

The Pattern of Civilian Gunshot Injuries at a University Hospital in North Central Nigeria

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Abstract: Gunshot injuries are a special category of trauma with a high potential for death and hospitalization. The objective of this study is to highlight their pattern and treatment outcome. This was a prospective study of all patients admitted through the Accident and Emergency Department of the Benue State University Teaching Hospital, Makurdi, Nigeria with gunshot injuries between July 2012 and June 2014. Data obtained were analyzed using the software Statistical Package for Social Sciences for Windows version 15.0 (SPSS, Inc; Chicago, Illinois). Sixty-two patients with gunshot injuries were included in the study. There were 49 males (79%) and a male-to-female ratio of 3.8:1. Their ages ranged from 4 to 65 years and the modal age group was 20-29 years. Communal clashes (n=29, 46.8%) were the predominant circumstances surrounding the injuries, followed by armed robbery attacks (n=18, 29%) and student cult violence (n=8, 12.9%). The most commonly involved body region was the upper limb (n=20, 29%). Isolated soft tissue injuries (n=38, 55.1%) were the predominant injury type sustained by patients in this study. The patients with fractures had debridement and fracture stabilization with external fixation (n=3, 4.7%), casting (n=3, 4.7%) and percutaneous K-wire fixation (n=1, 1.6%). Majority of patients (n=54, 78.3%) were treated and discharged while four (6.5%) left against medical advice. Mortality rate was 3.2%. Gunshot injuries mostly affected adult males with communal clashes being the leading cause. Instituting efficient conflict resolution channels and establishing trauma centers to promptly treat the injured may help reduce the menace of gun violence.

Keywords: Injuries, Firearms, Gunshot, Nigeria

I. Introduction

Firearms are the most destructive of readily available weapons in modern society.¹ They are the second leading cause of injury death in the United States and are the second most frequent cause of death overall for youth ages fifteen to thirty-four.^{2,3} Gunshot injuries (GSI) were a rarity before the Nigerian civil war of 1967 – 1970 but several Nigerian studies have demonstrated the significant morbidity and mortality associated with them ever since then.^{4,5,6} Recent surge in the spate of armed militancy and terrorism in Nigeria is likely to increase the magnitude of the problem.

The nature of ballistic injury is indiscriminate tissue damage which crosses specialty and sub-specialty borders.⁷ A missile launched onto the abdomen may finally lodge in the chest requiring expertise to tackle abdominal, chest and diaphragmatic injuries. The ability of a missile to wound is dependent on its kinetic energy at impact and biological characteristics of the tissue. The temporary cavitation phenomenon in high velocity injuries causes further tissue damage remote from the tract of the projectile.⁸

The causes of GSI in Nigeria include communal clashes, sectarian religious crises, military violence, armed robbery, hunting accidents, political violence and students' cultism activities.^{1,4,6} While armed robbery is the most common cause in developing countries, suicidal attempts predominate in developed countries.⁹ GSI are commonly seen among men in their productive years.^{1,4,10}

Firearm-related injuries have an increased potential of death and hospitalization compared with other causes of injury.¹¹ Besides high death toll, they are associated with significant morbidity, long term physical and psychological disability for individuals, families, communities and societies.¹² This study was undertaken to analyze GSI at Benue State University Teaching Hospital, Makurdi, with the objective of evaluating the pattern and outcome of these injuries.

II. Methods

a. Study design and setting

This was a prospective hospital-based study of gunshot injury patients of all age groups and gender presenting to the Accident and Emergency (A&E) Department of Benue State University Teaching Hospital (BSUTH), Makurdi, Nigeria between July 2012 and June 2014. BSUTH is a tertiary care and teaching hospital

for the Benue State University that is located along the shores of River Benue. The hospital provides trauma care for inhabitants of the city and surrounding areas of north central Nigeria.

b. Data collection and subjects

Subjects for the study included all consenting gunshot injury victims of all age groups and gender irrespective of injury severity who were managed at BSUTH during the study period. Those who could not give complete information and those who had no relatives to consent to the study were excluded from the study. Patients were screened at the A & E and those who met the inclusion criteria were consecutively enrolled into the study.

All recruited patients were first resuscitated in the A & E Department according to Advanced Trauma Life Support protocol and then transferred to the surgical wards or the intensive care unit from where necessary investigations were completed and further treatment modalities instituted. Information gathered from patients included demographic data, cause of shooting, anatomical site of injury, injuries sustained, definitive treatment modalities, outcome (discharged home, discharged against medical advice, referred to other facilities or died).

c. Statistical analysis

Data were analyzed using the software Statistical Package for Social Sciences for Windows version 15.0 (SPSS, Inc; Chicago, Illinois). Descriptive statistics were used to display single variable quantities using means and standard deviations (SD) for continuous variables or proportions for categorical variables unless otherwise stated.

III. Results

Sixty-two patients with gunshot injuries were included in the study. They comprised of 49 (79%) males and 13 (21%) females giving a male-to-female ratio of 3.8:1. Their ages ranged from 4 to 65 years with a mean of 28.0±11.9. The modal age group was 20-29 years.

Communal clashes were the predominant cause of gunshot injuries involving 29 patients (46.8%). Others were armed robbery attacks (n=18, 29%), student cult violence (n=8, 12.9%), accidental discharge (n=6, 9.7%) and assault (n=1, 1.6%). Majority of the injuries (n=56, 90.3%) were intentional. Table 1 shows the causes of gunshot injuries with respect to age groups of patients.

Table 1: Causes of gunshot injuries with respect to age groups of patients.

Age Group (years)	Cause of gunshot					Total (%)
	Communal clash	Robbery	Accidental discharge	Cult violence	Assault	
0 - 9	3	-	-	-	-	3 (4.8%)
10 - 19	5	1	1	-	1	8 (12.9%)
20 - 29	9	11	3	4	-	27 (43.5%)
30 - 39	10	5	2	-	-	17 (27.4%)
40 - 49	2	1	-	1	-	4 (6.5%)
50 - 59	-	-	-	-	-	-
60 - 69	-	-	-	3	-	3 (4.8%)
Total (%)	29 (46.8%)	18 (29.0%)	6 (9.7%)	8 (12.9%)	1 (1.6%)	62(100.0%)

Half of the patients (n=31, 50%) presented within 6 hours while 28(45.2%) between 6 and 72 hours and 3(4.8%) after 6 hours. The most commonly involved body region was the upper limb (n=20, 29%). This was followed by the chest (n=12, 17.4%), lower limb (n=12, 17.4%), head (n=11, 15.9%), abdomen (n=10, 14.5%) and spine (n=4, 5.8%). Isolated soft tissue injuries without bony or visceral injuries (n=38, 55.1%) were the predominant injury type sustained by patients in this study. This was followed by chest injuries (n=8, 11.6%) and fractures (n=7, 10.1%). Table 2 shows the gunshot injuries sustained by patients.

Table 2: Gunshot injuries sustained by patients

Injury sustained	Frequency	Percent
Soft tissue injury	38	55.1
Fracture	7	10.1
Chest injury	8	11.6
Abdominal injury	6	8.7
Spinal injury	3	4.3
Head injury	5	7.2
Hand injury	1	1.4
Eye injury	1	1.4
Total	69	100.0

Majority of the study population (n=39, 60.9%) had wound debridement and delayed primary closure or healing by secondary intention. The patients with fractures had debridement and fracture stabilization with external fixation (n=3, 4.7%), casting (n=3, 4.7%) and percutaneous K-wire fixation (n=1, 1.6%). A breakdown of the definitive treatment modalities employed is shown in Table 3.

Table 3: A breakdown of definitive treatment modalities employed for gunshot injury patients

Treatment modality	Frequency	Percent
Debridement	40	62.5
Exploratory laparotomy	5	7.8
CTTD	3	4.7
Conservative treatment	8	12.5
Ext. fix./Casting/K-wiring	7	11.0
Enucleation	1	1.6
Total	64	100.0

CTTD – Closed tube thoracostomy drainage, Ext. fix – External fixation, K – Kirschner

Two patients died in this study giving a mortality rate of 3.2%. One of the deaths resulted from an open head injury and the other, a high cervical spine injury. Majority (n=54, 78.3%) were treated and discharged. Four (6.5%) left against medical advice while 2 (2.9%) were referred for neurosurgical consultation.

IV. Discussion

The majority of GSI in this study were as a result of communal clashes. This is in contradistinction to most studies in developing countries that report armed robbery attacks as predominant cause.^{4, 6, 9, 13} This finding is likely to be due to the recent armed conflict between nomadic herdsmen and resident farming communities over grazing land in the study area. Seasonal migration of herdsmen in search of green pasture brings them in close contact with farmers. Designating special grazing zones for nomadic herdsmen along their seasonal migration route may help keep them away from farmland.

Similar to prior series on gunshot injuries, this study revealed a male preponderance.^{1, 4, 6, 13} Males are more likely to be involved in gang violence, violent robberies, banditry, war and misuse of drugs which expose them to firearm injuries.⁵ While most studies quoted very high male-to-female ratios, the finding in this study was rather modest. This may be because the leading cause of injuries were marauding nomadic herdsmen attacking unsuspecting locals at odd hours resulting in injuries to significant numbers of females. In consonance with prior studies,^{1, 13} the brunt of GSI in this study is borne by young adults with majority of the patients being less than 40 years of age. Involvement of mostly young male reduces the productivity of the nation not only in terms of lost man-hours but in the enormous costs to treat and rehabilitate these patients.

The extremities were the leading injured anatomical region. This is in line with findings from prior studies.^{4, 5, 13, 14} This may be due to the fact that most firearm injuries to the extremities are not life-threatening.¹⁵ Head and torso gunshots are more likely to be fatal with most of such injuries not reported because of the tradition of early burial in this environment.

Soft tissue injuries formed the bulk of GSI sustained in this study. This is similar to earlier studies.^{6, 13} Low-energy injuries are usually associated with minimal soft tissue damage and can be managed with superficial debridement and irrigation followed by a sterile dressing with or without antibiotics.¹⁵ Wounds are closed by delayed primary closure or allowed to heal by secondary intention. High-energy soft tissue injuries, on the other hand, are associated with severe soft tissue damage and require an aggressive debridement with several second-look surgeries.¹⁵ Of recent, the modality of treatment employed in GSI is based on the characteristics of the wound encountered instead of mere estimation of energy transfer.¹⁶

Gunshot wounds associated with long bone fractures were managed with casting and external fixation during the study period. Open reduction and internal fixation was not employed. It is advocated that femoral and tibial fractures requiring intramedullary nailing should be managed with reamed nails.¹⁷ However, in the presence of extensive comminution, external fixation is more appropriate.¹⁸

Early presentation noted following gunshot injuries has been noted in earlier studies.^{1, 5, 13} This may be due to the tumult and fright associated with gunshot incidents. It is impressive considering the dearth of ambulance services in this environment.

The study recorded a low mortality rate of 3.2% compared to previous studies.^{9, 13} They resulted from patients with head and high spinal injuries. The relatively low mortality rate in this study may not be a true reflection of the mortality pattern of these injuries as a proportion of fatal ones will not make it to the hospital.

Majority of the patients were discharged home following treatment while 6.5% requested for discharge against medical advice (DAMA) to seek alternative medical (traditional) care. Seeking alternative medical care is a common phenomenon in developing countries with some studies quoting higher figures.^{4, 13} Patients seek this form of treatment because of the erroneous belief in the ability of the healers to extract retained missiles by

non-surgical means. Exploitation of patients by this group of practitioners has been reported.¹⁹ Campaigns to educate people of the drawbacks of such practice ought to be instituted.

V. Conclusion

Gunshot injuries predominantly affect adult males with communal clashes being the leading cause. The extremities had a predilection for being hit of all the body regions and the most common injury sustained was isolated soft tissue injury. Instituting efficient conflict resolution channels in acrimonious communities and establishing trauma centers to promptly treat the injured may help reduce the menace of gunshot injuries.

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