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Pediatric Gunshot Wounds: A Decade-Long Emergency Department Experience in a High-Risk Region

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Abstract

Background: Pediatric gunshot wounds (GSWs) remain a significant cause of preventable mortality worldwide, particularly in regions with high violence and low socioeconomic conditions. The Pediatric Trauma Score (PTS) is widely used for trauma severity assessment, yet its prognostic value in firearm-related pediatric injuries remains underexplored.

Methods: This retrospective study included patients under 18 years who presented with GSWs to the emergency department of a tertiary care hospital in southeastern Türkiye between 2015 and 2025. Demographic, clinical, and outcome data were collected. The predictive value of PTS for in-hospital mortality was analyzed using ROC curve analysis. Logistic regression was used to identify independent mortality predictors.

Results: A total of 200 pediatric GSW cases were evaluated; the median age was 11 years, and 73% were male. The overall mortality rate was 6.5%. All deaths occurred in patients triaged as red zone and requiring emergency interventions. Mortality was significantly associated with low PTS (median: 1 vs. 9, $p<0.001$), low GCS, head/neck injuries, abdominal-pelvic trauma, intubation, and blood transfusion needs. ROC analysis showed that PTS had high predictive performance (AUC: 0.969) with an optimal cut-off of 5.5. In multivariate analysis, head/neck injuries (OR: 5.327) and abdominal trauma (OR: 3.173) remained significant predictors, while higher PTS was protective (OR: 0.014).

Conclusion: Pediatric firearm injuries are associated with substantial mortality. PTS is a strong, practical predictor of outcome and can aid in triage and early intervention strategies. Comprehensive trauma care systems and public health policies are essential to reduce mortality in high-risk pediatric populations.

Keywords: Pediatric Trauma, Gunshot Wounds, Mortality, Pediatric Trauma Score, Emergency Medicine

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Pediatrik Ateşli Silah Yaralanmaları: Yüksek Riskli Bir Bölgede On Yıllık Acil Servis Deneyimi

Öz

Amaç: Pediatrik ateşli silah yaralanmaları (ASY), dünya genelinde önlenebilir ölümlerin önemli bir nedeni olmaya devam etmektedir. Bu durum özellikle şiddetin yoğun olduğu ve sosyoekonomik düzeyin düşük olduğu bölgelerde daha belirgin hale gelmektedir. Pediatrik Travma Skoru (PTS), travma şiddetini değerlendirmede yaygın olarak kullanılmakla birlikte, ateşli silah kaynaklı pediatrik yaralanmalarda prognostik değeri yeterince araştırılmamıştır.

Yöntemler: Bu retrospektif çalışmaya, 2015–2025 yılları arasında Türkiye'nin güneydoğusunda bir üçüncü basamak hastanenin acil servisine ateşli silah yaralanması nedeniyle başvuran 18 yaş altı hastalar dâhil edilmiştir. Hastalara ait demografik, klinik ve sonuç verileri toplanmıştır. Hastane içi mortaliteyi öngörmede PTS'nin prediktif değeri ROC eğrisi analizi ile değerlendirilmiştir. Mortalitenin bağımsız belirleyicilerini saptamak amacıyla lojistik regresyon analizi yapılmıştır.

Bulgular: Toplam 200 pediatrik ASY vakası değerlendirildi; medyan yaş 11, hastaların %73'ü erkekti. Genel mortalite oranı %6,5 olarak saptandı. Tüm mortal vakalar, kırmızı alan triyajı almış ve acil müdahale gerektirmişti. Mortalite ile düşük PTS (medyan: 1 vs. 9, p<0.001), düşük GKS, baş-boyun yaralanmaları, abdominal-pelvik travma, entübasyon ve kan transfüzyonu ihtiyacı arasında anlamlı ilişkiler bulundu. ROC analizi, PTS'nin yüksek prediktif performansa sahip olduğunu gösterdi (AUC: 0.969) ve optimal eşik değeri 5,5 olarak belirlendi. Çok değişkenli analizde, baş-boyun yaralanmaları (OR: 5.327) ve abdominal travma (OR: 3.173) bağımsız mortalite belirleyicisi olarak kalırken, yüksek PTS koruyucu bir faktör olarak öne çıktı (OR: 0.014).

Sonuç: Pediatrik ateşli silah yaralanmaları önemli mortalite ile ilişkilidir. PTS, klinik sonuçları öngörmede güçlü ve pratik bir skorlama aracı olup, triyaj ve erken müdahale stratejilerinde kullanılabilir. Yüksek riskli pediatrik popülasyonlarda mortaliteyi azaltmak için kapsamlı travma bakım sistemleri ve etkili halk sağlığı politikaları gereklidir.

Anahtar kelimeler: Pediatrik Travma, Ateşli Silah Yaralanmaları, Mortalite, Pediatrik Travma Skoru, Acil Tıp.

INTRODUCTION

Firearm injuries represent a significant cause of traumatic mortality in the pediatric population worldwide and have increasingly become a pressing public health concern, particularly in regions characterized by low socioeconomic status and high levels of firearm-related violence[1,2]. Even in high-income countries such as the United States, there has been a marked rise in firearm-related mortality among children[3]. This phenomenon not only results in profound individual tragedies but also imposes long-term and multifaceted burdens on healthcare systems[4-6]. According to the literature, pediatric firearm injuries are more commonly observed in males, adolescents, outdoor environments, and low-income communities[7,8]. Factors such as the anatomical location of the injury, triage category, vital signs, and the need for interventional procedures are known to significantly influence clinical outcomes and mortality risk[8,9]. However, the scoring systems used to predict outcomes during the early stages of these complex events have been evaluated in only a limited number of studies.

The Pediatric Trauma Score (PTS) is a frequently used clinical assessment tool for predicting mortality in pediatric trauma cases[10]. Due to its incorporation of both physiological and anatomical components, PTS is considered a highly applicable and rapid decision-support system in the field[11]. Several studies have demonstrated that lower PTS values are associated with multiple trauma, altered consciousness, and derangements in vital parameters[12,13]. Nevertheless, the prognostic value of PTS in populations specifically affected by firearm injuries remains under-investigated.

Furthermore, risk factors associated with mortality following firearm injuries—such as head and neck trauma, intra-abdominal or pelvic injuries, the need for intubation, and transfusion requirements—may vary according to regional and demographic characteristics[14].

The present study aims to retrospectively evaluate the clinical characteristics, mortality-associated factors, and prognostic utility of the PTS in pediatric patients presenting to the emergency department with firearm injuries over a ten-year period. Moreover, this study seeks to contribute to the development of trauma protocols and public health interventions in regions with similar dynamics, particularly in the eastern and southeastern parts of Turkey. The findings are expected to inform not only clinical decision-making but also strategies for injury prevention.

METHODS

Study Design and Population

This retrospective cross-sectional study included all patients younger than 18 years who presented to the emergency department (ED) of a tertiary-care university hospital with firearm injuries between 1 January 2015 and 1 January 2025. Cases were identified in the hospital information system by International Classification of Diseases, 10th Revision (ICD-10) codes and triage records. Inclusion criteria were (i) presentation with a firearm-related injury, (ii) age < 18 years, and (iii) a complete ED registration record. Exclusion criteria were incomplete hospital records, post-discharge revisits, and cases transferred directly to another facility.

Variable Definitions and Coding

Before data extraction, all study variables were predefined and a detailed coding manual was developed. Collected variables comprised age, sex, mode of arrival, triage category, Glasgow Coma Scale (GCS), Pediatric Trauma Score (PTS), anatomical injury sites, initial vital signs, need for endotracheal intubation, need for blood transfusion, surgical intervention, intensive-care admission, ED length of stay, hospital length of stay, and discharge status. Standardized coding definitions were applied, and decision rules were established for ambiguous, missing, or conflicting entries. PTS is calculated based on six clinical parameters: airway status, level of consciousness, body weight, systolic blood pressure, presence of open wounds, and skeletal system injury. Each parameter is scored as -1, +1, or +2. The total score ranges from -6 to +12.

Data Collection Process and Abstractor Training

Two emergency-medicine physicians performed data abstraction. Both abstractors received prior training on study objectives, variable definitions, and the coding manual. A pilot abstraction of 10 patient charts was conducted to ensure inter-abstractor consistency. Discrepancies were resolved by consensus with a third senior investigator.

Blinding and Reliability Assessment

Abstractors were blinded to the study hypotheses: one abstractor collected demographic and clinical variables, whereas the other collected outcome variables. To assess reliability, 20 randomly selected charts (≈10% of the sample) were re-abstracted by an independent investigator. Inter-rater agreement assessed with Cohen's κ statistic was ≥ 0.85 for all variables.

Management of Missing and Conflicting Data

Missing values were coded as "missing" and treated with listwise deletion during analysis. For critical variables (e.g., PTS), physician notes were prioritized in cases of conflicting documentation. Records with insufficient medical information were excluded from the final dataset.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA) and MedCalc version 22.0 (MedCalc Software Ltd, Ostend, Belgium). Categorical variables were presented as counts and percentages [n (%)], and continuous variables were summarized as mean ± standard deviation (SD) for normally distributed data or median (interquartile range, IQR) for non-normally distributed data. The normality of distributions was assessed using the Shapiro–Wilk test and Q–Q plots. Non-normally distributed continuous variables were compared using the Mann–Whitney U test, and categorical variables were analyzed using the Chi-square (χ^2) test or Fisher's exact test, where appropriate. A p-value < 0.05 was considered statistically significant, although clinical relevance was also taken into account when interpreting multiple comparisons.

To determine the optimal cut-off value of the Pediatric Trauma Score (PTS) for predicting mortality, receiver operating characteristic (ROC) curve analysis was performed. Discriminative ability was reported as the area under the curve (AUC) with a 95% confidence interval (CI), and the cut-off point was selected based on the maximum Youden index (J = sensitivity + specificity −1). Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for the selected cut-off were presented in a summary table.

To identify independent risk factors associated with mortality, univariate logistic regression analyses were first performed. Variables with p < 0.20 in the univariate analyses were included in the multivariate model. A multivariate logistic regression model was then constructed using the forward likelihood ratio method. Effect sizes were expressed as odds ratios (OR) with 95% confidence intervals (CI). A p-value of <0.05 was considered statistically significant for all analyses.

RESULTS

Over the 10-year study period, 200 pediatric firearm-injury cases presenting to the emergency department of a high-risk region were identified. The median age was 11 years (interquartile range [IQR] 7–15), and 73% of the patients were male. Thirteen patients (6.5%) died. Mortality was not significantly associated with age group (p = 0.353) or sex (p = 0.751). In contrast, triage category differed markedly between groups: every fatal case was triaged to the red (resuscitation) zone on arrival (p < 0.001). Neurological status and injury-severity scores were substantially worse in nonsurvivors. The median Glasgow Coma Scale (GCS) was 3 in nonsurvivors versus 15 in survivors (p < 0.001). Likewise, the Pediatric Trauma Score (PTS) was markedly lower in nonsurvivors—median 1 (IQR 1.0–2.5) versus 9 (IQR 6.0–9.0) in survivors (p < 0.001). Analysis of anatomical injury sites showed significant associations with death. Head-and-neck injuries were present in 53.8% of nonsurvivors versus 19.3% of survivors (p = 0.008), and abdominal–pelvic injuries in 53.8% versus 17.1%, respectively (p = 0.004). Critical interventions were also strongly linked to outcome: 92.3% of nonsurvivors required endotracheal intubation compared with 6.4% of survivors (p < 0.001), and 53.8% of nonsurvivors received blood transfusion versus 14.4% of survivors (p = 0.002). Conversely, operative intervention was undertaken in only 7.7% of nonsurvivors but in 41.7% of survivors (p = 0.015) (Table I).

Table I: Distribution of Clinical Characteristics According to Patients' Mortality Status

		Mortality (-) (n:187)		Mortality (+) (n:13)		Total (n: 200)		Statistical Test	p
		Median/n	Q1 - Q3/%	Median/n	Q1 - Q3/%	Median/n	Q1 - Q3/%		
Age (year) [(Mean±SD), (11.1±4.6)]	0 - 5	29	15.5	1	7.7	30	15.0	2.295 ¥	0.353
	6 - 12	73	39.0	3	23.1	76	38.0		
	13 - 18	85	45.5	9	69.2	94	47.0		
Gender	Male	137	73.3	9	69.2	146	73.0	0.098 ¥	0.751
	Female	50	26.7	4	30.8	54	27.0		
Triage Category	Green	55	29.4	0	0	55	27.5	44.590 ¥	0.000
	Yellow	110	58.8	0	0	110	55.0		
	Red	22	11.8	13	100.0	35	17.5		
Anatomical Location Of İnjury	Head or Neck	36	19.3	7	53.8	43	21.5	7.055 ¥	0.008
	Face	34	18.2	2	15.4	36	18.0	0.067 ¥	1.000
	Chest	32	17.1	4	30.8	36	18.0	1.343 ¥	0.257
	Abdomen or Pelvic Contents	32	17.1	7	53.8	39	19.5	8.246 ¥	0.004
	Right Upper Extremity	15	8.0	0	0	15	7.5	2.099 ¥	0.604
	Left Upper Extremity	28	15.0	0	0	28	14.0	4.066 ¥	0.221
	Right Lower Extremity	35	18.7	0	0	35	17.5	5.190 ¥	0.130
	Left Lower Extremity	30	16.0	0	0	30	15.0	4.382 ¥	0.223
	External (Skin and Soft Tissue Injuries)	12	6.4	0	0	12	6.0	1.665 ¥	1.000
Glasgow Coma Skale (GCS)		15.0	15.0 - 15.0	3.0	3.0 - 3.0	15.0	15.0-15.0	-9.938 Ψ	0.000
Pediatric Trauma Score (PTS)		9.0	6.0 - 9.0	1.0	1.0 - 2.5	8.0	6.0-9.0	-5.766 Ψ	0.000
Vital Signs									
Heart Rate (Pulse)		90.0	80.0-101.0	50.0	50.0-83.5	89.0	80.0-100.0	-3.382 Ψ	0.000
Systolic Blood Pressure (mm/Hg)		110.0	100-118.0	70.0	59.5-82.5	109.5	99.0-118.0	-4.233 Ψ	0.000
Diastolic Blood Pressure (mm/Hg)		68.0	60.0-73.0	30.0	28.0-55.5	67.5	60.0-72.0	-4.339 Ψ	0.000
Oxygen Saturation (%)		98.0	97.0-99.0	93.0	50.0-97.0	98.0	97.0-99.0	-4.070 Ψ	0.000
Blood Transfusion		27	14.4	7	53.8	34	17.0	10.006 ¥	0.002
Surgical Intervention		78	41.7	1	7.7	79	39.5	5.886 ¥	0.015
Intubation		12	6.4	12	92.3	24	12.0	50.597 ¥	0.000
Amputation		3	1.6	0	0	3	1.5	0.406 ¥	1.000
ICU Admission		68	36.4	6	46.2	74	37.0	0.487 ¥	0.556
Number of Consultations		2.0	1.0 - 3.0	2.0	0.5-3.0	2.0	1.0 - 3.0	-0.291 ¥	0.771
Emergency Room Stay (Minutes)		150.0	65.0-315.0	60.0	45.0-212.0	138.5	60.0-303.0	-1.807 ¥	0.071
Hospital Stay (Days)		2.0	1.0 - 6.0	1.0	0 - 4.0	2.0	1.0-6.0	-1.354 ¥	0.176
Discharge		150	75.0	0	0	150	75.0	38.898 ¥	0.000

Ψ Mann-Whitney U Test / ¥ Chi-Square Test

The discriminative ability of the PTS for mortality was excellent (area under the ROC curve [AUC] = 0.969; p < 0.001). ROC analysis identified an optimal cut-off value of 5.5. At this threshold, sensitivity was 92.3%, specificity 88.8%, Youden index 0.811, positive predictive value (PPV) 36.4%, and negative predictive value (NPV) 99.4% (Table II; Figure 1).

Table II: Determination of the Pediatric Trauma Score Cut-Off Value for Predicting Mortality: ROC Curve

Characteristic	AUC	p	Cut-off Value	Sensitivity	Specificity	Youden Index	PPV	NPV
PTS	0.969	0.000	5.5	0.923	0.888	0.811	0.364	0.994

PTS: Pediatric Trauma Score, AUC: Area Under the Curve, PPV: Positive Predictive Value, NPV: Negative Predictive Value

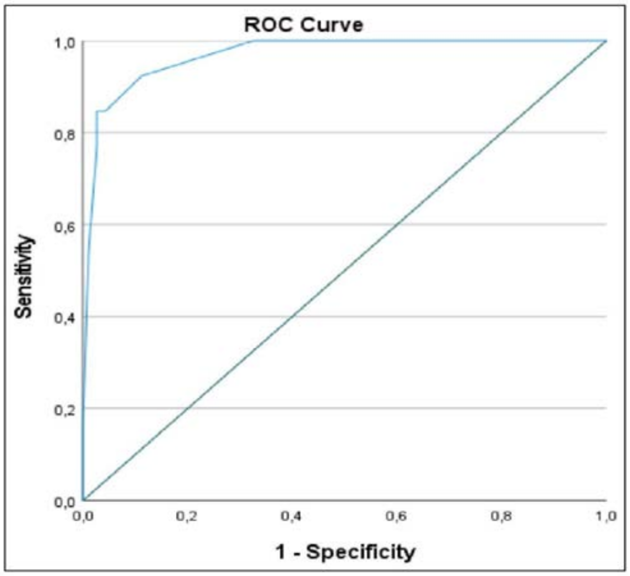

Figure 1. ROC Curve for Determining the Predictive Accuracy of the Pediatric Trauma Score in Estimating Mortality

A χ^2 test confirmed a strong relationship between PTS category and death ($\chi^2 = 40.712$; $p < 0.001$). Among patients with PTS ≤ 5.5, 92.3% were in the fatal group and only 11.2% in the nonfatal group, whereas 88.8% of those with PTS > 5.5 survived and just 7.7% died (Table III).

Table III: Distribution of Pediatric Trauma Scores According to Patients' Mortality Status

		Mortality (-) (n:187)		Mortality (+) (n:13)		Total (n: 200)		Statistical Test ¥	p
		n	%	n	%	n	%		
PTS	≤ 5.5	21	11.2	12	92.3	33	16.5	40.712	0.000
	> 5.5	166	88.8	1	7.7	167	83.5		

¥ Chi-Square Test, PTS: Pediatric Trauma Score

Logistic-regression analysis identified several predictors of mortality. On univariate analysis, head-and-neck injury (odds ratio [OR] 4.894; 95% CI 1.550–15.446; p = 0.007) and abdominal–pelvic injury (OR 5.651; 95% CI 1.781–17.935; p = 0.003) were linked to higher odds of death. Each one-point increase in PTS reduced the odds of death significantly (OR 0.011; 95% CI 0.001–0.085; p < 0.001). In the multivariate forward-likelihood model, head-and-neck injury remained independently associated with mortality (OR 5.327; 95% CI 1.148–24.725; p = 0.033), as did abdominal–pelvic injury (OR 3.173; 95% CI 0.695–14.492; p = 0.036). PTS persisted as a strong protective factor, with higher scores significantly reducing the risk of death (OR 0.014; 95% CI 0.002–0.121; p < 0.001) (Table IV).

Table IV: Identification of Factors Affecting Patient Prognosis Through Univariate and Multivariate Logistic Regression Analysis

Variables	Univariate		Multivariate	
	OR (95% CI)	p	OR (95% CI)	p
Head or Neck Injury	4.894(1.550-15.446)	0.007	5.327(1.148-24.725)	0.033
Abdomen or Pelvic Injury	5.651(1.781-17.935)	0.003	3.173(0.695-14.492)	0.036
PTS	0.011(0.001- .085)	0.000	0.014(0.002-0.121)	0.000

Logisric Regression Analysis, PTS: Pediatric Trauma Score

DISCUSSION

Based on our 10-year experience, we found that pediatric firearm injuries occurred most frequently in adolescent males. The overall mortality rate in our cohort was approximately 6.5%, and children who died had markedly lower initial PTS and GCS values. The principal factors significantly associated with mortality were low PTS and GCS scores, head-neck and abdominal injuries, the need for emergency department intubation, and blood transfusion. These findings underscore that pediatric firearm trauma constitutes a distinct patient group with a high risk of death and necessitates aggressive early management.

Our demographic results are consistent with the literature. It is well established that adolescents and males constitute the majority of children exposed to firearm injuries. For instance, a nationwide U.S. analysis reported that firearm injuries predominantly affect male children and adolescents, with a higher mean age and marked over-representation compared with females[2]. In our series, most cases were adolescents, and a substantial proportion of deaths occurred in this age group. A large Colombian trauma cohort similarly showed that

61 % of injury-related pediatric deaths occurred in adolescents aged 15–17 years[15]. A study from Diyarbakır reported that 51.2% of child and adolescent homicide victims were killed by firearms[16], highlighting the danger posed by individual gun ownership and violence in our region. Globally, a comparable pattern exists; it is estimated that >7,000 children aged 0–14 years died from firearm injuries in 2016, with boys exhibiting roughly a 2.4-fold higher risk of death than girls[17]. Moreover, in recent years firearms have risen to the top of the causes of death in children in some countries. As of 2020, firearm injuries surpassed motor-vehicle collisions to become the leading cause of death among children and adolescents in the United States[18]. This alarming trend supports the view that pediatric penetrating trauma represents an ongoing "epidemic". Indeed, the pediatric firearm problem, described as "epidemic" in the 2010s[19], remains pressing today. A recent single-center report found no decline in pediatric firearm injuries over the past decade, with persistently high case numbers[20], and another study demonstrated a clear upward trend in pediatric firearm deaths with significant sociodemographic disparities[21]. Collectively, these data confirm that pediatric firearm injuries continue to pose a critical public-health challenge worldwide and regionally.

The mortality rate in our study exceeds that reported for general pediatric trauma populations. At major trauma centers, overall in-hospital mortality for all pediatric trauma typically ranges from 1% to 5%[22]. Advances in trauma care and the predominance of blunt injuries allow the majority of children to survive. By contrast, high-energy penetrating trauma such as firearm injuries carries a substantially higher fatality risk. Reported mortality rates for pediatric firearm injuries vary between 3% and 15% depending on region and period; one single-center series reported only 3.5% mortality[23], whereas a large urban trauma center's 20-year experience documented a rate of 12.7%[24]. In a Latin American study encompassing pediatric trauma, overall mortality was 5.9%[15]. Our rate of approximately 6-7% lies in the middle of this range and reflects regional risk factors and healthcare capacity. Despite ongoing improvements in pediatric trauma care in our country, the inherent nature of firearm injuries still results in substantial mortality, emphasizing the importance of preventive measures and robust trauma systems.

PTS and GCS emerged as strong predictors of mortality in our cohort, consistent with previous work. As a practical scoring system incorporating both anatomical and physiological variables, PTS is widely used in pediatric trauma. Historically, Tepas et al. showed a sharp increase in mortality when PTS fell below 8; later studies have suggested even lower thresholds. In our study, as in several contemporary reports, the optimal PTS cut-off for mortality prediction was lower. For example, a Latin American study identified a critical threshold of ≤4 for best sensitivity and specificity, and Orliaguet et al. reported a similar discriminative value of ~4–5. These findings imply that PTS cut-off values may require recalibration across different pediatric trauma populations, although the overall accuracy of PTS in survival prediction has been confirmed in many studies[15]. Combined trauma scores such as TRISS or BIG can yield slightly higher predictive accuracy than PTS/GCS[25], but their reliance on laboratory data limits practicality in acute settings. Moreover, recent comparative analyses suggest that combining anatomical and physiological scoring tools can enhance early risk stratification in pediatric polytrauma[26]. Rapidly calculated scores like PTS and GCS therefore remain invaluable, particularly for prehospital triage and initial assessment. Our experience suggests that routine PTS use in high-risk regions could facilitate prompt transfer of severely injured children by providing an objective severity criterion15. Although the PTS demonstrated high sensitivity and specificity, its positive predictive value (PPV) was relatively low. This limitation in PPV, despite strong discriminative performance, can be attributed to the low in-hospital mortality rate.

Regarding anatomical injury sites, our results align closely with existing literature. Pediatric cranial firearm injuries carry the highest mortality risk. More than half of our fatal cases involved entry wounds to the head or neck, and the presence of cranio-cerebral trauma dramatically increased the likelihood of death. Prior research echoes this observation: an analysis of >1,000 pediatric firearm injuries in Miami found a 35 % mortality rate among cases with head-neck wounds—almost triple the overall mortality[24]. Feldman et al. also identified head trauma as the strongest independent predictor of mortality in pediatric firearm injuries (OR ≈ 14)[27]. Our findings are congruent. Although parameters such as initial GCS, pupillary response, and multilobar involvement shape prognosis, literature notes that even children presenting with fixed dilated pupils and low GCS can achieve meaningful recovery with timely surgical intervention[28]. Moreover, a multicenter study conducted in 2024 demonstrated that emergency surgical intervention can improve neurological outcomes even in pediatric patients presenting with fixed dilated pupils and low GCS[29]. Thus, an aggressive approach can be life-saving in select cranial cases.

Torso injuries likewise confer significant risk. In our study, abdominal or pelvic injuries were associated with markedly higher mortality. Firearm-induced great-vessel trauma, multiple intra-abdominal organ wounds, and uncontrolled hemorrhage can lead to rapid death, particularly in children. Feldman et al. reported that children with a single major thoracic injury had an almost 2.7-fold higher risk of death than those with isolated abdominal injuries[27]; massive hemothorax, cardiac injury, or damage to highly vascular organs such as the liver and spleen can progress to irreversible shock within minutes[27,30]. In our cohort, 92 % of children who died required immediate intubation upon emergency-department arrival, compared with only 6 % among survivors. Likewise, more than half of the fatal cases needed blood transfusion versus 14 % of survivors. The need for critical interventions such as intubation and transfusion underscores the severity of these patients' conditions. Other series affirm that shock and massive hemorrhage predict poor outcomes; for instance, an initial arterial pH ≤ 7.15 increased mortality risk ~15-fold, and an initial hematocrit ≤ 30 % served as a significant adverse factor[27]. Rapid blood-product resuscitation and surgical hemostasis are therefore imperative. Notably, only 7.7 % of our fatal cases underwent surgical intervention, compared with 41.7 % of survivors—likely because most nonsurvivors succumbed too quickly to reach the operating room. Similar observations in the literature reveal that the most severely injured children often die prehospital or in the emergency department[15]. This underscores the necessity for swift, high-quality care across every link of the pediatric trauma chain—from scene and transport to in-hospital management.

LIMITATIONS

Because our hospital information system does not record exact timestamps for critical interventions such as endotracheal intubation and blood transfusion, we were unable to evaluate the time-dependent impact of these procedures on mortality. Consequently, temporal analyses of intervention timing should be addressed in future prospective studies.

CONCLUSION

Our findings highlight the extreme vulnerability of children in high-risk regions to firearm-related trauma and underscore that early recognition, accurate triage, and aggressive treatment can be lifesaving. Although advances in inter-facility coordination, pediatric trauma protocols, and intensive-care practices have improved survival for severely injured children, penetrating injuries still carry a substantial risk of death. Preventive public-health measures—such as tighter regulation of civilian firearms, community education, and shielding children from conflict environments—must therefore be intensified, while the clinical arm of care should focus on strengthening regional capacity in pediatric surgery, neurosurgery, and critical care. Continuous training of pediatric trauma teams and, when necessary, rapid stabilization and transfer to higher-level centers are vital. Beyond medical strategies, societal and legislative actions are essential to protect children. Our decade of experience reminds us that each case represents not just a data point but an avoidable tragedy. A clear understanding of mortality determinants in pediatric firearm injuries informs clinicians about which patients are most critical and guides policymakers toward the areas most in need of intervention. Ultimately, the management of firearm-injured children demands both rapid, multidisciplinary medical care and robust community-level violence-prevention strategies, and the evidence generated here will help shape future efforts to reduce the incidence and lethality of these injuries.

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Ethics Committee Approval: This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Clinical Research Ethics Committee of Dicle University Faculty of Medicine (approval date: March 19, 2025; approval number: 140). All patient data used in the study were anonymized to protect patient privacy and were analyzed solely for scientific purposes.

Conflict of Interest: No conflicts of interest were reported by the authors.

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