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# Pattern of Traumatic Injury Sustained by Civilian Victims of Armed Conflicts Presenting to Federal Teaching Hospital Katsina (2022–2024)

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**Research Article**

**Keywords:** Armed conflict, Civilian casualties, Gunshot wounds, Trauma care, Injury Severity Score, Katsina

**Posted Date:** November 4th, 2026

**DOI:** https://doi.org/10.21203/rs.3.rs-11394093/v1

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**Additional Declarations:** No competing interests reported.

## Abstract

# Background

Armed conflict in Northwestern Nigeria has caused a sharp rise in civilian casualties, yet local epidemiological data to guide trauma systems remain scarce.

# Methodology:

We conducted a retrospective case series analysis of medical records for all civilian victims of armed conflict admitted to Federal Teaching Hospital Katsina (FTHK) from January 2022 to December 2024. Demographic profiles, injury mechanisms, anatomical distributions, Injury Severity Scores (ISS), and clinical outcomes were evaluated.

# Results

Among 321 civilian casualties, 90.3% were male (mean age: 33.43 ± 13.71 years), with agricultural workers representing the largest occupational group (43.6%). Gunshot ballistics accounted for 100% of injuries. Extremities were the most frequent anatomical site (57.4%), followed by abdomen/pelvis (24.1%), head/neck (11.6%), and chest (9.6%). Overall, in-hospital mortality was 14.3%, while 17.2% did not complete care (12.5% left against medical advice, 4.7% absconded). In multivariate regression, ISS was the sole independent predictor of mortality (aOR = 1.052, 95% CI: 1.023–1.083, p = 0.0005).

# Discussion

The total predominance of ballistic trauma contrasts with modern global conflict trends dominated by blast ordnance. The lower proportions of central thoracic and cranial injuries suggest a severe pre-hospital survival gap due to delayed transit and absent formal emergency medical services. High rates of premature discharge highlight critical financial barriers in emergency care.

# Conclusion

Conflict-related civilian trauma in this setting disproportionately affects productive-age males and carries substantial mortality driven by injury severity. Mitigating this burden requires decentralized pre-hospital stabilization, subsidized trauma care funds, and coordinated regional registry surveillance.

## BACKGROUND

Armed conflicts continue to ravage societies across the globe and inflict a profound toll on civilian populations. The impact of such conflicts is multifaceted, not only leading to loss of life and incurring extensive physical disability but also causing long-term psychological trauma, displacement, and socioeconomic destabilization. In regions affected by persistent insecurity, civilians often become inadvertent victims of violence, resulting in complex clinical scenarios that pose significant challenges to healthcare providers. This article focuses on traumatic injury patterns among civilian victims of armed conflicts as observed at the Federal Teaching Hospital Katsina between 2022 and 2024. (1)

Although the global literature provides a comprehensive understanding of injury patterns in conflict settings, there is a pressing need to contextualize these patterns in local settings such as Katsina state in Northwestern Nigeria that has witnessed a surge in violent incidents related to banditry and other forms of conflict.

In recent decades, systematic reviews of civilian injury patterns have emphasized the predominance of injuries to the extremities, head, and chest, with children representing a significant proportion of the affected population. Such findings also underscore the critical gaps in existing trauma care frameworks. In resource constrained environments like Katsina, where evacuation chains and rapid pre-hospital care may be lacking, the outcome of traumatic injuries is further compounded by limited access to specialized medical interventions available only tertiary/ trauma centers. Moreover, the absence of standardized reporting protocols in conflict settings hampers the synthesis of epidemiological data, making it challenging to derive actionable insights for healthcare planning.(2,3)

Given these challenges, the present study is undertaken with the aim of outlining the specific traumatic injury patterns that have emerged among civilian victims treated in Katsina. By aligning our local observations with established global data, this research will look to provide a robust evidence base that can inform clinical protocols, optimize resource allocation, and ultimately enhance trauma care outcomes in similar low-resource conflict settings.

**Global Impact of Conflict on Civilians**

Armed conflicts have been identified as one of the major drivers of global morbidity and mortality. According to the World Health Organization, injuries—both unintentional and violence-related account for approximately 4.4 million deaths each year, representing nearly 8% of all global deaths. This staggering statistic underscores the substantial public health burden associated with conflict-related trauma. In addition to immediate fatalities, survivors of violent conflict often suffer from long-term disabilities, psychological disorders, and socioeconomic marginalization, which further strain both local health systems and international humanitarian efforts.(4)

The disruption caused by conflicts extends well beyond the immediate injuries sustained during violent encounters. As observed by Doctors Without Borders (MSF), conflict situations not only lead to direct physical trauma but also precipitate secondary complications such as displacement, interruption of routine medical services, and exacerbation of preexisting health conditions. This multidimensional

impact aggravates the overall vulnerability of civilian populations, particularly in low resource settings where medical infrastructure is already fragile. In many conflict regions, the collapse of healthcare delivery systems results in delays in access to critical care, with pre-hospital transportation relying on any available means—ranging from private vehicles to rudimentary methods like bicycle or even foot transport. Such circumstances significantly diminish the “golden hour”of trauma care, thereby heightening the risk of preventable morbidity and mortality. (5)

Furthermore, explosive weapons deployed in densely populated areas have emerged as a particularly lethal component of modern warfare. The article “Bringing Victim Assistance Closer to the Point of Injury” highlights that explosive devices in populated settings can result in widespread casualties, including complex polytrauma that overwhelms local emergency services 6. This source notes that nearly 40% of the victims of explosive weapons succumb to their injuries even before reaching a healthcare facility. The indiscriminate nature of such weaponry often leads to disproportionate harm, with children and other vulnerable groups bearing a significant brunt of the damage. (6)

The cumulative impact of these factors not only necessitates immediate humanitarian intervention but also calls for a re-examination of trauma care protocols in conflict settings. Global efforts by organizations such as WHO, Doctors Without Borders, and various academic consortia emphasize the need for coordinated approaches that integrate rapid trauma response with long-term rehabilitation. In this context, systematic reviews of civilian injury patterns—such as the one conducted by Chevalley and colleagues (2024)—provide essential insight into the specific types of injuries sustained during conflicts, thus laying the groundwork for evidence-based interventions.

In summary, the global impact of armed conflicts on civilians is profound. The continuous cycle of violence, compounded by the collapse of essential services, demands an urgent focus on optimizing trauma care. Enhanced coordination, standardized reporting mechanisms, and targeted resource allocation are imperative to mitigate the devastating effects of conflict on civilian health outcomes.

**Objectives**

The main objective of this study is to determine the pattern of traumatic injury sustained by civilian victims of armed conflicts presenting to FTHK. The specific objectives are:

1. To assess the demographic characteristics of civilian victims of armed conflicts presenting to FTHK.
2. To identify the types of traumatic injuries sustained by civilian victims of armed conflicts presenting to FTHK.

# Methodology

Study Design

This was a Retrospective case series conducted at FTHK. Data was collected from medical records of civilian victims of armed conflicts who presented to the hospital between January 2022 and December 2024.

Study Population

The study population included all civilian victims of armed conflict who presented to FTHK during the study period.

**Inclusion And Exclusion Criteria**

Inclusion criteria were as follows:

1. Civilian patients presenting with conflict-related traumatic injuries between January 2022 and December 2024.
2. Records with complete demographic and clinical outcome data.
3. Patients of all age groups.

Exclusion criteria included:

1. Records with incomplete or missing key variables.
2. Military personnel or non-civilian casualties, as the focus of this study is solely on civilian injury patterns.
3. Cases not directly linked to armed conflict incidents (e.g., accidents unrelated to conflict).

**Sample Size**

All eligible medical records were included in the study; civilian victims of armed conflicts presenting to FTHK during the study period.

# RESULTS

**Demographic Characteristics and Annual Trends**

During the 3-year study period between January 2022 and December 2024, a total of **321 civilian victims** of armed conflict presented to Federal Teaching Hospital Katsina (FTHK) and met the inclusion criteria. Annual presentation volume demonstrated a sharp surge of **52.2%**, rising from 90 cases in 2023 to 137 cases in 2024. Overall, the vast majority of casualties were male (n = 290, **90.3%**), yielding a male-to-female ratio of 9.35:1. The mean age of victims at admission was **33.43 ± 13.71 years**.

Working-age young adults in the 18–30 age group (n = 116, **36.1%**) and middle adults in the 31–45 age group (n = 107, **33.3%**) constituted over two-thirds (**69.5%**) of the overall cohort. Pediatric casualties (<18 years) accounted for **10.9%** (n = 35) of total presentations, while elderly patients aged 66 and above

represented **1.6%** (n = 5). By occupation, agricultural workers (farmers) formed the single largest group of victims (n = 140, **43.6%**), followed by traders (n = 60, **18.7%**) and students (n = 40, **12.5%**) (Table 1).

**Table 1: Yearly Demographic Profile of Civilian Trauma Victims (2022–2024)**

| Variable | Category | 2022 (n=94) | 2023 (n=90) | 2024 (n=137) | Overall Total (N=321) | Percentage (%) |
|---|---|---|---|---|---|---|
| **Gender** | Male | 86 (91.5%) | 79 (87.8%) | 125 (91.2%) | 290 | 90.3% |
| | Female | 8 (8.5%) | 11 (12.2%) | 12 (8.8%) | 31 | 9.7% |
| **Age Group** | 0–5 yrs | 0 (0.0%) | 2 (2.2%) | 4 (2.9%) | 6 | 1.9% |
| | 6–12 yrs | 2 (2.1%) | 1 (1.1%) | 4 (2.9%) | 7 | 2.2% |
| | 13–17 yrs | 7 (7.4%) | 6 (6.7%) | 9 (6.6%) | 22 | 6.9% |
| | 18–30 yrs | 25 (26.6%) | 34 (37.8%) | 57 (41.6%) | 116 | 36.1% |
| | 31–45 yrs | 30 (31.9%) | 28 (31.1%) | 49 (35.8%) | 107 | 33.3% |
| | 46–65 yrs | 29 (30.9%) | 18 (20.0%) | 11 (8.0%) | 58 | 18.1% |
| | 66+ yrs | 1 (1.1%) | 1 (1.1%) | 3 (2.2%) | 5 | 1.6% |

### 2.2 Geographic Distribution (Local Government Area of Residence)

Casualties originated across various Local Government Areas (LGAs) within Katsina State. The highest proportion of patients resided in Katsina LGA (n = 37, **11.5%**), followed closely by security-compromised frontline conflict zones including Kankara (n = 35, **10.9%**), Batsari (n = 26, **8.1%**), Jibia (n = 26, **8.1%**), Dutsinma (n = 25, **7.8%**), Safana (n = 24, **7.5%**), Kurfi (n = 17, **5.3%**), and Danmusa (n = 16, **5.0%**). Combined, these eight designated LGAs accounted for **64.2%** (n = 206) of all civilian trauma presentations (Table 2).

**Table 2: Geographic Distribution by Primary LGA of Residence**

| Local Government Area (LGA) | 2022 | 2023 | 2024 | Total Cases (n) | Percentage (%) |
|---|---|---|---|---|---|
| Katsina | 9 | 13 | 15 | 37 | 11.5% |
| Kankara | 10 | 9 | 16 | 35 | 10.9% |
| Batsari | 7 | 5 | 14 | 26 | 8.1% |
| Jibia | 6 | 12 | 8 | 26 | 8.1% |
| Dutsinma | 6 | 6 | 13 | 25 | 7.8% |
| Safana | 9 | 5 | 10 | 24 | 7.5% |
| Kurfı | 6 | 5 | 6 | 17 | 5.3% |
| Danmusa | 4 | 4 | 8 | 16 | 5.0% |
| Other LGAs / Unstated | 37 | 31 | 47 | 115 | 35.8% |

### 2.3 Trauma Mechanism and Anatomical Spectrum of Injury

In terms of injury mechanism, **100%** (N = 321) of recorded cases were attributed to gunshot ballistics. Diagnostic anatomical categorization revealed that injuries to the extremities were the predominant site, affecting **57.4%** (n = 143) of casualties with localized anatomical records. Abdominal and pelvic trauma was documented in **24.1%** (n = 60) of cases, head and neck trauma in **11.6%** (n = 29), chest/thoracic trauma in **9.6%** (n = 24), and spinal trauma in **3.6%** (n = 9).

Compared to global conflict trauma benchmarks, the FTHK cohort demonstrated a higher proportion of extremity trauma (**57.4% vs. 50.0%**) and a lower rate of presenting head/neck injuries (**11.6% vs. 26.0%**) and chest injuries (**9.6% vs. 18.0%**).

### 2.4 Injury Severity Score (ISS) and Clinical Outcomes

The overall mean Injury Severity Score (ISS) for the cohort was **14.72 ± 9.84**. When categorized into standard severity grades, **35.5%** (n = 114) presented with Severe injuries (ISS 16–24), **33.3%** (n = 107) with Moderate injuries (ISS 9–15), **17.1%** (n = 55) with Very Severe injuries (ISS ≥ 25), and **14.0%** (n = 45) with Minor injuries (ISS 1–8).

Overall disposition outcomes indicated that **68.5%** (n = 220) of victims were successfully treated and discharged. The overall in-hospital mortality rate was **14.3%** (n = 46). Notably, a combined non-completion of care rate of **17.2%** was observed, comprising patients who Left Against Medical Advice (LAMA: n = 40, **12.5%**) and those who Absconded (n = 15, **4.7%**)(Table 3).

**Table 3: Injury Severity Score (ISS) vs. Clinical Outcome Intersection**

| ISS Severity Grade | Discharged (n, %) | Mortality (n, %) | LAMA (n, %) | Absconded (n, %) | Total (n) | In-Hospital Mortality Rate (%) |
|---|---|---|---|---|---|---|
| **Minor (ISS 1–8)** | 34 (75.6%) | 0 (0.0%) | 6 (13.3%) | 5 (11.1%) | 45 | **0.0%** |
| **Moderate (ISS 9–15)** | 80 (74.8%) | 11 (10.3%) | 12 (11.2%) | 4 (3.7%) | 107 | **10.3%** |
| **Severe (ISS 16–24)** | 79 (69.3%) | 15 (13.2%) | 15 (13.2%) | 5 (4.4%) | 114 | **13.2%** |
| **Very Severe (ISS ≥ 25)** | 27 (49.1%) | 20 (36.4%) | 7 (12.7%) | 1 (1.8%) | 55 | **36.4%** |
| **Overall Total** | **220 (68.5%)** | **46 (14.3%)** | **40 (12.5%)** | **15 (4.7%)** | **321** | **14.3%** |

### 2.5 Multivariate Predictors of Survival and Resource Utilization

In bivariate analyses, injury severity demonstrated a clear dose-response relationship with mortality: minor trauma resulted in **0.0%** mortality (n = 0), moderate trauma in **10.3%** (n = 11), severe trauma in **13.2%** (n = 15), and very severe trauma in **36.4%** (n = 20).

In a multivariate logistic regression model controlling for age and gender, ISS score was identified as the sole independent predictor of in-hospital mortality (Adjusted Odds Ratio [aOR] = 1.052, 95% CI: 1.023–1.083, p = 0.0005). Each 1-point increase in ISS raised the odds of mortality by **5.2%**. Patient age (aOR = 0.992, p = 0.484) and male sex (aOR = 0.675, p = 0.431) showed no independent statistical association with survival.

The overall mean length of hospital stay (LOS) was **8.24 ± 9.52 days** (Median: 5.0 days, IQR: 9.0 days). Among surviving discharged patients, LOS increased progressively with injury severity, averaging **7.76 days** for minor trauma, **9.29 days** for moderate trauma, **10.57 days** for severe trauma, and **9.11 days** for very severe trauma. Conversely, non-survivors in the severe and very severe groups succumbed early in their admission course, with mean times to death of **2.00 days** and **2.35 days**, respectively.

# DISCUSSION

### Epidemiological Vulnerability and Socioeconomic Footprint

The epidemiological demographic of civilian trauma victims in this cohort reflects a distinct socioeconomic vulnerability in Northwestern Nigeria. Young adult males (18–45 years, **69.5%**) and agricultural workers (**43.6%**) bore the primary burden of conflict-related gunshot injuries. This aligns with regional conflict dynamics where armed attacks, banditry, and rural raids predominantly target agrarian communities during farming activities or village defense. The heavy involvement of working-age males has profound downstream economic ramifications for rural households, leading to catastrophic loss of

household income, disruption of regional food production, and long-term disability in prime productive years. Although pediatric casualties constituted a smaller proportion (**11.0%**) compared to global conflict benchmarks (**23.0%**; Chevalley et al., 2024), pediatric trauma remains a critical area requiring specialized pediatric surgical and psychological rehabilitation protocols.

**Divergence in Trauma Mechanism: Gunshots vs. Explosive Ordnance**

A striking finding of this study is that **100%** of civilian trauma presentations at FTHK were attributed to direct gunshot ballistics. This presents a marked contrast to modern global conflict literature (e.g., Middle Eastern, Eastern European, or Tigray conflict zones), where explosive ordnance (IEDs, artillery, and aerial bombardment) accounts for the majority of civilian casualties and complex blast polytrauma. This total reliance on ballistic mechanisms reflects the unique nature of asymmetric security threats in Katsina State and broader Northwestern Nigeria, where violence is primarily driven by close-range assault weapons, highway ambushes, and rural village invasions. Consequently, local emergency services must focus surgical protocols on low- and high-velocity gunshot wound management, severe soft-tissue debridement, and complex fracture fixation.

**Anatomical Pattern and the "Pre-Hospital Survival Gap"**

Extremity injuries dominated the anatomical spectrum (**57.4%**), slightly exceeding global benchmarks (**50.0%**). Conversely, presenting head/neck injuries (**11.6%**) and chest trauma (**9.6%**) were substantially lower than reported global averages (**26.0%** and **18.0%**, respectively). This structural discrepancy strongly suggests the presence of a **"Pre-Hospital Survival Gap."** In low-resource settings like Katsina State, formal pre-hospital EMS evacuation chains, field triage, and rapid transit are largely lacking. Victims with critical penetrating trauma to central organ systems (craniofacial, major thoracic vascular injuries) likely succumb to acute hemorrhage or airway loss at the scene or during prolonged informal transport (e.g., private cars, commercial motorcycles). Patients arriving at FTHK thus represent a pre-screened cohort of survivors who survived long enough to reach tertiary care.

**Financial Barriers, Non-Completion of Care, and Equity Gaps in Trauma Fund Implementation**

A major non-clinical challenge identified in this study is the high rate of non-completion of care (**17.2%** combined LAMA and Absconded). Discharging against medical advice (**12.5%**) or absconding (**4.7%**) is frequently driven by out-of-pocket health expenditures, inability to afford emergency surgical consumables/blood products, or fear of prolonged hospital stays. While a government-funded Conflict Trauma Fund exists to offset these emergency financial burdens, its operational implementation is currently restricted primarily to tertiary receiving centers like FTHK. Consequently, this creates a major equity gap in trauma coverage: victims who present directly to FTHK benefit from financial relief, whereas primary healthcare centers (PHCs) and secondary general hospitals—which serve as the immediate first-line care institutions in rural conflict zones—are completely excluded from this funding pool. Frontline peripheral centers are left under-resourced, forcing impoverished rural casualties to incur out-of-pocket costs at the point of initial stabilization or delay transfer altogether.

**RECOMMENDATIONS:**

To address the substantial morbidity and death rates linked to armed violence in Katsina State, strategic responses must move beyond isolated clinical care. We advocate for a **multi-tiered framework** designed to resolve immediate life-saving constraints, reinforce healthcare systems in the medium term, and ensure long-term policy sustainability.

**Immediate Interventions: Resolving Acute Survival Constraints**

Short-term objectives focus on mitigating pre-hospital mortality and removing administrative hurdles to emergency tertiary services.

1. **Institutionalize "Zero-Delay" Emergency Trauma Funds:** Establish decentralized, facility-level funding mechanisms financed via state emergency budgets or humanitarian pools to bypass out-of-pocket payment bottlenecks that currently stall critical surgeries like laparotomies.
2. **Deploy Pre-Hospital "Damage Control" Caches:** Distribute standardized trauma kits (tourniquets, pressure bandages, and Tranexamic acid) to Primary Healthcare Centers (PHCs) and community responders located along high-risk insecurity corridors.
3. **Buffer Tertiary Consumable Stockpiles:** Coordinate with FTHK to maintain ring-fenced reserves of blood products, orthopedic hardware, and surgical supplies specifically designated for conflict-related mass-casualty events.

**Medium-Term Interventions: Strengthening System Capacity and Outcomes**

Efforts should prioritize the decentralization of trauma expertise and address complex comorbidities.

1. **Implement Task-Shifting for Secondary Care:** Provide Advanced Trauma Life Support (ATLS) and damage control training to Medical Officers in rural General Hospitals to bridge the "Golden Day" gap and stabilize victims closer to the site of injury.
2. **Integrate Trauma and Nutritional Care Protocols:** Develop unified surgical recovery plans that incorporate inpatient therapeutic feeding for pediatric and vulnerable cohorts to enhance immune response and post-operative survival.
3. **Expand Post-Surgical Rehabilitation Services:** Create community-level psychosocial support and physical therapy programs to manage complex fractures and amputations, aiming to reduce permanent disability and support social reintegration.

**Long-Term Interventions: Policy Resilience and Data Integration**

Sustainable progress requires formal financial protection, evidence-based advocacy, and the safeguarding of medical neutrality.

1. **Institutionalize Financial Risk Protection:** Lobby for the inclusion of emergency conflict trauma coverage within the National Health Insurance Authority (NHIA) and Basic Health Care Provision

Fund (BHCPF) frameworks.

2. **Establish a Regional Trauma Registry:** Implement a unified, data-driven surveillance system to track weapon types, conflict hotspots, and clinical results, providing an empirical basis for future health policy and funding.
3. **Advocate for Medical Neutrality:** Partner with state and non-state actors to formalize protected medical zones and safe transit routes, ensuring civilian access to care and protecting regional healthcare infrastructure from incursions.

# LIMITATIONS

This study was limited by the availability and completeness of medical records. Some medical records were missing or incomplete, which affected the accuracy of the data collected. In addition, the study could only include data from one hospital, which may not be representative of the entire population of civilian victims of armed conflicts in the region.

# CONCLUSION

The escalating civilian toll of armed conflict in Northwestern Nigeria presents an urgent, multidimensional challenge to the regional health system. As demonstrated across the 321 conflict-trauma presentations at Federal Teaching Hospital Katsina, civilian trauma in this setting is characterized by severe, high-velocity penetrating injuries, compounded by protracted pre-hospital evacuation delays ("the Golden Day") and severe financial barriers to emergent surgical care. Ultimately, trauma care in conflict-affected civilian populations cannot be viewed merely as a hospital-based clinical task, but as an indispensable pillar of humanitarian protection and health systems development. Bridging the gap between frontline surgical need and high-level health policy is essential to saving lives and restoring dignity to communities caught in the crossfire.

# Declarations


### Funding

The authors declare that no funds, grants, or other financial support were received during the preparation of this manuscript.


### Consent to Publish

Consent to Publish declaration: not applicable.

### Ethics Approval and Consent to Participate

Ethical approval was obtained from the Health Research and Ethics Committee (HREC) of the Federal Teaching Hospital Katsina (FTHK) prior to study commencement. Due to the retrospective nature of the

study relying on anonymized medical records, individual informed consent to participate was waived by the ethics committee.

### Data Availability

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request, subject to patient data confidentiality regulations.

### Author Contributions

All authors contributed to the study conception and design. A.M., M.D.G., and A.A. performed study preparation, data collection, and analysis. The first draft of the manuscript was written by A.M., and all authors reviewed, critically revised, and approved the final manuscript.

### Competing Interests

The authors have no competing interests or financial relationships to declare that are relevant to the content of this article.

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