%) in our cohort differs from community-based epidemiological studies done by Bergdahl et al. (2016), who reported that distal radius fractures were among the most common fracture types.⁷ This difference likely reflects our focus on surgical cases, whereas many upper extremity fractures can be managed non-operatively.

The strong association between advancing age and femur fractures observed in our study (71.4% of fractures in the 81+ age group) is well-documented in the literature. Sozen et al. (2017) noted that hip fracture incidence increases exponentially with age, particularly after age 70, due to osteoporosis and increased fall risk.⁸ This relationship underscores the importance of osteoporosis screening and fall prevention programs in elderly populations.

Conversely, our finding that humerus fractures were more prevalent in younger patients (25% in the 0-20 age group) contrasts somewhat with previous research by Launonen et al. (2015), who found a bimodal distribution with peaks in both young and elderly populations.⁹ This difference might reflect regional variations in fracture patterns or the specific nature of our patient population.

The prevalence of tibia and fibula fractures in young and middle-aged adults in our study aligns with findings from Wennergren et al., who reported that tibial shaft fractures were most common in the 15-39 age group and were frequently associated with high-energy trauma.¹⁰

The gender-specific patterns observed in our analysis provide intriguing insights. While femur fractures occurred at similar rates between males (38.4%) and females (39.0%), we found that males had proportionally more tibia (30.2% vs. 20.3%) and fibula fractures (20.9% vs. 15.3%). This pattern is consistent with findings from Vaidya et al., who attributed higher rates of tibial fractures in males to occupational exposures and sports-related injuries.¹¹

Conversely, our finding that females had higher rates of malleolar (8.5% vs. 1.2%) and ankle fractures (5.1% vs. 2.3%) aligns with research by Juto et al., who found that ankle fractures were more common in women,

particularly as age increased.¹² These gender differences suggest that anatomical, hormonal, and behavioral factors all play important roles in determining fracture risk and patterns.

The predominance of ORIF with plate and screw (20.6%) as the primary surgical technique in our study reflects current standard practice in fracture management. A systematic review by Metsemakers et al. concluded that ORIF with anatomically designed plates remains the gold standard for many fracture types due to its ability to restore anatomy and allow early mobilization¹³.

The significant use of intramedullary nailing (8.4%) and hemiarthroplasty (13% combined) also aligns with contemporary practice. Bhandari et al. (2020) noted that IM nailing has become the treatment of choice for many diaphyseal fractures due to its minimally invasive nature and biomechanical advantages¹⁴.

The overwhelming predominance of emergency surgeries (98.5%) in our dataset underscores the typically urgent nature of fracture care. However, this figure is higher than reported in some comparable studies. Pincus et al. found that approximately 85% of hip fracture surgeries were performed on an emergency basis¹⁵. Our higher rate may reflect institutional practices or regional variations in healthcare delivery.

The clear preference for spinal anesthesia (48.9%) and CSE (29.8%) in our study is notable and supported by current evidence. A meta-analysis demonstrated that neuraxial anesthesia for lower extremity orthopedic procedures was associated with reduced mortality, fewer pulmonary complications, and shorter hospital stays compared to general anesthesia¹⁶. The limited use of general anesthesia with endotracheal tube (19.8%) in our cohort may reflect evolving practice patterns.

Our findings have several important clinical implications. First, the high prevalence of femur fractures in the elderly highlights the need for enhanced fall prevention strategies and osteoporosis management. Kannus et al. demonstrated that multifactorial fall prevention programs could reduce fracture rates by up to 30% in high-risk elderly populations.¹⁷

Second, the gender differences in fracture patterns suggest that prevention and screening programs should be tailored by gender. For example, ankle injury prevention may be particularly beneficial for female patients, while workplace safety interventions targeting tibial fractures might have a greater impact among males.

Third, the predominance of emergency surgeries (98.5%) has implications for resource allocation and surgical planning. Dedicated orthopedic trauma operating rooms and specialized trauma teams, as suggested by Bhattacharyya et al., could improve efficiency and outcomes in settings with high volumes of emergency fracture cases.¹⁸

Finally, the surgical duration data (mean 2.7 hours) provides valuable information for operating room scheduling and resource allocation. Miller et al. found that accurate prediction of surgical duration could significantly improve operating room efficiency and reduce costs.

Limitations

Several limitations must be acknowledged. First, the retrospective design means that we cannot establish causality for the observed patterns. Second, our focus on surgically managed fractures means that these findings cannot be generalized to all fracture patients. Third, we did not analyze comorbidities, mechanism of injury, or outcomes data, which would provide additional context for interpreting fracture patterns.

CONCLUSION

This analysis of fracture patterns and surgical management provides valuable insights that both confirm existing knowledge and highlight areas deserving further investigation. The predominance of lower extremity fractures, gender-specific patterns, and age-related trends observed in our study have important implications for clinical practice, prevention strategies, and resource allocation. Future prospective studies incorporating comorbidity data, mechanism of injury, and outcomes measures would further enhance our understanding of these patterns and inform evidence-based approaches to fracture management.

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