Original Article

Blunt Abdominal Trauma in Geriatric Populations in a Rural Nigerian Community: Clinical Outcomes, Socioeconomic Barriers, and Systemic Challenges

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Article History
Submitted: 18/05/2025; Accepted: 22/05/2025: Published: 31/05/2025

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ABSTRACT

Geriatric populations in rural Nigeria face disproportionately high risks from blunt abdominal trauma (BAT) due to physiological fragility, limited healthcare access, and socioeconomic marginalization. This retrospective cohort study analyzed 32 patients aged >65 years admitted with BAT at Alex Ekwueme Federal University Teaching Hospital (AEFUTHA), Abakaliki, a referral center for southeastern Nigeria's agrarian communities, where geriatric patients accounted for 32.1% of all BAT cases over a two-year period (2022–2023). Data on demographics, injury mechanisms, clinical management, and outcomes were extracted from hospital records and analyzed using SPSS v28. The cohort (median age: 73 years, IQR: 68–79) was predominantly male (65.6%, n=21) and engaged in subsistence farming (81.3%, n=26). Falls (40.6%, n=13), assaults (25.0%, n=8), and road crashes (18.8%, n=6) were the primary injury mechanisms. Delayed hospital presentation (>24 hours) occurred in 84.4% (n=27) of cases, with 53.1% (n=17) initially seeking traditional healers. Clinically, 68.8% (n=22) presented with baseline anemia (Hb <8 g/dL), and 43.8% (n=14) exhibited hemodynamic instability (SBP <90 mmHg). Hollow viscus perforations (34.4%, n=11) and hepatic/splenic injuries (28.1%, n=9) predominated. All patients required laparotomy, but 87.5% (n=28) experienced surgical delays (>24 hours post-admission) due to financial constraints. Mortality reached 37.5% (n=12), primarily from sepsis (75.0%, n=9). Catastrophic health expenditure (CHE) affected 96.9% (n=31) of families, with 59.4% (n=19) selling livestock to fund care. Geriatric mortality quadrupled adult rates (37.5% vs. 9.4%), with multivariate logistic regression identifying baseline anemia (OR: 3.8), surgical delays (OR: 4.1), and CHE (OR: 2.7) as independent predictors. These findings underscore systemic failures in prehospital care, diagnostic delays, and financial toxicity as key drivers of preventable geriatric trauma deaths in rural Nigeria. Urgent interventions—including subsidized trauma insurance, community-based fall prevention programs, and task-shifting ultrasound training for rural clinicians—are needed to mitigate disparities and align with global health equity goals.

Keywords: Blunt abdominal trauma, Catastrophic health expenditure, Geriatric trauma, Health equity, Rural Nigeria, Sepsis, Surgical delays

INTRODUCTION

Blunt abdominal trauma (BAT) represents a critical yet under prioritized public health challenge among geriatric populations in low- and middle-income countries (LMICs), where aging demographics intersect with systemic healthcare inequalities. Globally, adults over 65 years account for 20% of trauma-related deaths, with abdominal

Article Access
Website: www.wjmbs.org.ng
10.5281/zenodo.15766484

How to cite this article
Umezurike DAH. Blunt Abdominal Trauma in Geriatric Populations in a Rural Nigerian Community: Clinical Outcomes, Socioeconomic Barriers, and Systemic Challenges. West J Med & Biomed Sci. 2025;6(2):128-137. DOI:10.5281/zenodo.15766484.

injuries contributing disproportionately to mortality in resource-constrained settings.[1] In sub-Saharan Africa, geriatric trauma burden is escalating due to prolonged life expectancy and occupational hazards among aging agrarian communities, yet research and policy responses remain alarmingly sparse.[2,3] Nigeria, home to over 15 million elderly individuals—70% residing in rural areas—epitomizes this crisis, where frail health systems, poverty, and infrastructural deficits amplify risks for older adults.[4]

Physiological vulnerabilities exacerbate outcomes in elderly BAT patients. Age-related declines in cardiorespiratory reserve, preexisting anemia, and comorbidities such as osteoporosis impair resilience to hemorrhagic shock and delay recovery.[5,6] Unlike younger individuals geriatric patients often sustain severe injuries from low-mechanism trauma, such as ground-level falls, which account for 40% of BAT cases in rural Africa.[7] In Nigeria, where 80% of older adults engage in subsistence farming, occupational falls, assaults during land disputes, and road crashes involving overcrowded transport systems are predominant injury mechanisms.[8] Despite this, fewer than 10% of rural health facilities possess ultrasound machines for timely diagnosis,[9] and delays in surgical intervention exceeding 24 hours are reported in 85% of cases.[10]

Clinical management of geriatric BAT in LMICs is fraught with diagnostic and therapeutic dilemmas. Atypical presentations—masked peritonitis, blunted tachycardia, and normotensive hypotension—frequently lead to missed injuries, while financial barriers restrict access to computed tomography (CT), the gold standard for BAT evaluation.[11,12] In Nigeria, where 99.3% of the elderly lack health insurance, families face catastrophic costs for emergency laparotomies, blood transfusions, and postoperative care, forcing 60% to sell productive assets like livestock.[13,14] Compounding these challenges, cultural reliance on traditional healers delays hospital presentations, increasing sepsis risk in hollow viscus injuries.[15] Existing trauma registries in LMICs disproportionately exclude elderly patients, perpetuating a cycle of invisibility in health policy.[16]

The socioeconomic ramifications of geriatric BAT extend beyond clinical outcomes. In southeastern Nigeria's Ebonyi State, where 90% of the elderly live below the poverty line, trauma-related disability exacerbates dependency cycles, straining familial resources and community resilience.[17] A 2023 systematic review identified only four Nigerian studies analyzing geriatric trauma outcomes, none of which proposed age-specific management protocols.[18] This scarcity of research focusing on geriatric BAT in Nigeria represents a significant knowledge gap. While existing literature highlights the general challenges of trauma care in LMICs, there is a dearth of studies specifically examining the interplay of age-related physiological vulnerability, socioeconomic factors, and healthcare system limitations that uniquely shape the outcomes of elderly trauma patients.

This study examines the epidemiology, clinical outcomes, and systemic barriers shaping geriatric BAT management at Alex Ekwueme Federal University Teaching Hospital (AEFUTHA), a referral center serving Nigeria's underserved southeast. We aim to (1) characterize injury mechanisms and patterns in rural geriatric BAT, (2) identify predictors of mortality and catastrophic health expenditure, and (3) propose context-specific interventions to mitigate disparities. By foregrounding the experiences of elderly trauma patients, this work seeks to address the marginalization of geriatric care in LMIC health agendas and advocates for equity-driven reforms in trauma system strengthening.

MATERIALS AND METHODS

Study Design and Setting

This retrospective cohort study analyzed geriatric patients (>65 years) admitted with blunt abdominal trauma (BAT) at Alex Ekwueme Federal University Teaching Hospital (AEFUTHA), Abakaliki, between January 2022 and December 2023. AEFUTHA is a tertiary referral centre serving rural agrarian communities in southeastern Nigeria, where 80% of the population lacks formal health insurance.

Participants

The study included 32 elderly patients meeting the following criteria:

Inclusion:

Age >65 years.

Confirmed BAT via imaging (ultrasound, X-ray), surgical exploration, or clinical diagnosis (e.g., abdominal tenderness, guarding, hypotension).

Complete medical records documenting injury mechanism, management, and outcomes.

Exclusion:

Isolated extra-abdominal injuries (e.g., limb fractures without abdominal involvement).

Death before clinical evaluation.

Data Collection

Data were extracted from emergency department registers, surgical operative notes, anesthesia records, and discharge summaries. Variables included:

Demographics: Age, sex, occupation, insurance status.

Injury Characteristics: Mechanism (fall, assault, road crash), time from injury to hospital presentation.

Clinical Parameters:

Vital signs on admission (systolic blood pressure [SBP], heart rate).

Hemoglobin (Hb) level, presence of baseline anemia (Hb <8 g/dL).

Injury pattern (hollow viscus perforation, solid organ injury).

Management:

Use of imaging (ultrasound, CT).

Time from admission to surgery.

Surgical procedures performed (e.g., bowel resection, splenectomy).

Outcomes:

Mortality, complications (sepsis, surgical site infection).

Hospital length of stay.

Financial Burden:

Total treatment costs.

Incidence of catastrophic health expenditure (CHE), defined as out-of-pocket payments exceeding 10% of annual household income.

Asset liquidation (e.g., sale of livestock, farmland).

Statistical Analysis

Data were analyzed using SPSS v28. Descriptive statistics (frequencies, percentages, medians, interquartile ranges [IQR]) summarized demographic and clinical variables. Fisher's exact test compared categorical outcomes (e.g., mortality, CHE) between subgroups (e.g., delayed vs. early presentation). Continuous variables (e.g., age, Hb levels) were analyzed using the Mann-Whitney U test. Multivariate logistic regression identified independent predictors of mortality, adjusting for covariates such as anemia, surgical delays, and CHE. Odds ratios (OR) with 95% confidence intervals (CI) were calculated. Statistical significance was set at $p < 0.05$.

Ethical Considerations

Approval was obtained from AEFUTHA's Ethics Committee (NHREC/16/05/22/384). Informed consent was waived for this retrospective analysis. Patient identifiers were anonymized to ensure confidentiality.

RESULTS

Our analysis of 32 geriatric BAT cases at AEFUTHA revealed critical patterns across demographic, clinical, and socioeconomic domains (Table 1). The cohort demonstrated a pronounced male predominance (65.6%, n=21), with over 80% (n=26) engaged in subsistence farming - a demographic profile reflecting southeastern Nigeria's agrarian economy where elderly men remain primary breadwinners despite advanced age. The median age of 73 years (IQR:68-79) underscores the vulnerability of Nigeria's "oldest-old" population, who face cumulative risks from both biological aging and hazardous occupational exposures.

Injury mechanisms followed distinct rural patterns (Table 1). Falls accounted for 40.6% (n=13) of cases, predominantly occurring during farming activities such as climbing palm trees or traversing rain-eroded footpaths. Assaults, predominantly blunt

force trauma from land dispute altercations, comprised 25% (n=8) - a finding corroborated by Ebonyi State's 2021 land conflict reports. Road crashes, though less frequent (18.8%, n=6), involved high-energy collisions with overloaded "okada" motorcycles lacking age-appropriate safety features.

A critical barrier emerged in care-seeking timelines: 84.4% (n=27) presented >24 hours post-injury (Table 1), with over half (53.1%, n=17) initially consulting traditional healers. This delay cascade proved clinically consequential, as 68.8% (n=22) arrived with life-threatening anemia (Hb<8g/dL) and 43.8% (n=14) in hemorrhagic shock (SBP<90mmHg) (Table 2). Diagnostic limitations were stark - no CT scans were performed due to cost barriers, forcing reliance on clinical exams and ultrasound. Despite these constraints, intraoperative findings confirmed hollow viscus injuries in 34.4% (n=11) and solid organ damage in 28.1% (n=9), predominantly splenic lacerations from left upper quadrant impacts during falls.

Management challenges were multifaceted (Table 2). While all patients required laparotomy, 87.5% (n=28) endured >24-hour surgical delays awaiting blood products or family fund mobilization. This lag proved lethal - sepsis caused 75% of deaths (9/12 fatalities), with median time-to-antibiotics being 8 hours versus 1.5 hours in survivors (p=0.003). Overall mortality reached 37.5% (n=12), quadruple the 9.4% rate in adult BAT patients during the study period.

The financial devastation extended beyond clinical outcomes (Table 3). Catastrophic health expenditure (CHE) affected 96.9% (n=31) of families, with 59.4% (n=19) liquidating livestock assets - equivalent to 3-5 years' income loss per animal sold. Multivariate analysis identified three modifiable mortality predictors (Table 4): baseline anemia tripled risk (OR=3.8, 95%CI:1.4-10.3), surgical delays quadrupled risk (OR=4.1, 1.6-10.8), and CHE independently doubled odds of death (OR=2.7, 1.1-6.9). These interconnected factors create a lethal cycle where poverty delays care, which in turn amplifies complications and costs.

Table 1: Demographic and Injury Characteristics (N=32)

Variable	Value
Age (median, IQR)	73 years (68–79)
Male sex	65.6% (n=21)
Subsistence farmers	81.3% (n=26)
Injury mechanism	
- Falls	40.6% (n=13)
- Assaults	25.0% (n=8)
- Road crashes	18.8% (n=6)
- Other	15.6% (n=5)
Time to presentation	
>24 hours	84.4% (n=27)
Traditional healer first	53.1% (n=17)

Table 2: Clinical Presentation and Outcomes (N=32)

Variable	Value
Hemodynamic instability	43.8% (n=14)
Baseline anemia (Hb <8 g/dL)	68.8% (n=22)
Injury pattern	
- Hollow viscus	34.4% (n=11)
- Solid organ (liver/spleen)	28.1% (n=9)
- Other	37.5% (n=12)
Mortality	37.5% (n=12)
- Sepsis-related	75.0% (n=9)
- Hemorrhagic shock	25.0% (n=3)
Time-to-antibiotics (median)	
- Non-survivors	8 hours
- Survivors	1.5 hours

Table 3: Financial Burden (N=32)

Variable	Value
Catastrophic expenditure	96.9% (n=31)
Asset liquidation	
- Sold livestock	59.4% (n=19)
- Mortgaged farmland	25.0% (n=8)

Table 4: Multivariate Predictors of Mortality

Variable	Adjusted OR (95% CI)	p-value
Baseline anemia	3.8 (1.4 –10.3)	0.009*
Surgical delay >24h	4.1 (1.6 –10.8)	0.003*
Catastrophic expenditure	2.7 (1.1 –6.9)	0.04*

DISCUSSION

This study exposes a critical epidemiological chasm: geriatric blunt abdominal trauma (BAT) patients in rural Nigeria experience a 37.5% mortality rate—a staggering disparity quadruple the 9.4% mortality observed in younger adults treated at the same facility. This disproportionate burden of death arises not merely from age-related frailty but from a lethal synergy of systemic failures: crushing poverty forcing treatment delays, diagnostic incapacities due to imaging shortages, and healthcare frameworks exclusionary to elderly needs. Our data reveal an unforgiving reality—existing trauma protocols, optimized for younger physiologies, catastrophically neglect the compounded vulnerabilities of aging bodies within resource-deprived contexts. The absence of geriatric-specific triage guidelines, financial safety nets, or rehabilitation pathways in such settings perpetuates what amounts to structural ageism in global health priorities. These findings demand immediate recalibration of LMIC trauma systems to address the unique biomechanical, socioeconomic, and infrastructural determinants of survival for aging populations.

The observed mortality rate of 37.5% in this study significantly surpasses figures reported in high-income countries (HICs), where geriatric trauma mortality typically ranges from 8–15% despite older average patient ages.[19,20] This striking difference highlights the profound impact of resource limitations and systemic disparities on patient outcomes. Sepsis emerged as the primary cause of death in our cohort, accounting for 75% of fatalities. This high incidence of sepsis is directly linked to delayed laparotomies, with 87.5% of cases experiencing surgical intervention more than 24 hours post-admission. This finding aligns with data from Cameroon, which demonstrates a 3.5-fold increase in mortality when surgery for bowel perforations is delayed beyond 12 hours.[21] In our study, critical hours were lost due to financial negotiations for essential resources such as blood products, CT scans, and surgical supplies—a barrier virtually nonexistent in populations with access to health insurance. This financial barrier creates a tragic paradox where the very act of seeking care can lead to financial ruin, further exacerbating the cycle of poverty.

Pre-existing comorbidities further complicate the clinical picture. A significant, 68.8% of patients presented with baseline anemia (Hb <8 g/dL), a condition that tripled the risk of mortality (OR: 3.8). Chronic anemia, prevalent among Nigeria's elderly population due to malnutrition and parasitic infections,[22] severely impairs oxygen delivery during hemorrhagic shock and increases susceptibility to sepsis.[23] This stands in stark contrast to the standard practice in HICs, where preoperative anemia correction is routinely performed.[24] The lack of access to basic blood transfusion services underscores the resource disparities that contribute to the disproportionately high mortality rate observed in this study.

The predominant mechanisms of injury in our cohort were falls (40.6%) and assaults (25%), reflecting the precarious intersection of agrarian livelihoods, communal land disputes, and inadequate social safety nets. Over 80% of the patients were subsistence farmers, a population inherently exposed to fall risks associated with activities such as climbing palm trees or carrying heavy loads across uneven terrain.[25] Assaults, often linked to intergenerational land conflicts, highlight the vulnerability of elderly Nigerians in regions characterized by weak legal title systems.[26] While road traffic crashes (RTCs) accounted for a smaller proportion of injuries (18.8%) compared to pediatric cohorts,[27] the reliance on overcrowded 'okada' motorcycles, which lack safety features tailored to older adults (e.g., secure seating, handrails), exemplifies systemic failures to prioritize geriatric needs in transportation infrastructure and safety policies. This highlights the need for targeted interventions to address the specific risks faced by the elderly in rural communities.

Delayed hospital presentation, occurring in 84.4%

of cases (greater than 24 hours post-injury), was compounded by the reliance on traditional healers (53.1%). This finding is consistent with other Nigerian studies indicating that approximately 60% of rural families initially seek spiritual therapies for trauma.[28] However, this delay is not simply a matter of cultural preference but a direct consequence of infrastructural deficiencies. A staggering 70% of communities in Ebonyi State lack ambulance services,[29] and 43% of families cannot afford motorized transport. [30] One poignant case involved a farmer with a mesenteric tear who endured a four-hour journey by okada or motorcycle, arriving in septic shock—a narrative echoing reports from Uganda, where trauma mortality doubles with each hour of delay.[31] These delays underscore the critical need for improved infrastructure and access to timely transportation.

Due to financial constraints, none of the geriatric patients in our study received preoperative CT imaging, forcing reliance on clinical examinations and ultrasound. While CT scans are utilized in approximately 95% of BAT cases in HICs,[32] functional CT scanners are rarely available in rural Nigerian hospitals. This “diagnostic austerity” carries the inherent risk of missed injuries, as evidenced by the 12.5% of our cohort who were found to have occult diaphragmatic ruptures intraoperatively. Despite these limitations, the surgeons demonstrated remarkable adaptability, achieving 100% diagnostic accuracy using focused assessment with sonography for trauma (FAST)—a valuable skill requiring wider dissemination and training.[33] This resourcefulness highlights the potential of point-of-care ultrasound to bridge the diagnostic gap in resource-limited settings.

The financial burden of trauma care proved catastrophic for 96.9% of the families in our study, with 59.4% resorting to selling livestock—a devastating loss in agrarian economies. The loss of a cow, for example, represents a sacrifice of 3–5 years of income for a Nigerian household.[34] This desperate measure, taken to fund essential medical care, further entrenches intergenerational poverty, as surviving patients often become dependent, straining already limited familial resources.[35] This contrasts sharply with the success of community-based health insurance initiatives in Rwanda, which have demonstrably reduced catastrophic health expenditure (CHE) for surgical care from 48% to 12%.[36] The implementation of similar programs in Nigeria could significantly alleviate the financial burden of trauma care.

Our findings unequivocally demonstrate the inadequacy of applying adult-centric guidelines to elderly BAT patients. For instance, non-operative management (NOM), which has proven successful in managing 40% of geriatric splenic injuries in HICs,[37] was deemed unsuitable in our setting due to the prevalence of anemia and limited capacity for follow-up care. Similarly, "watchful waiting" for stable patients was not feasible in the absence of CT monitoring. Contextualized protocols are urgently needed, including:

Triage Red Flags: Prioritize emergent laparotomy for elderly patients presenting with anemia (Hb <8 g/dL) or delayed presentation (>24 hours).

Mobile FAST Units: Equip and train rural clinicians in bedside ultrasound to expedite triage and inter-facility transfers.

Blood Banks: Expand access to blood transfusions through the establishment of solar-powered refrigeration units in rural health facilities, thereby minimizing presurgical delays.

Limitations

While this study provides valuable granular data on geriatric BAT in a resource-limited African setting, its single-center design and relatively small sample size limit generalizability. This means the findings may not be representative of the experiences of geriatric BAT patients in other regions of Nigeria or other LMICs. Recall bias may have influenced the accuracy of injury mechanism documentation, potentially leading to misclassification of injury causes. And long-term functional outcomes were not assessed, limiting our understanding of the long-term impact of BAT on the lives of these patients. Furthermore, the retrospective nature of the study relies on the accuracy and completeness of medical records, which may be subject to limitations in resource-constrained settings.

CONCLUSION

This study exposes the catastrophic intersection of geriatric vulnerability and systemic neglect in rural Nigerian trauma care. The 37.5% mortality rate for elderly BAT patients - fourfold higher than adults - stems not merely from biological frailty but from remediable structural failures. Three key findings demand urgent attention: First, the predominance of low-mechanism injuries (falls, assaults) linked to occupational hazards and social instability reveals preventable injury patterns requiring community-level interventions. Second, diagnostic and therapeutic delays - exacerbated by financial barriers and traditional healer reliance - transform survivable injuries into fatal sepsis. Third, the near-universal incidence of catastrophic health expenditure underscores how poverty itself becomes a pathophysiological factor, with families' economic collapse mirroring patients' physiological decline.

These outcomes starkly contravene the WHO's trauma care equity goals, highlighting how geriatric populations in LMICs bear dual burdens of physiological risk and systemic marginalization. The high prevalence of baseline anemia (68.8%) - a marker of chronic malnutrition and parasitic disease - exemplifies the syndemic nature of geriatric trauma in resource-limited settings, where preexisting comorbidities amplify acute injury impacts. Our finding that surgical delays independently quadrupled mortality risk provides empirical evidence to prioritize financing mechanisms for emergency surgical care.

The ripple effects extend beyond individual mortality - each trauma-induced bankruptcy destabilizes familial support networks, potentially pushing entire households below the poverty line. In a region where 90% of elderly depend on family care, these cases represent both a clinical and societal emergency. This study provides the first quantified evidence of geriatric trauma's disproportionate impact in rural Nigeria, challenging policymakers to confront age-based disparities in trauma system resourcing. Without targeted interventions addressing the unique vulnerabilities of aging populations, LMICs risk perpetuating cycles of preventable mortality and intergenerational poverty as demographic shifts accelerate.

RECOMMENDATIONS

To address the systemic inequities contributing to geriatric BAT mortality in rural Nigeria, we propose the following evidence-based interventions:

Immediate Actions:

Implement subsidized trauma insurance for elderly farmers to mitigate financial barriers to emergency care.

Train rural clinicians in bedside ultrasound (FAST) to expedite triage and reduce diagnostic delays.

Community-Level Initiatives:

Develop culturally tailored fall prevention programs targeting elderly farmers, addressing occupational hazards like palm tree climbing.

Establish community blood banks with solar-powered refrigeration to ensure timely access to transfusions.

Policy Reforms:

Integrate geriatric-specific trauma protocols into national guidelines, prioritizing anemia screening and surgical urgency for elderly patients.

Advocate for government-funded ambulance services in rural regions to reduce prehospital delays.

By implementing these recommendations, we can begin to address the systemic inequities contributing to the high mortality rate among geriatric BAT patients in rural Nigeria and move towards a more equitable and just healthcare system.

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