

Investigation of firearm injury cases presented to training and research hospital's emergency service

Orhan Meral, M.D.,¹ Caner Sağlam, M.D.,² Birdal Güllüpnar, M.D.,²

Özlem Ezgi Aktürk, M.D.,² Serdar Beden, M.D.,² İsmet Parlak, M.D.³

¹Department of Forensic Medicine, University of Health Sciences İzmir Bozyaka Training and Research Hospital, İzmir-Turkey

²Department of Emergency Medicine, University of Health Sciences İzmir Bozyaka Training and Research Hospital, İzmir-Turkey

³Department of Emergency Medicine, Aksaray University Training and Research Hospital, Aksaray-Turkey

ABSTRACT

BACKGROUND: Firearm injuries are criminal events that may cause severe morbidity and mortality and concerned with Emergency Medicine and Forensic Medicine. The present study aims to evaluate the wound characteristics of the cases who presented to emergency services due to firearm injuries.

METHODS: In this study, 213 patients who were 18 years of age or older who applied to the Sağlık Bilimleri University Bozyaka Training and Research Hospital Emergency Service with gunshot injury were included.

RESULTS: Of the 213 cases examined, 182 (85.4%) were male. The ages of the cases ranged from 18 to 78 years, and the mean age was found as 33.2±12.6. The most common months were April (n=28, 13.2%) and May (n=25, 11.6%). The findings showed that 194 (91.1%) of 213 patients were discharged after completing the treatment in the hospital, and 19 patients (8.9%) died despite all interventions.

CONCLUSION: Our study presents an important cross-section of the gunshot injury patterns and their consequences in Turkey, but it contains regional data. In this regard, multicentre and multidisciplinary studies covering the country, in general, are considered to be a significant contribution to the literature.

Keywords: Emergency; firearm injury; morbidity; mortality.

INTRODUCTION

Firearms are weapons used for defense or assault, which are capable of throwing bullets into the distance with the gunpowder gas pressure.^[1] They may cause a wide range of damage from simple soft tissue trauma to a fatal internal organ and vascular injuries.^[2,3]

Firearm injuries may occur as a result of accidental or homicidal/suicidal actions.^[4] The severity of the injury depends on the type of firearm and the distance between the firearm and the body part, which is shot.^[3,5,6] Thus, rapid evaluation and treatment of gunshot wounds, especially in case of serious injuries, within the golden hour is of vital importance.^[7,8]

Emergency Department care of the firearm injury patient begins with an initial assessment for potentially serious injuries. A primary survey is undertaken quickly to identify and treat immediately life-threatening conditions, with simultaneous resuscitation and treatment. Specific injuries that should be immediately identified and addressed during the primary survey include airway obstruction, tension pneumothorax, massive internal or external hemorrhage, open pneumothorax, flail chest, and cardiac tamponade.^[9]

This study aims to evaluate the relationship between morbidity and mortality and wound characteristics of firearm injury cases presenting to emergency service. We expect that this study may contribute to the national and international literature.

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Address for correspondence: Orhan Meral, M.D.

Sağlık Bilimleri Üniversitesi İzmir Bozyaka Eğitim ve Araştırma Hastanesi Adli Tıp Kliniği, İzmir, Turkey

Tel: +90 232 - 250 50 50 / 5832 E-mail: orhanmeral@ymail.com

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MATERIALS AND METHODS

Our study is retrospective and cross-sectional study. In this study, 213 patients who were 18 years of age or older who presented to the Sağlık Bilimleri University Bozyaka Training and Research Hospital Emergency Service with gunshot injury were included.

The demographic characteristics, such as age and gender of the cases, the type of gun used, the date of the incident, the time of presentation to the emergency service, the blood alcohol level of the patient, injury findings of the patient, and requested specialty consultations, were retrieved from the medical records. Forensic medical evaluation of the injuries was made.

Cleaning wounds and dressing were accepted as simple medical interventions. Wound debridement or bullet removal, as well as injuries like bone fractures or internal organ damage, were not considered to be simple wounds.

Our work was carried out in accordance with the Helsinki Declaration and approved by the Ethics Committee (date: 08.11.2016, no: 2).

Statistical Analysis

Demographic data were expressed as mean \pm standard deviation and/or percentage. The SPSS version 22.0 for Windows (Statistical Software, Chicago, IL, USA) was used for statistical analysis, and Chi-square and Fisher's exact tests were conducted for data comparison. The comparison values were calculated at a 95% confidence interval; $p < 0.05$ was considered statistically significant.

Limitations

Due to the lack of a childhood trauma unit in the hospital where this study was conducted, there were no cases under 18 years old in this study. Other limitations, including the retrospective nature of the study, and the inadequacy of medical records, make it impossible to comment on the nature of the incidents (accident/suicide/homicide).

RESULTS

Of the 213 patients who were included in this study within the 5-year period of this study, 182 (85.4%) of them were male. The ages of the cases ranged from 18 to 78 old years, and the mean age was found as 33.2 ± 12.6 . The demographic data of the cases are summarized in Table 1.

When the dates that firearm injuries took place were examined, the most frequent months of occurrence were April ($n=28$, 13.2%) and May ($n=25$, 11.6%). The findings showed that admissions to the hospital were more frequent between 18:01–24:00 ($n=78$, 36.6%) (Table 2).

Table 1. Demographic data

	n	%
Gender		
Female	31	14.6
Male	182	85.4
Age range of subjects	18–78	
Mean age of subjects (years)	33.2 \pm 12.6	
Age groups (year)		
18–30	106	49.8
31–40	51	24.0
41–50	28	13.1
51–60	23	10.8
61 and over	5	2.3

Table 2. Date of event and cases of hospital admissions

	n	%
Distribution of firearm injuries by year		
2011	45	21.1
2012	29	13.6
2013	29	13.6
2014	51	23.9
2015	59	27.8
Distribution of firearm injuries by month		
January	15	7.0
February	8	3.8
March	10	4.7
April	28	13.2
May	25	11.6
June	20	9.4
July	18	8.5
August	17	8.0
September	17	8.0
October	16	7.5
November	20	9.4
December	19	8.9
Distribution of firearm injuries by the time period of a day		
00:01–06:00	59	27.7
06:01–12:00	26	12.2
12:01–18:00	50	23.5
18:01–24:00	78	36.6

When the types of firearms were examined, it was found that 160 (75.1%) of the cases were by pistol, and 53 cases (24.9%) were injured by hunting rifles.

Table 3. Distribution of consulted specialties

Clinics	n	%
Orthopedic & traumatology	114	53.2
General surgery	34	15.9
Neurosurgery	26	12.1
Cardiovascular surgery	23	10.8
Others*	17	8.0
Total	214	100.0

*Ophthalmology (6), thoracic surgery (4), otorhinolaryngology (2), plastic surgery (2), anesthesia (2), urology (1).

Table 4. Distribution of hospitalization by specialties

Clinics	n	%
Orthopedic & traumatology	49	46.6
General surgery	30	28.6
Neurosurgery	17	16.2
Others*	9	8.6
Total	105	100.0

*Ophthalmology (4), cardiovascular surgery (2), otorhinolaryngology (1), thoracic surgery (1), plastic surgery (1).

The findings showed that 182 (85.4%) of the cases were injured on one single body region while 31 (14.6%) cases were injured on more than one body region. The total number of injured body regions was 247, and the most common injuries were lower-extremity injuries (n=102, 41.3%). The distributions of the injury zones are shown in Figure 1.

The findings showed that 36 of the cases (16.9%) had their blood alcohol levels measured in Emergency Service, and all of the cases were reported to the judicial authorities after the initial or emergency management.

In 46 cases (21.6%), no specialty consultation was requested while for the other 167 cases (78.4%), other specialties were consulted 214 times in total, and most of them were made to the Orthopedics & Traumatology department (n=114, 53.2%) (Table 3).

After forensic medicine evaluation was made, it was concluded that 48 patients (22.5%) suffered a life-threatening injury, 33 patients' injuries (15.5%) were mild enough to be treated by simple medical intervention, and the remaining 132 cases (62%) were found not to have life-threatening injury but also not to be mild enough to be treated by simple medical intervention.

It was found that 97 cases (45.5%) were discharged from the emergency department, 105 cases (49.3%) were hospitalized,

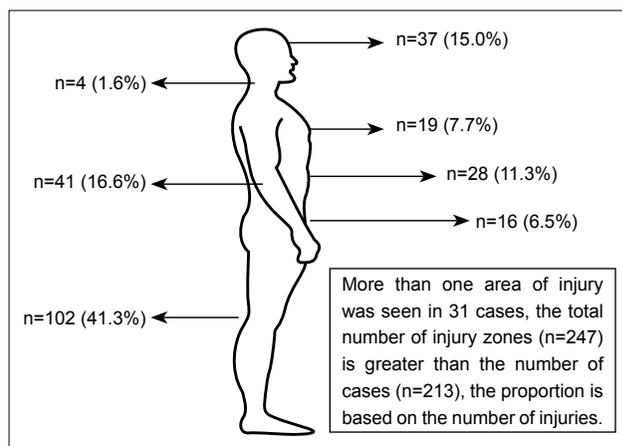


Figure 1. Distribution of injury zones.

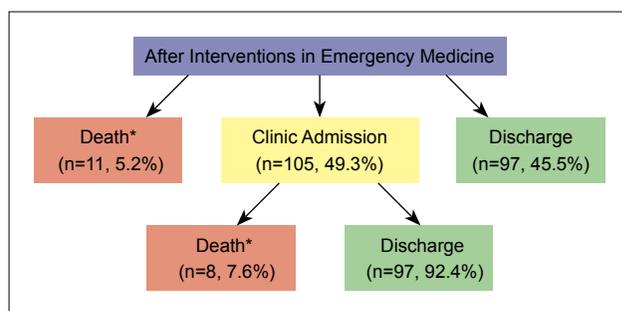


Figure 2. Situation for the cases' post-interventions in hospital. *Of the 19 patients who died, 14 had head and brain injuries, two patients had abdominal and internal organ injuries, and three patients had chest and lung injuries. In addition, all the patients who died were followed up in intensive care units and six patients were operated.

and 11 cases (5.2%) died despite all interventions made in the emergency service. Most of the cases were hospitalized in the Department of Orthopedics & Traumatology (n=49, 46.6%) (Table 4), and 61 of the 105 patients who were hospitalized (58.1%) underwent surgery. Of the 213 patients included in this study, 194 (91.1%) were discharged after completing their treatment in the hospital, but 19 patients (8.9%) were found to have died despite all interventions (Fig. 2).

Complications occurred in seven patients during the follow-up period after hospitalization. Upper extremity amputation was performed in one patient, lower-extremity amputation was performed in one patient, and splenectomy was performed in one patient. In addition, paraplegia was developed due to medulla spinalis injury in one patient and permanent eye and vision loss were observed in three patients.

When the relationship between death and injured body regions was examined, it was determined that 14 (37.8%) of the 37 patients who had head injuries died (p<0.001). None of the 41 patients who were injured on the upper extremity and none of the 102 patients who were injured on the lower-extremity died (p<0.001). No statistically significant relation-

ship was found between the number of deaths and the other body regions of injuries, the total number of injured body regions, and the type of firearm used ($p>0.05$).

DISCUSSION

Due to its easy availability and portability, there is a steady increase in firearm injuries and deaths in our country and the world.^[6,7] From this point of view, gunshot wounds and deaths have become an important public health problem, and at the same time, it also carries a judicial event feature.^[1,6]

The high number of male in the cases of firearm injuries had been found to be related to that males are more likely to take part in criminal events and also they reach these weapons more easily.^[1,10] In our study, most of the cases ($n=182$, 85.4%) were male and most frequently were in the 18-30 age group ($n=107$, 49.8%). This finding is consistent with many studies in our country and other countries.^[7,10-14] In addition, it is seen that firearm injuries are a risk factor of death for almost all ages when examination made in our study in which patients' ages changed between 18-78 and also in other studies.

The most frequent months of occurrence were April ($n=28$, 13.2%) and May ($n=25$, 11.6%). Admissions to the hospital were more frequent between 18:01-24:00 ($n=78$, 36.6%). Although it is seen that there is a difference between the studies about in which months patients admitted to the hospital mostly, Türkoglu's study^[10] reported that events occurred most often in May, similar to our study. Due to the differences in the scientific research conducted, it is thought that there is not enough explanation about why more people are suffering during April and May.

Studies indicate that pistols are the most common type of firearm, resulting in death.^[1,10,11] In our study, the majority of firearm injuries were found to have occurred by pistols ($n=160$, 75.1%). Long-barreled weapons have been reported to be used more frequently in the studies performed by Kahramanmaraş^[14] and Elazığ.^[10] It is thought that the terrorist events are seen more in these regions due to their geographical location, leading to this result.

In our study, the findings showed the most common injuries were on the lower extremity ($n=102$, 41.3%), followed by the upper extremity ($n=41$, 16.6%). In the studies conducted by Karaca^[7] and Tokdemir,^[11] extremity injuries were the most common, but the head and neck injuries were reported more frequently in Cingöz,^[1] Erkol,^[14] Kır^[12] and Türkoğlu^[10] studies. The studies which found the head and neck region injuries to be more frequent are the studies that were conducted on the autopsy cases. This is anticipated as head and neck injuries are often more likely to cause death.

Physicians have medical and legal obligations, as well as administrative and judicial obligations. Since firearm injury cases

are also forensic cases,^[6] judicial authorities should be notified about these cases by reports according to the 280th article of the Turkish Penal Code.^[15] If the notification is not made, there may be an investigation by the judicial authorities regarding "not reporting a crime". In our study, blood alcohol levels were checked only in 16.9% ($n=36$) of the cases, and all of the cases were reported to the judicial authorities ($n=213$). From this point of view, the obligation to report when encountered this kind of judicial event is fulfilled in the hospital where the examination is made. Along with this, although blood alcohol level checking for all firearm injury cases is not compulsorily enforced by legal regulations or judicial decisions. It is also thought that the level of blood alcohol should be examined in all firearm cases to protect physicians from allegations that may arise in the future and to prevent possible grievances.

Patients with firearm injuries are considered as multi-trauma patients. Thus, a comprehensive physical examination is mandatory. After the evaluation of the consultant physicians, the decision to admit or discharge a patient is given. Although there are no definitive criteria, all the following criteria may be used for the evaluation of firearm injuries cases: All penetrating head, thorax and abdominal injuries, history of prolonged loss of consciousness, deterioration in the level of consciousness, moderate to severe headache, significant alcohol/drug intoxication, multiple bone fractures, cerebrospinal fluid leakage (rhinorrhea or otorrhea), significant associated injuries, no reliable companion at home, abnormal Glasgow Coma Scale score, focal neurologic deficits, abnormal Computer Tomography scan, unavailable Computer Tomography scan.^[16] In our study, for patients with firearm injury, the most commonly consulted specialty was the Orthopedics & Traumatology Department ($n=114$, 53.2%). Patients were also most frequently admitted to the Orthopedics & Traumatology Department ($n=49$, 46.6%). This situation was found usual because injuries were seen mostly in extremities.

Injuries from firearms are increasing in our country and in the world and also form an important part of all injuries.^[8,9] Thus, attention has been drawn to the necessity of strict measures for the control of firearms, as well as to increase public awareness using media and other social networks.^[1] After forensic medicine evaluation was made, it was concluded that 48 patients (22.5%) suffered a life-threatening injury, 33 patients' injuries (15.5%) were mild enough to be treated by simple medical intervention, and the remaining 132 cases (62%) were found not to have life-threatening injury but also not to be mild enough to be treated by simple medical intervention. In addition, 61 of 105 patients (58.1%) who were hospitalized to the related clinics underwent surgery. Tokdemir's study on 304 cases with firearm injuries in Elazığ^[11] also reported that 43% of the cases were exposed to life-threatening situations, which shows the importance of morbidity and mortality of firearm injuries.

It was determined that 194 cases (91.1%) were discharged after completing their treatment in the hospital (97 cases of them discharged from the Department of Emergency), but 19 patients (8.9%) died despite all interventions (11 cases of them have died in Emergency Department). In Karaca's study^[7] held in Ankara, the findings showed that 24 of the 142 cases (16.9%) died. There are many factors affecting morbidity and mortality in firearm injuries. Although bullets cause small holes in the skin, serious injuries may occur in the body, especially in the head, chest and abdomen. Because of these possible injuries, studies emphasized the importance of rapid and effective evaluation in the early stages.^[2,7]

In our study, complications occurred in seven patients during the follow-up period after hospitalization. Upper extremity amputation was performed in one patient; lower-extremity amputation was performed in one patient, and splenectomy was performed in one patient. In addition, paraplegia was developed due to medulla spinalis injury in one patient, and permanent eye and vision loss were observed in three patients. Complications related to gunshot wound cases depend on the location and severity of the injury. Injuries affecting the nervous system and causing long-term neurological damage are especially important.^[7]

When the relationship between death and injured body regions is examined, the findings showed that 14 (37.8%) of the 37 patients who were injured on the head died ($p < 0.001$). None of the 41 patients who were injured on the upper extremity and none of the 102 patients who were injured on the lower-extremity died ($p < 0.001$), which was found statistically significant. Firearms may lead to serious fatal head injuries as they cause brain and large vessel injuries, as well as skull fractures, but when in the extremities, these wounds may be fatal only in case of major vessel injuries. From this point of view, the data we have obtained in our study are considered normal.

Conclusion and Recommendations

In our study, the majority of cases ($n=182$, 85.4%) were male, their ages ranged from 18 to 78, and the most frequent group was 18 to 30 years ($n=107$, 49.8%). The findings suggest that males often play a major role in criminal matters because of easy access to firearms, although firearm injuries are a risk factor for almost all ages.

Physicians have medical and legal obligations, as well as administrative and judicial obligations. Since these firearm injury cases are also forensic cases, these cases should be reported to the judicial authorities. In our study, all cases presented to emergency services were reported to the judicial authorities by physicians to fulfill the obligations. Physicians should follow legislation regularly in forensic medical issues to prevent future allegations and grievances in judicial cases, so it would be appropriate for physicians to participate in the training in this regard.

When forensic medical evaluation made, the findings showed that 19 of them (8.9%) died despite all interventions. As the availability of firearms becomes easier, it is inevitable that injuries and deaths due to this will occur more frequently. To prevent unauthorized weapons from being procured, to keep the legal regulations related to the possession of weapons and carrying licenses in sight, to maintain strict follow-up, control and control after the license acquisition, as well as to increase deterrent criminal sanctions, especially in civil society organizations, media and other social networks to inform and raise awareness of the community on these issues will contribute to the reduction of firearm injuries and deaths. Our study presents an important cross-section of the gunshot injury patterns and their consequences in Turkey, although this study only contains regional data. Although firearm injuries and deaths are a serious public health problem, which is an important factor in all injuries and deaths, there is no multicentered study covering the country in general. Thus, multicentered and multidisciplinary studies that reflect the country's situation as a whole are needed.

Ethics Committee Approval: Approved by the local ethics committee (date: 08.11.2016, no: 2).

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ORİJİNAL ÇALIŞMA - ÖZET

Bir eğitim ve araştırma hastanesi acil servisine başvuran ateşli silah yaralanması olgularının incelenmesi

Dr. Orhan Meral,¹ Dr. Caner Sağlam,² Dr. Birdal Güllüpınar,² Dr. Özlem Ezgi Aktürk,² Dr. Serdar Beden,² Dr. İsmet Parlak³

¹Sağlık Bilimleri Üniversitesi İzmir Bozyaka Eğitim ve Araştırma Hastanesi, Adli Tıp Kliniği, İzmir

²Sağlık Bilimleri Üniversitesi İzmir Bozyaka Eğitim ve Araştırma Hastanesi, Acil Tıp Kliniği, İzmir

³Aksaray Üniversitesi Eğitim ve Araştırma Hastanesi, Acil Tıp Kliniği, Aksaray

AMAÇ: Ateşli silah yaralanmaları, ciddi morbidite ve mortaliteye neden olan ve acil tıp ve adli tıp ile ilgili kriminal olaylardır. Çalışmamızın amacı, ateşli silah yaralanmaları nedeniyle acil servislere başvuran olguların yara özelliklerini değerlendirmektir.

GEREÇ VE YÖNTEM: Sağlık Bilimleri Üniversitesi İzmir Bozyaka Eğitim ve Araştırma Hastanesi Acil Servisi'ne ateşli silah yaralanması nedeniyle başvuran 18 yaş ve üzeri 213 olgu çalışmaya alındı.

BULGULAR: İncelenen 213 olgunun 182'si (%85.4) erkekti. Olguların yaşları 18–78 yaş arası değişmekte olup yaş ortalaması 33.2±12.6 olarak bulundu. Yaralanmaların en sık Nisan (n=28, %13.2) ve Mayıs (n=25, %11.6) aylarında meydana geldiği tespit edildi. İki yüz on üç olgunun 194'ünün (%91.1) hastanedeki tedavileri tamamlandıktan sonra taburcu edildiği, 19 olgunun (%8.9) ise tüm girişimlere rağmen öldüğü belirlendi.

TARTIŞMA: Çalışmamız Türkiye'deki ateşli silah yaralanma patern ve sonuçları hakkında önemli bir kesit sunmakta, ancak bölgesel veriler içermektedir. Bu konuda ülke geneline kapsayan çok merkezli ve multidisipliner çalışmaların literatüre ciddi katkıda bulunacağı düşünülmektedir.

Anahtar sözcükler: Acil servis; ateşli silah yaralanması; morbidite; mortalite.

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