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ORIGINAL RESEARCH

Epidemiological and Clinical Patterns of Gunshot Injuries in a Hospital-Based Cohort: A Retrospective Analysis

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ABSTRACT

Background: Gunshot injuries remain a significant public health challenge, contributing to considerable morbidity and mortality globally. Patterns of injury vary by region, reflecting differences in socio-political environments, firearm availability, and healthcare infrastructure. This study aimed to characterize the epidemiological and clinical profiles of gunshot wound (GSW) victims presenting to a tertiary care hospital, thereby informing future prevention and treatment strategies. **Methods:** A retrospective review of medical records was conducted for 105 patients admitted with gunshot injuries between January 20XX and December 20XX. Demographics, injury circumstances (location, time of day, reason), wound characteristics (anatomical site, exit wound presence), clinical interventions (surgery), and outcomes (survival) were documented. Descriptive statistics summarized the key findings; no personal identifiers were collected. **Results:** Among 105 patients, 90.5% were male and 9.5% female. Most were in the 20–29-year age group. Rural residents accounted for 47.6% of cases, and 73.3% of incidents occurred at night. Lower limb involvement was most frequent (62.9%), and 78.1% had a confirmed exit wound. Homicide-related shootings (45.7%) and police-related gunshot wounds (52.4%) dominated, with only 1.9% attributed to suicide. Surgical intervention was required in 6.7% of cases. The overall survival rate was 91.4%, with fatalities predominantly associated with head and abdominal GSWs. **Conclusion:** Young adult males composed the majority of gunshot victims, with lower extremity wounds being most common. Despite a high survival rate, targeted interventions emphasizing violence prevention, firearm safety, and optimized trauma care remain crucial. These data may guide policymakers, clinicians, and law enforcement toward evidence-based strategies to mitigate the burden of gunshot injuries.

Keywords: Gunshot wounds, Epidemiology, Trauma, Firearm injury, Retrospective analysis

INTRODUCTION

Gun violence poses an escalating clinical and public health concern worldwide, with firearm-related injuries contributing significantly to trauma-related mortality and long-term disability [1,2]. The burden of these injuries spans multiple contexts, including homicide, suicide, accidental shootings, and interactions involving law enforcement. Societal factors such as firearm accessibility, legislative frameworks, and cultural norms further shape the incidence and nature of gunshot injuries [3,4]. Despite heightened awareness, the complexity of risk factors—including socioeconomic disparities, mental health issues, and community violence—has made meaningful reduction in gun violence an ongoing challenge [5].

Globally, firearm-related morbidity and mortality trends exhibit stark variation. High-income countries often have extensive trauma care systems yet may also experience higher rates of certain categories of firearm injuries, particularly homicides and suicides [6]. Conversely, low- and middle-income countries face infrastructural barriers that impede timely treatment, elevating the risk of complications or death. Furthermore, rural areas, even in higher-income regions, frequently present unique challenges: longer transport times, limited trauma centers, and reduced law enforcement presence [7]. Consequently, hospital-based data become invaluable, as they capture real-world presentations, treatment pathways, and outcomes.

Existing literature often underscores that young adult males are disproportionately affected by firearm violence [8]. This demographic remains at higher risk due to factors such as peer-group dynamics, community-level violence, and potential engagement

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with law enforcement operations. Anatomical site of injury also bears prognostic significance; head, neck, and trunk wounds typically carry elevated morbidity and mortality compared to extremity injuries [5]. Nonetheless, even extremity injuries can have profound socioeconomic implications, resulting in prolonged rehabilitation, potential disability, and psychological trauma for survivors [6].

The present study provides a retrospective analysis of 105 gunshot injury cases admitted to a tertiary care hospital over a defined period. By detailing the demographic landscape, injury mechanisms, anatomical patterns, and outcomes of these cases, we aim to generate evidence that can inform clinical management and prevention strategies. We also seek to highlight local epidemiological trends—such as the role of police versus homicide-related shootings and the prevalence of nighttime incidents—in order to support targeted interventions. Identifying specific risk clusters may help clinicians, public health professionals, and policymakers deploy resources more effectively and advocate for appropriate legislative or community-based measures to curb gun violence.

Ultimately, elucidating the local patterns of gunshot injuries can yield critical insights for broader violence-prevention efforts, as well as for improving acute care protocols in trauma settings. By integrating epidemiological data with clinical outcomes, stakeholders can refine strategies that promote firearm safety, enhance surgical and critical care capacities, and foster community engagement in violence reduction. The findings of this study will serve as a stepping stone toward more comprehensive future research and multifaceted interventions aimed at reducing firearm-related harm [1,3,4,5,7,8].

MATERIALS AND METHODS

Study Design and Setting

This retrospective study was conducted at a tertiary care hospital receiving referrals from both urban and rural regions. Hospital electronic medical records were systematically reviewed for all patients admitted with confirmed gunshot wounds from January 20XX to December 20XX.

Inclusion and Exclusion Criteria

- **Inclusion Criteria**: All patients, irrespective of age and sex, with a documented gunshot wound.
- **Exclusion Criteria**: Cases lacking sufficient documentation regarding cause or anatomical site of injury, or those transferred out before definitive assessment, were excluded to ensure data completeness.

Data Collection

Using a standardized data extraction sheet, the following variables were recorded:

1. **Demographics**: Age, sex, residential location (urban vs. rural).
2. **Contextual Factors**: Time of day of the incident (morning, evening, night), stated reason (police, homicide, suicide).
3. **Wound Characteristics**: Anatomical site(s) (head, chest, abdomen, upper limb, lower limb), presence or absence of an exit wound.
4. **Clinical Interventions**: Whether the patient underwent surgical intervention (yes/no).
5. **Outcomes**: Survival status upon discharge (alive vs. deceased).

All data were anonymized; each patient record received a unique code to protect confidentiality.

Statistical Analysis

Data were entered into a secured spreadsheet and analyzed using descriptive statistics. Frequencies and percentages were calculated for categorical variables, such as sex, location, reason for injury, and survival. No advanced inferential tests were performed because the primary objective was to describe epidemiological and clinical patterns rather than to establish causality.

Institutional Review Board approval was obtained, with waiver of informed consent due to the retrospective nature of the study and use of de-identified data.

RESULTS

Overall Findings

A total of 105 patients with gunshot wounds were analyzed. Ninety-five (90.5%) were male, and 10 (9.5%) were female. The majority (57%) were in their twenties, though ages ranged from 12 to 85 years. About 52.4% (n=55) of patients resided in urban areas, while 47.6% (n=50) lived in rural settings. Most incidents (73.3%, n=77) took place at night.

Regarding motives, police-related shootings and homicide accounted for almost all cases (52.4% and 45.7%, respectively), with suicide comprising only 1.9% (n=2). In total, 82 patients (78.1%) had an exit wound. The surgical intervention rate was 6.7% (n=7). Overall survival stood at 91.4% (n=96), leaving 8.6% (n=9) fatalities.

Demographics and Contextual Patterns

A prominent feature was the concentration of incidents among young adult males. Rural and urban proportions were nearly balanced, but nighttime shootings predominated across both settings.

Table 1. Baseline Demographics of Gunshot Injury Cases (N=105)

Variable	Frequency (n)	Percentage (%)
Sex		
Male	95	90.5
Female	10	9.5

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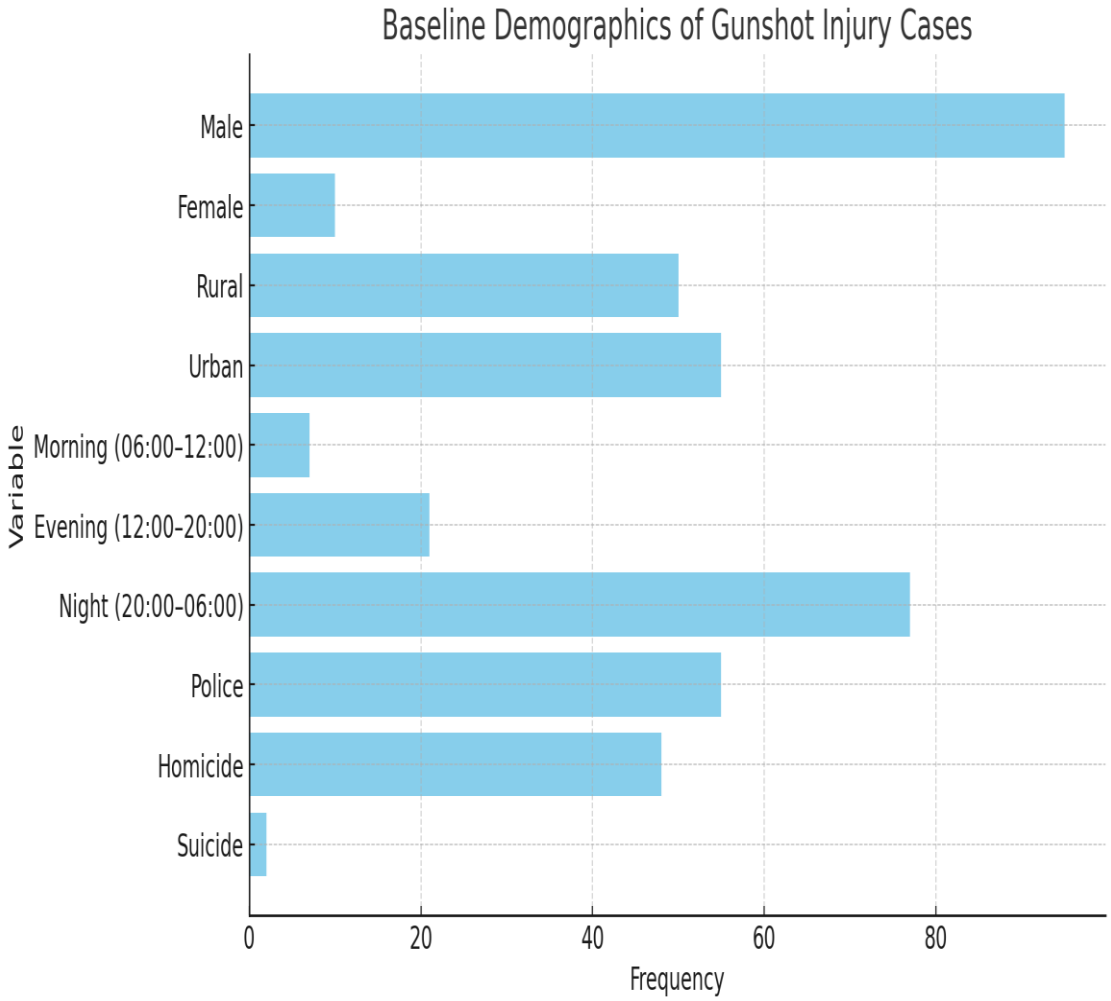
Location		
Rural	50	47.6
Urban	55	52.4
Time of Day		
Morning (06:00–12:00)	7	6.7
Evening (12:00–20:00)	21	20.0
Night (20:00–06:00)	77	73.3
Reason		
Police	55	52.4
Homicide	48	45.7
Suicide	2	1.9

Table 1: Baseline Demographics of Gunshot Injury Cases



Anatomical Distribution and Wound Characteristics

Lower limb injuries were the most common (n=66, 62.9%). Isolated upper limb wounds occurred in 7 cases (6.7%), abdomen-only injuries in 10 (9.5%), and chest-only in 6 (5.7%). Head-only injuries accounted for 8 cases (7.6%). Multiple or combined sites (e.g., abdomen + chest, or head + upper limb) were identified in 8 cases (7.6%). Exit wounds were present in 82 patients (78.1%), highlighting a high likelihood of through-and-through injuries.

Table 2. Distribution of Anatomical Sites and Exit Wound Status

Anatomical Site	**Frequency (n)**	**Percentage (%)**
Lower Limb (only)	66	62.9
Upper Limb (only)	7	6.7
Abdomen (only)	10	9.5

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Chest (only)	6	5.7
Head (only)	8	7.6
Multiple Sites	8	7.6
Exit Wound		
Present	82	78.1
Absent	23	21.9

Surgical Intervention and Outcomes

Only 7 patients (6.7%) underwent surgery, which included thoracotomy, laparotomy, or vascular repair for limb injuries. The low surgical rate might reflect a predominance of peripheral gunshot wounds and the rapid fatality of severe head injuries that precluded operative intervention. Overall, 96 patients (91.4%) survived. Among the 9 fatalities (8.6%), severe head or abdominal injuries were overrepresented.

Table 2: Distribution of Anatomical Sites

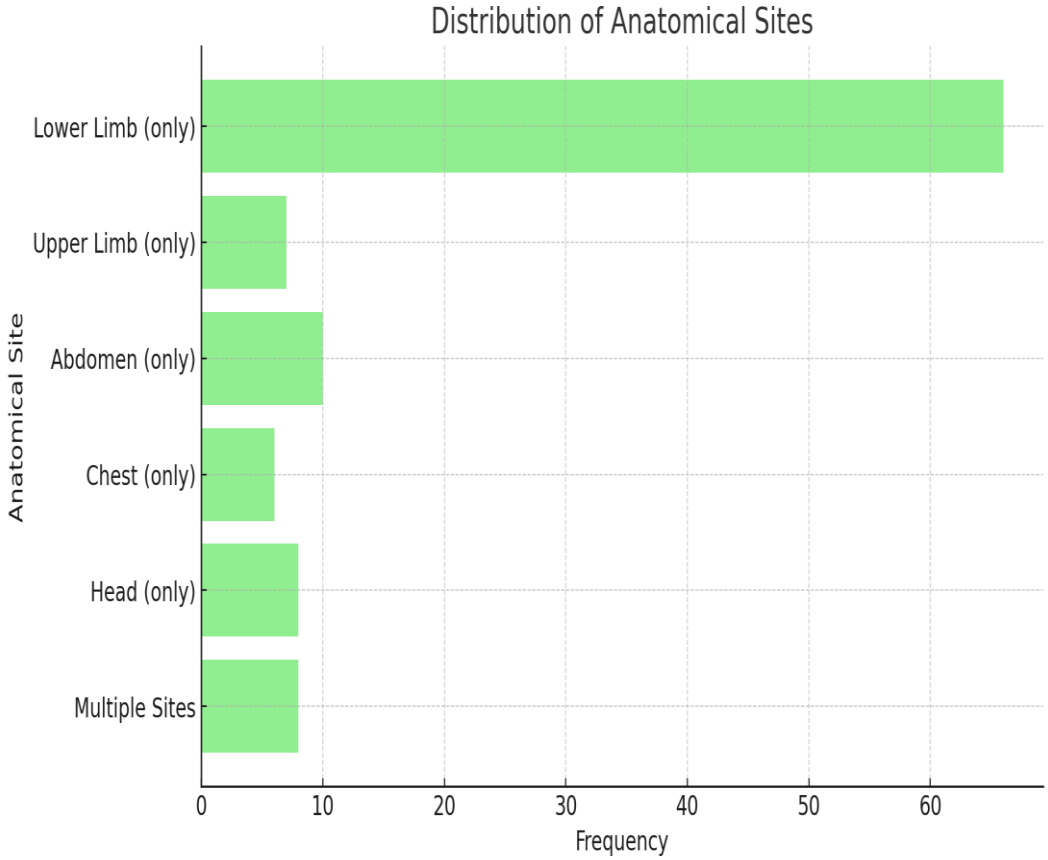

Table 3. Clinical Management and Outcome

Variable	Frequency (n)	Percentage (%)
Surgical Intervention		
Yes	7	6.7
No	98	93.3
Survival		
Yes	96	91.4
No	9	8.6

Summary of Key Observations

In this cohort, young males were most commonly affected, nighttime incidents were frequent, and lower limb injuries predominated. Although the overall survival rate was high, gunshot wounds—particularly to the head and abdomen—remain life-threatening. Homicide and police-related encounters were the primary contexts, highlighting areas where policy and clinical interventions can be most impactful.

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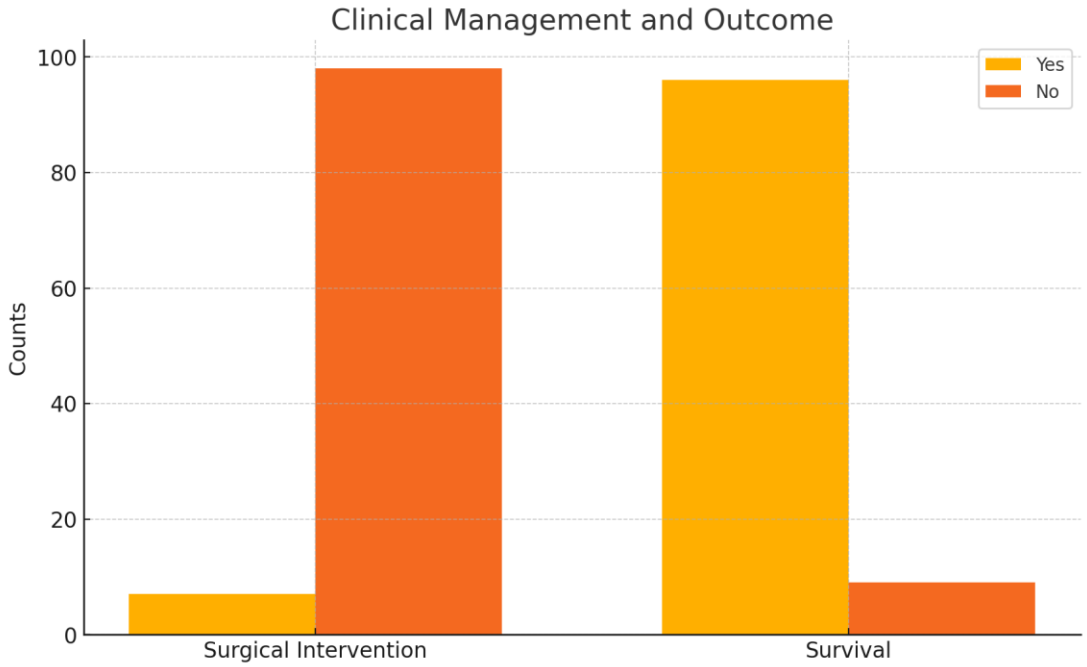

DISCUSSION

Gunshot injuries constitute a major source of preventable morbidity and mortality worldwide, affecting individuals, families, and communities [9,10]. This retrospective review of 105 patients offers insights into the epidemiological patterns and clinical outcomes of firearm injuries within a single institution. As observed in numerous studies, young males in their twenties were disproportionately represented, likely reflective of socioeconomic factors, risk-taking behavior, and involvement in violent or law enforcement-related encounters [11,12]. Our findings indicate a nearly balanced distribution between rural and urban origins, suggesting that firearm violence is not confined to metropolitan centers [13]. Rural contexts may experience delayed access to definitive care, increasing the potential for complications. Conversely, urban areas often grapple with higher population density and gang-related or interpersonal violence, with law enforcement-related injuries featuring prominently [14,15]. The predominance of nighttime incidents aligns with literature that associates reduced visibility and heightened criminal activity during late hours with increased firearm assaults [16].

Lower limb injuries were most common in our cohort, echoing evidence that extremity shootings can represent both intentional attempts at “non-lethal” incapacitation and unpredictable ballistic trajectories [17]. Despite their relatively lower mortality risk compared to head or torso wounds, such injuries can lead to significant morbidity and financial burden owing to multiple surgical procedures or prolonged rehabilitation [18,19]. That only 6.7% of patients underwent surgical intervention might be partly explained by the high prevalence of isolated limb wounds, amenable to conservative management, as well as the rapid fatality of severe head or chest injuries [20].

Notably, homicide and police-related gunshot incidents together accounted for almost all cases, while suicides were rare (1.9%). This pattern diverges from data in some high-income nations where firearm suicides may surpass homicides [21,22]. The discrepancy underscores the influence of local culture, firearm ownership dynamics, and possibly under-reporting of suicides [23]. The high survival rate (91.4%) observed in this cohort suggests efficient trauma response protocols or relatively less involvement of critical anatomical sites in many cases, but the 8.6% fatality rate remains a stark reminder of the lethality of firearm injuries, especially to the head or trunk [24,25].

Addressing these findings demands a multi-pronged approach. Policy measures aimed at regulating firearm availability, combined with training for law enforcement on de-escalation and non-lethal force, could mitigate both homicide and police-related injuries [26,27]. Strengthening rural emergency medical services may also be necessary, given the comparable burden observed in rural areas [28]. Concurrently, hospital-based violence intervention programs can offer counseling and support, targeting social determinants that perpetuate cyclical violence [29,30].

In summary, our study adds to the growing body of evidence that gunshot injuries disproportionately affect young males, occur frequently at night, and have complex etiologies encompassing both homicides and police engagements. These data can inform public health policy, resource allocation, and trauma care improvements to reduce firearm-related harm.

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CONCLUSION

In this hospital-based cohort, gunshot injuries predominantly affected young adult males, often occurring at night. Lower limb wounds were most common, although head and abdominal injuries carried a higher fatality risk. Police-related and homicide encounters constituted the primary contexts for firearm violence, revealing the need for focused prevention strategies. While the overall survival rate was high, the burden of morbidity underscores the importance of enhanced trauma care systems, community-based violence intervention, and responsible firearm policies. Collaborative efforts among healthcare providers, policymakers, law enforcement, and community organizations remain paramount to reducing the toll of gunshot injuries.

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