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Pattern and Outcome of Armed Robbery Related Gunshot Injury in a Teaching Hospital in South-west, Nigeria.

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ABSTRACT

Background: Armed robbery attacks are the commonest cause of civilian gunshot injuries (GSI) in published data in Nigeria. This study was done to determine the pattern and outcome of the armed robbery-related gunshot injuries.

Methods: A prospective observational study was done over a 30-months period from January 2018 to June 2020 at a teaching hospital in southwest Nigeria. The study recorded details on patient demographics, firearm types, gunshot wound characteristics, attack timing and location, pre-attack events, and outcome status according to predefined criteria. Continuous variables were expressed as mean and standard deviation, while categorical variables were expressed as percentages. Association between categorical variables was assessed using Chi square at p <.05 level of significance.

Results: Seventy-nine patients presented with gunshot injuries over the study period, 34(43%) were because of armed robbery attack. The mean age was 35.2 years ±8.8SD with age group 25-44 years being the most commonly affected and male to female ratio of 16:1.The extremities was most injured region in 38.2% and 67.6% of the attacked occurred at night with 20.6% mortality rate. Outcome of the patient and type of weapons used were significantly associated with p =.04.

Conclusion: Armed robbery-related GSI affects predominantly young adults. The extremities were most commonly injured, and weapons of injury, were predominantly low velocity, with a high mortality when fired at close range. There is an increasing need to reduce the prevalence through youth engagement and effective night policing.

Key words: Outcome, Armed robbery-related, gunshot injuries, teaching hospital, Nigeria.

1. INTRODUCTION

Civilian gunshot injuries (GSI) are increasingly becoming a common occurrence worldwide with associated mortality and morbidity[1]. Violent crimes involving the use of firearms are also on the rise in sub-Saharan Africa attributed to economic downturns, youth unemployment, and poor social support[2]. Armed robbery is one of the recognized vice that unemployed and agitated youths engage in as a means of survival[3].

In Nigeria, armed robberies have become increasingly common, so much so, that in 1992, a special unit - the Special Anti-Robbery Squad (SARS) - was formed to specifically target the growing menace of armed robbers[4]. The primary aim of those involved is to dispossess their victims of valuables, a process that often results in death when their victims are fired at close range at the head or chest or severe incapacitation for survivors when the injuries are not life-threatening but limb-threatening. The extent of damage inflicted depends on the nature of the weapon used and the kinetic energy it dissipates, with high velocity weapons causing the greatest damage[5,6].

While the epidemiology of GSI has been widely reported in literature from different parts of Nigeria, despite the notoriety of armed robberies in Nigeria, there is paucity of data concerning the contribution of armed robbery attacks to the patterns and outcomes of GSI in the country[7–11]. We found only one study from Northern Nigeria which exclusively reported on armed robbery related GSI, and it was

limited to patterns and outcomes of injuries[12]. Therefore, this study aims to elucidate not only the patterns and outcomes of GSI following armed robbery attacks among patients presenting to a teaching hospital in southwest, Nigeria, but also to compare GSI resulting from armed robberies to other causes. This comparison will provide important preventive and clinical insights into the complexities of GSI.

2. PATIENTS AND METHODS

This was a descriptive observational study over an 18-month period at Ekiti State University Teaching Hospital (EKSUTH) in Ado-Ekiti, South-Western Nigeria, between January 2018 and May 2019. The hospital, which previously served as the State Specialist Hospital was upgraded to a teaching hospital on April 1st 2008 following the establishment of the College of Medicine in the Ekiti State University. It is a 252 bedded hospital that provides tertiary health care to indigenes of the State and catchment areas including the three neighbouring States of Ondo, Kogi and Edo. It separately handles adult and paediatric trauma cases in the Adult Accident and Emergency Ward and the Paediatric Accident and Emergency Ward, respectively. The total population of the State is estimated at 3,592,200 while Ado Ekiti, (7.6124oN, 5.2371o E) the capital city of the State has an estimated population of 536,000[13]. The estimated number of trauma patients seen yearly averages 630. The inclusion criterion was all patients with newly diagnosed GSI seen at the adult and children emergency rooms of the hospital. The exclusion criteria were all the patients with GSI but had been treated in another institution, GSI brought in dead, and those referred as result of treatment related complication following GSI.

The sample size was determined using the sample size calculation for the primary outcome, which was a dichotomous variable (Alive or dead), in one study group compared to the population[14]. Therefore, Solagberu's finding which showed that a proportion armed

$$N = P_0 q_0 \{Z_{1-\alpha/2} + Z_{1-\beta} \frac{\sqrt{p_1 q_1}}{p q_0}\}^2 / P_1 - P_0$$

$$q_0 = 1 - p_0$$

$$q_1 = 1 - p_1$$

robbery related GSI in their population of 57% amongst GSI was used in calculating the sample size[15]. For our study, we assumed a 30% difference in the proportion of patients with GSI.

p0 = proportion (incidence) of population

p1 = proportion (incidence) of study group

N = sample size for study group

α = probability of type I error (usually 0.05)

β = probability of type II error (usually 0.2)

z = critical Z value for a given α or β

N= 0.57*0.43{1.96+0.84

0.741*0259/0.57*0.43}^{2}

(0.741-0.57)^2

N=61.

To this was added 10% attrition or drop rate. So, the minimum sample of 67 participants was the total calculated sample size.

The consecutive sampling technique was used to recruit patients as they presented to the adult and pediatric emergency rooms of the institution until the minimum sample size was fulfilled or exceeded.

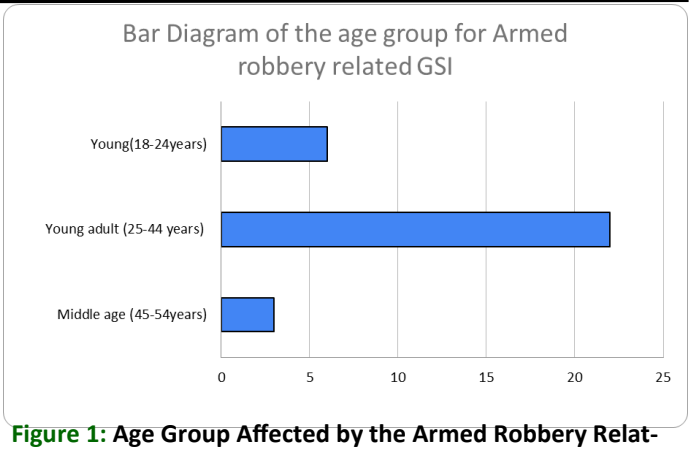

Figure 1: Age Group Affected by the Armed Robbery Related GSI

All patients with gunshot injuries who presented alive to the Adult and Children Accident and Trauma Wards of our facility during the study period were evaluated, resuscitated and stabilised. The hemodynamically unstable patients and those in haemorrhagic shock were carefully resuscitated with intravenous fluid and whole blood transfusion as needed using the principle of advanced trauma life support. All the patients, had analgesia, tetanus prophylaxis, and a course of parenteral antibiotics. Before recruitment into the study, consent was obtained from the patients when stable or from caregivers in case of children, and unstable patients. The following information was obtained at presentation for each recruited patient by the attending physician: age, sex, place, and events preceding the attack, and possible type of gun used based on the history (with emphasis on police report) and on wound examination. The gunshot wound was classified as non-penetrating, penetrating or perforating[16]. Injuries were assessed using Abbreviated Injury Scale (AIS) and classification of the injury was done using the Injury Severity Score (ISS). The threshold for major injury was a score greater than or equal to 15.

On discharge, the following information was also obtained from the case notes: treatment given, surgical findings where surgery was indicated, outcome of treatment, and duration of hospital stay. Outcome was defined as discharged from hospital after treatment, death, left against medical advice (LAMA), or referred.

2.1 Data Analysis

The data obtained were analysed using the IBM SPSS version 25 (IBM Corp. Armonk, NY) Continuous variables were expressed as mean and standard deviation while categorical variables are expressed as percentages. GSI resulting from armed robberies were subsequently compared to GSIs from other causes. Associations between categorical variables and continuous variables were assessed using Chi-square tests for categorical variables. The threshold for significance was set at P< 0.05.

3. RESULT

A total of 76 patients presented with GSI over the study period of which 31(40.8%) were due to armed robbery attack. The mean age was 35.2years ±8.8SD. The age group 25-44 years was most commonly affected. (Figure 1)

The male to female ratio was 16:1. The type of the weapon used by the assailants on victims was locally fabricated pistol in 17(54.8%) of the cases, followed by Dane gun in 7 (22.6%) and unspecified in

Table 1: Pattern and Outcome of Armed Robbery Related GSI Injuries (N=31)

Variables	Frequency (%)	Percentages (%)
Region of the Body Injured		
Extremities (Upper and Lower Limbs)	13	41.9
Abdomen	6	19.4
Chest Wall	6	194
Head and Neck	3	9.7
Chest/ Abdomen	2	6.5
Head/Neck/Chest	1	3.2
Types of Gunshot Wound		
Penetrating	30	96.2
Non-Penetrating	1	32
Time of the Attack		
Night-Time	21	67.7
Day-Time	10	32.3
Types of Weapons Used		
Local Pistol	17	50
Dane Gun	7	226
Unspecified	7	22.6
Type of Procedure Done		
Wound Debridement Only	13	38.2
Wound Debridement + External	6	17.7
Fixation		
Exploratory Laparotomy(Bowel Resection, Anastomosis ± Colostomy	5	14.7
Tube Thoracostomy	6	17.7
None	4	11.8
Outcome		
Discharged	27	79.4
Died	4	20.6

7(26.6%). The type of GSI was penetrating in 30(96.8%) and non-penetrating in 1(3.2%) of the patients. There was no case of perforating wound. In combination, both lower and upper limbs were the most common region of the body involved in 38.2% of the injuries followed by abdominal injury in 23.5%. OTheir details are as shown in table 1.

The night-time was the period of attack in 21(67.7%) while day-time attack was in 10(32.3%). There was a total of 4 deaths among the victims representing a mortality of 12.9%. Among those that died, 2 died during resuscitation and 1 died from complications of injuries and treatments.

Two of those that died during resuscitation had abdominal injury and one had a combination of extremities and head injury. Then one died as a result of complication of the injury treatment had abdominal injury, he developed high output entero-cutaneous fistula. Twenty-seven (79.4%) of the patient were discharged to follow-up at the surgical outpatients. None left against medical advice neither was any one referred. Further, analysis showed the outcome status of the victim and types of weapon used were statistically significant at P<.05; with those with unspecified type of weapon having the worst outcome compared to Dane gun and local pistols; however time of the injury and outcome status of the patients were not statistically significant. (Table 2).

The predominantly affected region in armed robberies related GSI and among the others causes were the extremities. Others are shown in table 3.

There was also no significant difference between the armed related GSI and others causes based on the severity on injuries using the Injury Severity Scores (ISS) and outcome status of the patients. Table 4.

4. DISCUSSION

Armed robbery related GSI are usually the most prevalent causes among the GSI victims in different reports from region of Nigeria5[11,12,17–19] except one paper from south-south geopolitical zones of Nigeria[20] but only one paper from the north east has described the ominous effect to different parts of the body and outcome of such injuries[12]. Our study was done elucidate the pattern and outcome of these injuries in south western Nigeria. We found armed robbery attack to be the most prevalent cause of GSI. This was similar previous reports from Nigeria[3,9,11,15,21] and from Kenya where it accounted for 80% of the studied population.[22] However, it contrasted with recent report from Sudan where personal enmity was most common cause followed by armed robbery attack. This may be explained by the different cultural setting [23] Violent crimes including armed robbery attack have been found to be directly related to socioeconomic deprivation, deepening poverty level, rising youth unemployment and gun availability[24]. Therefore the present economic downturn in the country may account for this prevalent.

The finding of male preponderance, and young adult aged 25-44 years being the most victims in this study was akin to published data[12] The possible explanation for this may be the societal gender role and secondly, younger males are more adventurous and likely to be aggressive in their response to perceived threats compared to their female counterpart. Thirdly in some other climes males are usually involved in travels while female are required to keep the home[23].

The extremities were found to be most commonly affected with lower limbs accounting for the highest proportion. This was in tandem with reports of other researchers from others part of Nigeria, [3,11,21,24,25] Pakistan,[26] and South Africa[27] but was at variance with report from one of the states in the south-south geopolitical zones where abdominal injuries was most commonly affected[20]. However, the head and neck region of the body had higher proportion of

Table 2: Relationship Between Outcomes Status, Types of Weapon Used, and Time of Injury Amongst the Armed Robbery Related GSI

	Types of Weapon Used				
Outcome Status	Dane Gun	Local Pistol	Unspecified	Total	P-value
Discharged	7 (25.9)	17(63.0)	3(11.1)	27 (100)	
Death	1(14.3)	2(28.6)	1(57.1)	4(100)	.04
	8(23.5)	19(53.9)	4(20.6)	31(100)	
	Time of Injury				
	Day Time (6.00am to 5.59pm	Night Time (6.00pm to 5.59am)	Total		
Discharged	8(29.6%)	19(70.4%)	27(100%)		
Death	2(42.9%)	2(57.1%)	4(100%)		.66
Total	10(32.4%)	21(67.6%)	31(100%)		

Fisher's exact probability is 0.04*

*The Fisher exact test was used because one of the cells had a value less than 5 and the sample size was small.

Table 3: Comparison of Region of the Injured Between Armed Robberies Related Gunshot Injury and Others

Cause of Gunshot Injuries	Combined Lower and Upper Extremities (%)	Abdominal Injury (%)	Chest Wall Injury (%)	Chest / Abdominal Injury (%)	Head and Neck (%)	Head/Neck /Chest (%)	Total (%)
Armed Robbery	13 (41.9)	8(25.8)	6(19.5)	2(6.5)	1(3.2)	1(3.2%)	31 (100)
Others							
Political Rally/ Politically Motivated	8(34.9%)	5(21.7%)	5 (21.7%)	0 (0)	5(21.7)	0 (0)	23 (100)
Accidental Discharge	12(85.7%)	1 (7.1%)	0(0)	0(0)	1(7.1%)	0(0)	14(100)
Shot by Law Enforcement Agent	7(87.5%)	1(2.5%)	0(0)	0(0)	0(0)	0(0)	8 (100)
Total	40 (50.6%)	15(20.3%)	11(13.9)	2(2.5%)	7(11.4%)	1 (1.3%)	76(100)

injuries. This underpins the motive for the attack, when the intent was to kill the victim, the head and neck, and chest are likely target but when the intent was to immobilize the victims in order to dispossessed of them of their valuables or to arrest the victims, the limb usually suffers the most. Wound debridement and saline irrigation was most commonly surgical procedure done due to high contamination and delay in effecting definitive treatment sometimes occasioned by logistics[28]. Penetrating type of gunshot wound was most encountered in our studied population. This is not unconnected with the weapon used which were locally fabricated pistol in high proportion of cases. These are low velocity missile weapons, however when fired at close range, their tissue damaging can be closed to those of high velocity weapon. The mortality rate 12.9% in this study was high compared to 1.7% reported by Abass et al[12]. Whereas, the region of the body affected has similar proportions, however number of patients in their study which was a retrospective done over a period of 5 years were more than our study. Secondly, most of their patients were travelling at night and their vehicle were often shot while still on motion compared to findings in our study where high proportion of the patients were attacked in the confine of their home at night. Thirdly being shot at close range have negative implication for survival especially when it involved the head and neck, and thoraco-abdominal region. This was actually the case among those died. Further analysis of the outcome status of the patients and type of weapon in this study revealed a statistically significance difference. The extent of damage from GSI depend on the tissue characteristics, deformation of the bullet, fragmentation of the bullet or secondary target such as bone, and amount of kinetic energy dissipated to the tissue[29]. Although locally fabricated pistol and Dane guns were classified as low to medium velocity missile, their damaging effect can be pronounced when fired at close range. This may explain why those who had injuries related to these weapons died during resuscitation because they had a combination of injuries involving thoraco-abdominal region, head, and extremities. This finding was corroborated by other published data from South-south[11], in North -west geopolitical zones[8], and in United kingdom where inner city GSI were due to the use of low velocity weapon[30]. The lethality of thoraco-abdominal GSI has been previously documented highlighting the ill preparedness of our emergency room to handle such injuries[15]. The local availability and access to the purchase of these locally fabricated gun should be checked and controlled by the government to mitigate gun access in the community.

The night time was the predominant period for more than two third of the armed robbery attacks. This was similar to the finding by Omoke [31] and Abbas[12] in Nigeria, and Chalya et al in Tanzania.[32] However, this contrasted with published report by Ilo et al [33] The plausible explanation for this in our study may be that the perpetrators of armed robbery attacks used the cover of darkness to hide their identity to execute their nefarious acts on their unsuspecting victims while reports of preponderance of day time attacks adduced it to the increasing level of desperation by the perpetrators in their study area.

Our study also revealed that there is no difference between armed robbery related GSI and other causes in relation to the affected region of the body, severity of the injury, type of weapons used, and outcome status of the victims. This was a new finding. It might be that the overall objectives appears to be similar with different motives.

4.1 Conclusion

Although this is a single centre hospital-based study that might be a tip of the iceberg of the actual pattern and outcome of this injury. Secondly, this might not have captured those who were not brought to the hospital or treated at other government and private health facilities in the study population.

The following can be deduced from this study; armed robbery related GSI affect predominantly young adults, and in the extremities, weapons of injury were commonly low velocity, and with high mortality when fired at close range. There is an increasing need to reduce the prevalence of GSI through appropriate youth engagement and effective night policing. Finally, our tertiary institutions should be prepared to handle those that were brought in alive to reduce mortality from these injuries.

Recommendation

We recommend a multi-centre prospective study that will involve major tertiary health institutions in each of the six geopolitical zone

Table 4: Association Between Armed Related GSI and Other Causes Using Injury Severity Score and Outcome.

	Injury Severity Scores			
Cause of Gunshot Injuries	**Scores <15**	**>15**	**Total**	**p-value**
Armed Robberies	20(64.5%)	11 (34.5%)	31 (100%)	
Others Causes	27(60%)	18(40%)	45(100%)	.69 n
Total	47(59.5%)	32(40.5%)	79(100%)	
		Outcome Status		
	Discharged	**Death**		
Armed Robberies	27(79.4%)	4(20.6%)	31(100%)	
Others	35(77.8%)	10(22.2%)	45 (100%)	
Total	34(43.0)	45(57%)	79(100%)	.86

in Nigeria.

Data Availability Statement

The data that support the findings of this study are openly available in Zenodo at https://doi.org/10.17605/OSF.IO/D76AV

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