

An analysis of firearms-related deaths between 1993-2010: a retrospective study

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ABSTRACT

BACKGROUND: Firearm injuries (FI) are the most common cause of death among military personnel. In this study, postmortem examination and autopsy records of deaths resulting from firearm injuries recorded in the Department of Forensic Medicine of Gülhane Military Medical Academy between 1993-2010 were examined retrospectively.

METHODS: We evaluated the characteristics of 153 firearm deaths accounting for 36.6% of all medical-legal autopsies. The cases included 152 men (99.3%) and 1 woman (0.7%).

RESULTS: The mean age of the cases was 23.1 years (± 4.7 ; range, 20-43 years). The manner of death was determined in all cases with 41.8% of cases identified as suicide and 39.9% as homicide. The most common sites of firearm entrance wounds were the head and neck region (n=109, 71.2%), the chest (n=26, 17%), or the abdomen (n=14, 9.2%). The type of firearm was not clear in most cases.

CONCLUSION: In conclusion, complete forensic and medical records will facilitate the rapid and accurate conclusion of the legal process and will enhance future retrospective studies.

Key words: Firearm deaths; homicide; suicide.

INTRODUCTION

Firearm injury (FI) is one of the most important causes of death among military personnel.^[1] According to the World Health Organization, firearms are used in two thirds of all homicide cases and one fifth of suicide cases.^[2] According to data from the World Health Organization (WHO), 2.3 million people have died as a result of violence worldwide and 26% of these deaths were war-related deaths. Interpersonal violence, self-mutilation and injuries as a result of war are the

most common causes of death in the 15-44 year age population all over the world.^[2]

In the USA, there are 30,000 firearm-related deaths every year.^[3] In a study in Italy, while 27.7% of forensic autopsies were of deaths resulting from firearm injuries,^[4] in India it has been reported that only 1.5% of forensic autopsies are of deaths resulting from firearm injuries.^[5]

In Turkey according to the data of National Statistical Institute (TurkStat), firearm injuries are the most common cause of homicides and the third cause of suicides following poisoning and hanging.^[6,7] According to the 2008 data of TurkStat, 0.3% (749/215.562) of deaths were caused by firearms apart from deaths in warfare.^[6] In our country, studies evaluating forensic cases have stated mortality rates of 8.2-27.7% from firearms injuries.^[8-12]

This study aimed to analyze the demographic data of cases of firearms injury which underwent an autopsy in our department and to compare that data with other studies.

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MATERIALS AND METHODS

A retrospective examination was made of postmortem examination and autopsy records in the Department of Forensic Medicine of Gulhane Military Medical Academy of deaths resulting from firearms injuries between 1993-2010. Approval for the study was granted by the Local Ethics Committee. It was determined that examination and autopsy were conducted on a total of 417 forensic qualified cases. The records were examined of 153 (36.6%) of these deaths, which were firearms related. Explosive substance-related deaths were not included in the study. Cases were evaluated according to the autopsy records, age, gender, manner of death, site of entrance wound, exit wound location, length of stay in hospital, range of fire, type of firearm, whether bullets were obtained from the corpse or not, the number of bullets that hit the body and toxicological examinations.

RESULTS

Demographic Characteristics

In this study, examination and autopsy processes were conducted on 417 forensic qualified cases including 153 firearms-related death cases. These cases were 152 male (99.3%) and 1 female (0.7%) with a mean age of 23.1±4.7 years (range, 20-43 years).

Manner of Death

Cases were examined according to the manner of death

and it was determined that 41.8% of the cases were suicide, 39.9% were homicide, 9.2% were accident and 9.2% were from other causes (non-specific origin in the medical and investigative documents).

Types of Firearms

The type of firearm used was not clear in 59.5% of all cases. It was interesting that the type of firearm could not be determined in all the cases in which the manner of death could not be determined (Table 1).

Wound Characteristics

The distribution of firearm entry wounds were evaluated according to the body parts; entry wound was in head and neck region of 109 (71.2%) of victims, in chest of 26 (17%), in abdomen of 14 (9.2%) and in lower extremity of 4 (2.6%). In the cases with multiple-entry wound, the vital localizations of entry wounds were considered.

When the distribution of firearm exit wound of cases was evaluated according to the body parts. The exit wound was in the head and neck region of 96 (62.7%) cases, in the back of 30 (19.6%), in the abdomen of 8 (5.2%) and in the lower extremity of 4 (2.6%). It was also detected that 9 cases had no exit wound and in 6 cases the exit wound could not be defined because of atypical wound characteristics. In the cases with multiple-exit wounds, the vital localization of the exit wounds was considered.

Table 1. The type of firearm used according to the manner of death

Types of firearms	Homicide		Suicide		Accident		Not-Specified		Total	
	n	%	n	%	n	%	n	%	n	%
Long-barrelled	10	16.4	34	53.1	2	14.3	0	0	46	30.1
Short-barrelled	4	6.6	7	10.9	5	35.7	0	0	16	10.4
Not-Specified	47	77	23	35.9	7	50	14	100	91	59.5
Total	61	100	64	100	14	100	14	100	153	100
	39.9		41.8		9.2		9.2		100	

Table 2. Entry wound localization according to the manner of death

Entry area	Homicide		Suicide		Accident		Not-Specified		Total	
	n	%	n	%	n	%	n	%	n	%
Head-neck	44	72.1	45	70.3	9	64.3	11	78.6	109	71.2
Chest	10	16.4	11	17.2	3	21.4	2	14.3	26	17
Abdomen	5	8.2	8	12.5	1	7.1	0	0	14	9.2
Lower extremity	2	3.3	0	0	1	7.1	1	7.1	4	2.6
Total	61	100	64	100	14	100	14	100	153	100
	39.9		41.8		9.2		9.2		100	

When the entry wound localization was examined according to the manner of death, the head and neck was the most frequent site of wounding regardless of the manner of death (Table 2).

Range of Fire

When the cases were evaluated according to the range of fire, while it was not clear in 43.1% of cases, there was, a contact/near contact shot in 44.4%, a close shot in 4.6% and a distant shot in 7.8%. In the autopsy reports, the range of fire could not be defined in 43.1% of all cases and in 78.6% of accidental cases. This was because the shot was made to a clothed area or there had been medical intervention to the entry wound(s) (the identification of the features of the entry wounds were not made in the medical records before medical intervention, and the information about analysis results in terms of range of fire of perforated clothing was not found from the available data of shots made to a clothed area) (Table 3).

In the analysis of the type of weapon according to the range of fire, it was observed that cases in which the type of the weapon could not be determined, mostly consisted of cases in which the range of fire could not be determined (Table 3). When the range of fire was examined according to the manner of death of cases, it was striking that the range of fire could not be determined in most of the accidental firearm deaths (Table 4).

The Entry Wound Localization According to the Range of Fire

When the entry wound localization of cases was examined according to the range of fire, the entry wound was in the head area in 62.4% of the cases with an undetermined shot (Table 5).

It is interesting that cases with gunshot wounds in the chest and abdomen were not wounded with short-barrelled guns.

Table 3. The range of fire according to the type of firearm

Range of fire	Long barrelled		Short barrelled		Not-specified		Total	
	n	%	n	%	n	%	n	%
Contact/near contact	26	38.2	8	11.8	34	50	68	44.4
Close	2	28.6	0	1.6	5	71.4	7	4.6
Distant	4	33.3	1	8.3	7	58.4	12	7.8
Undetermined	14	21.2	7	10.6	45	68.2	66	43.1
Total	46	30.1	16	10.4	91	59.5	153	100

Table 4. The range of fire according to the manner of death

Range of fire	Homicide		Suicide		Accident		Not-Specified		Total	
	n	%	n	%	n	%	n	%	n	%
Contact/near contact	18	29.5	42	65.6	2	14.3	6	42.9	68	44.4
Close	3	4.9	1	1.6	1	7.1	2	14.3	7	4.6
Distant	12	19.7	0	0	0	0	0	0	12	7.8
Undetermined	28	45.9	21	32.8	11	78.6	6	42.9	66	43.1
Total	61	100	64	100	14	100	14	100	153	100

Table 5. The entry wound localization according to the type of firearm

Range of fire	Long barrelled		Short barrelled		Not-specified		Total	
	n	%	n	%	n	%	n	%
Head-neck	26	23.8	15	13.8	68	62.4	109	71.2
Chest	13	50.0	0	-	13	50.0	26	17.0
Abdomen	6	42.9	0	-	8	67.1	14	9.2
Lower extremity	1	25.0	1	25.0	2	50.0	4	2.6
Total	46		16		91		153	100

Toxicological Review

In the autopsy reports of firearm-related deaths, no toxic substance was determined in 55.6% of materials and xycain, ethyl alcohol, prilocaine, lidocaine, barbiturates, benzodiazepines and atropine were found in 3.9%. No toxicological review was applied to 39.9% of cases because of lengthy hospitalization and medical treatment.

Bullets

When the cases were evaluated according to the number of bullets that hit the body, it was determined that 86.9% died with one bullet injury, 7.2% with two bullet injuries and 5.9% with three or more bullet injuries.

Bullets were not retrieved in the autopsy of 94.8% of cases who died as a result of firearms injury, and were retrieved from 5.2% of cases and were handed over to the judicial authorities.

Death from Complications

61.4% of the cases died at the crime scene, during transport on the road or in the emergency services. In 55.3% of cases, the weapon type could not be ascertained, 35.1% were shot with a long-barrelled weapon and 9.6% with a short-barrelled weapon.

Analysis of the cases who died at the crime scene, during transport on the road or in the emergency services determined the following data; 68.1% were injured in the head area, 21.3% in the chest and 9.6% in the abdomen; 63.8% were shot from a contact/near contact shot, 6.4% from a close shot, 10.6% from a distant shot and the range of fire could not be determined in 19.1% of these cases; the origin was homicide in 36.2%, suicide in 46.8% and no clear origin was determined in 10.6%.

In this study, the duration of hospitalization and medical treatment ranged from 1 day to 630 days. Hospitalization was less than 90 days in 96.1% of cases.

DISCUSSION

In this study covering a period of 17 years between 1993-2010, 153 (36.6%) of the 417 forensic qualified cases that underwent examination and autopsy procedures originated from firearms. Previous studies in our country have reported this rate as between 7.4%- 27.7%.^[8-12] In a study by Norton and Langley in New Zealand, this rate was 0.3%,^[13] Nizamo et al^[14] reported this rate as 8.7% in Mozambique, and Biago Solarino^[4] determined this rate to be 27.7% in Italy. In the current study, this ratio is higher because the population served by our health center has access to firearms.

Studies evaluating deaths from firearms injuries have shown that these deaths especially concern the 20-40 year group.^[9-12] Parallel to literature, the cases in the current study ranged

from 20-43 years of age. In a study by Azmak et al in Edirne, the cases were primarily in the 21-30 years age group, followed by the 31-40 years age group.^[8] In other studies in Iran (38.2%),^[15] in Africa^[16] and in India (46.7%) in a study by Kohli et al^[5] it has been stated that cases were most common in the 20-30 years age group. Other studies in other regions such as Sweden, Germany, the United States and South Africa have also yielded similar results.^[5,15-21]

A contact/near contact shot is the range of fire in the majority of suicide cases,^[8,22-25] while a close or distant shot has been the range of fire determined in the majority of homicide cases.^[23,26] Druid identified that firearm wounds in homicides were made from a contact/near contact shot or a close shot and in 99% of suicide cases it was a close shot.^[27] In a study by Azmak et al it was determined that the range of fire was mostly a distant shot, was not detected in 8% of cases, and was a contact shot in almost all suicide cases.^[8] The range of fire could not be determined in 32.8% of suicide cases, because the shot had been made to a clothed area or there had been medical intervention to the entry wound. Definition of the entry wound features had not been entered in the medical records before medical intervention, so there was insufficient information in terms of range of fire in the data obtained from the analysis results of perforated clothing in a shot made to a clothed area. It is estimated that the majority of these cases were from a distant shot.

When the cases of the current study were evaluated according to origin, it was determined that 39.9% were homicide. Although several studies have stated this rate as ranging between 62.2%-71.80%, it was determined by Solarino et al^[4] as 88.4%, by Kellermann^[28] as 88%, by Guileyardo^[29] as 65%, by Riddick^[30] as 53%, by Al Ragheb^[31] as 51%, by Verzeletti et al^[32] as 35.9%, and by Druid^[27] as 18.7%. While the results of the current study are similar to those of some previous studies, they are also different from those of some others.

In the current study, 41.8% were suicide cases. In several studies in our country this rate has been reported as between 11.70-32.7%^[6,8,33-35] and in studies in other countries as 6.5-73.9%.^[5,27,32] Researchers have reported a strong relationship between access to firearms and suicide.^[36-38] In the current study, the suicide rate is higher than in other studies, which may be due to a high rate of accessibility to firearms of the study population.

In the current study, 9.2% were accidental cases. This rate has been reported as ranging between 0.13-24% in previous studies.^[4-6,8,11,33-35] Copeland and Ornehult made a detailed study of accidental firearms deaths together with crime scene investigation and it was reported that the firearms accidents could have occurred as a result of playing with firearms, showing the weapon others or because of faulty firearms.^[39,40] These features are similar to the findings of accidental deaths in the current study.

In studies by Azmak,^[8] Al Ragheb,^[31] Riddick,^[30] Muscat,^[41] Verzeletti^[32] and Solarino^[4] short barrelled weapon types were determined to have been used in homicide cases. In contrast, Druid stated that the weapon type most used in homicide cases was a shotgun and secondly, rifles. However, attention was also drawn to the fact that in 44% of homicide cases information about the weapon type could not be obtained.^[27] In the current study, in most of the homicide cases (77%), the type of firearm could not be determined because information about the weapon type was not available (terrorism, medical intervention to patients in more than one place, attempts to firstly rescue the patients rather than assessing the judicial aspect of cases and therefore no record of the type of weapon in judicial records etc.). In the current study, the type of the firearm could not be determined in all cases in which the manner of death could not be determined. This may suggest a strong relationship between these two factors. In a study by Azmak et al,^[8] the weapon type used in 50% of suicide cases was reported to be a handgun. In other studies, similar results have also been reported.^[4,8,32,38]

Al Ragheb,^[31] Riddick^[30] and Muscat^[41] reported that while the handgun was common in suicide cases in the civil population, rifled weapons were common in military populations. The preferred weapon type in suicide cases of the current study was mostly long barrelled (53.1%), which is due to a higher rate of use of long barrelled weapons in the study population.

In a study of homicides by Amiri, the most common entry wound site was reported as 42.6% head, 42.6% chest and 16.7% back,^[15] which conforms with the results of previous studies.^[8,15,30,31,35,41-44]

Azmak reported that the entry wound was in the head (right temporal area, left temporal area and neck) in 65%, in the chest in 25% and in the abdomen in 10% of suicide cases.^[8] Ağritmiş^[46] reported that the most common entry wound localization is in the head-neck, chest and abdomen in children and adolescents. Similar findings have been reported in previous studies.^[15,30,31,36,42,47] Di Maio^[47] stated that in suicide cases with handguns and long barrelled weapons, the most common entry wound localization was in the head area, and this result is compatible with the findings of the current study.

The gun type was identified when the entry wound localization was in the head-neck area in all cases of homicide. It can be seen that almost all the findings of the current study conform with the findings of other studies.

Muscat^[41] reported that the most commonly seen entry wound localization in homicide with a handgun is the head-neck area. In homicide cases where a long-barrelled weapon had been used the most common entry wound localization has been reported as the chest area.^[41]

Rates of single entry wound have been reported by Fedakar^[35] as 70.9% of cases, by Amiri^[15] as 65.2%, by Verzeletti^[32] as 74.8%, by Kohli^[5] as 77%, and by Azmak^[8] as 74.1%. When the current study was evaluated according to single entry wound, the findings are consistent with literature.

Azmak,^[8] Kohli^[5] and Goren^[34] reported that the majority of cases that died as a result of firearms injury died at the crime scene, during transportation or in the emergency services. Similar to the findings of other studies, the majority of the cases in the current study died within 24 hours.

Verzeletti^[32] detected alcohol, amphetamines, opiates, cannabinoid, and cocaine in 35% of cases and Şam^[6] detected substances such as ethyl alcohol, stimulants, narcotics or psychoactants in 24% of cases. Galea^[48] identified positive drug results in more than half of cases and the most detected substances (24.2%) were cannabis (19.5%), opiates (9.6%), and alcohol (26.9%). Druid^[27] identified an association between alcohol and the majority of murder and suicide cases. Bilban^[49] identified alcohol in 68.8% of suicide cases who died as a result of firearms injury. Bosnar^[50] reported significantly high blood alcohol concentrations in suicide cases that occurred with firearms in time of war. Alcohol has been found in 62% of homicide cases in Sweden^[51] and 68.6% of murder cases in Norway.^[52] According to literature, in the current study, substances were identified at very low rates in the toxicological analysis. The reason for this low rate is that the study group was living in an environment which was often checked in respect of substance abuse and where alcohol or other harmful substances were not permitted.

Conclusion

As our department serves people who have been authorized to use firearms, firearms injuries are a more frequently encountered issue in our department than in other institutions relevant to the subject. However, it can be seen that there is no great difference in terms of demographic data. As the most common injury areas in firearms-related death and injury cases are localized in the head-neck and chest, taking precautions (hard hat, protective clothing etc.) in these areas is thought to decrease the number of injuries and deaths.

The results of this study suggest a strong relationship between criminal findings such as non-identification of the type of firearm and range of fire and the manner of death and clarification of the incident. Attempting to make a medical intervention quite rightly to save life and thus focusing on a therapeutic direction creates problems in keeping detailed and proper records of medical interventions in these type of forensic cases and in the clarification of investigations. This leads to a prolonged legislative process and leaves some questions unanswered that should be answered by the official authorities. We think that keeping complete forensic and medical records will lead to a more rapid and accurate conclusion

of the legal process and thus future retrospective research will be able to reflect more accurate and objective results.

Conflict of interest: None declared.

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KLİNİK ÇALIŞMA - ÖZET

1993-2010 yılları arasında gerçekleşmiş ateşli silah yaralanmasına bağlı ölümler: Geriye dönük çalışma

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AMAÇ: Ateşli silah yaralanmaları (ASY) askeri personelin en sık ölüm sebebidir. Bu çalışmada, Gülhane Askeri Tıp Akademisi Adli Tıp Anabilim Dalı'na 1993-2010 yılları arasında ateşli silah yaralanmasına bağlı ölümlere ait postmortem muayene ve otopsi kayıtlarının geriye dönük analizi amaçlandı.

GEREÇ VE YÖNTEM: Olguların 153'ünün (%36.6) ateşli silah kaynaklı olduğu gözlemlendi. Olguların %99.3'ü erkek (n=152), %0.7'si kadın idi (n=1). Yaş ortalaması 23.1±4.7 yıl (20-43 yıl) idi.

BULGULAR: Olgular ölüm biçimine göre değerlendirildiğinde %41.8'i intihar, %39.9'u cinayetti. En sık ateşli silah giriş bölgesi sırasıyla baş-boyun 109 (%71.2), toraks 26 (%17) ve abdomen 14 (%9.2) idi. Olguların çoğunda ateşli silah tipi belli değildi.

TARTIŞMA: Sonuç olarak adli ve tıbbi kayıtların tam ve düzgün tutulmasının yasal sürecin doğru ve hızlı sonuçlanmasına ve ileride yapılacak geriye dönük araştırmalarda daha doğru ve objektif sonuçların yansıtılmasına neden olacağı kanaatindeyiz.

Anahtar sözcükler: Ateşli silah ölümleri; cinayet; intihar.

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