ORIGINAL ARTICLE

Clinical Characteristics Of Non-Fatal Forensic Chest Trauma And Their Association With Forensic Reporting Processes

Ölümle Sonuçlanmayan Adli Göğüs Travmalarının Klinik Özellikleri ve Adli Raporlama Süreçleri ile İlişkisi

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ABSTRACT

Aim: This study aimed to analyze non-fatal forensic chest traumas in terms of demographic characteristics, incident types, injury patterns, and clinical outcomes, and to reveal the relationship between trauma severity and forensic medical reporting processes, thereby contributing to forensic documentation practices.

Methods: This retrospective descriptive study included thoracic trauma cases who presented to the Forensic Medicine Outpatient Clinic of the Faculty of Medicine at Eskişehir Osmangazi University for medico-legal reporting between 01.01.2021 and 31.12.2023. Out of a total of 3,965 forensic cases, 227 thoracic trauma cases were included in the study. Data were obtained from forensic reports, medical records, and the hospital automation system. The cases were evaluated based on parameters such as age, gender, type and mechanism of the incident, type of injury, presence of bone fracture, life-threatening condition, and treatment method. Statistical analyses were performed using SPSS 29.0, with a significance level set at p<0.05.

Results: Of the cases, 76.7% were male and 23.3% were female, with a mean age of 39.56±17.11 years. The most common incident type was traffic accidents (72.2%). Blunt traumas accounted for 85% of the cases, while 15% were penetrating injuries. The most frequent injury was rib fracture (43.6%), followed by lung tissue injury (36.1%). Bone fractures were detected in 78.4% of cases, and 52% had a life-threatening condition. The rate of rib fractures was significantly higher in females (p=0.029). Surgical intervention was performed in 31.3% of cases.

Conclusions: This study shows that forensic chest traumas are predominantly due to blunt mechanisms, mainly traffic accidents. Bone fractures, lung injuries, and accompanying extra-thoracic injuries indicate the severity of trauma. These findings highlight the importance of a multidisciplinary approach in the forensic medical evaluation and demonstrate that trauma severity can influence the medico-legal reporting and subsequent legal process.

Keywords: Chest wall injuries, forensic medicine, thoracic injuries, traffic accidents

ÖZ

Amaç: Bu çalışmanın amacı, ölümle sonuçlanmayan adli nitelikli göğüs travmalarını demografik özellikler, olay türleri, yaralanma desenleri ve klinik sonuçlar açısından analiz etmek; travmanın şiddeti ile adli tıp raporlama süreçleri arasındaki ilişkiyi ortaya koyarak adli raporlama uygulamalarına katkıda bulunmaktır.

Gereç ve Yöntemler: Bu retrospektif tanımlayıcı çalışma, 01.01.2021–31.12.2023 tarihleri arasında Eskişehir Osmangazi Üniversitesi Tıp Fakültesi Adli Tıp Polikliniği'ne adli rapor düzenlenmesi amacıyla başvuran toraks travması olgularını kapsamaktadır. Toplam 3965 adli olgu içerisinden 227 toraks travması vakası çalışmaya dahil edilmiştir. Veriler, adli raporlar, tıbbi kayıtlar ve hastane otomasyon sistemi üzerinden elde edilmiştir. Olgular; yaş, cinsiyet, olay şekli ve türü, yaralanma tipi, kemik kırığı varlığı, yaşamsal tehlike durumu ve tedavi yöntemi parametreleri açısından değerlendirilmiştir. İstatistiksel analizlerde SPSS 29.0 kullanılmış, anlamlılık düzeyi p<0,05 olarak kabul edilmiştir.

Bulgular: Olguların %76,7'si erkek, %23,3'ü kadındı ve yaş ortalaması 39,56±17,11 yıl idi. En sık görülen olay türü trafik kazasıydı (%72,2). Travmaların %85'i künt, %15'i penetran karakterdeydi. En yaygın yaralanma kot fraktürü (%43,6), ardından akciğer dokusu yaralanması (%36,1) oldu. Olguların %78,4'ünde kemik kırığı saptanırken, %52'sinde yaşamsal tehlike mevcuttu. Kadınlarda kot fraktürü oranı anlamlı şekilde daha yüksekti (p=0,029). Cerrahi müdahale oranı %31,3 idi.

Sonuçlar: Çalışmamız, adli nitelikli göğüs travmalarının çoğunlukla künt travma mekanizmasına bağlı trafik kazalarından kaynaklandığını göstermektedir. Kemik kırıkları, akciğer hasarı ve eşlik eden yaralanmalar travmanın ciddiyetini belirlemekte; bu durum, adli raporlama süreçlerinde multidisipliner yaklaşımın önemini ve travmanın şiddetine göre hukuki sürecin şekillenebileceğini ortaya koymaktadır.

Anahtar Kelimeler: Adli tıp, göğüs duvarı yaralanmaları, toraks yaralanmaları, trafik kazası

INTRODUCTION

Chest traumas occupy an important place among trauma-related deaths both in our country and worldwide. Thoracic traumas constitute approximately 10–15% of all trauma cases and are held responsible for 25% of trauma-related deaths (1). Approximately 70% of these traumas occur as blunt traumas, while the remaining portion consists of penetrating injuries (1).

Thoracic traumas that develop through either penetrating or blunt mechanisms are serious injuries frequently associated with forensic incidents. Penetrating thoracic injuries may occur due to firearms, knives, skewers, and similar sharp and penetrating objects (2). Blunt thoracic injuries, on the other hand, are most commonly seen as a result of traffic accidents, followed by falls from height, domestic accidents, sports injuries, and assaults (2).

The thorax is an anatomically critical region as it contains vital organs such as the heart and lungs. Trauma to this area can lead to serious complications such as rib fractures, pneumothorax, hemothorax, and lung contusion (3). Chest traumas have a mortality rate of approximately 10%, and even in non-fatal cases, they carry a significant risk of morbidity and complications (4). This highlights the importance of detecting and carefully evaluating thoracic traumas that are non-fatal but forensic in nature.

In this context, it is of critical importance that forensic medicine specialists accurately assess the nature, severity, and outcomes of the trauma in terms of both medical practice and the proper functioning of legal processes. This study aims to address thoracic traumas from a forensic medicine perspective, and to reveal their clinical outcomes, their place in forensic practice, and their significance in legal processes.

MATERIALS and METHODS

This study includes thoracic trauma cases who presented to the Department of Forensic Medicine at a university hospital between 01.01.2021 and 31.12.2023, and were evaluated under Articles 86, 87, and 89 of the Turkish Penal Code. In this retrospectively designed study, cases for which a forensic report was requested were examined.

All individuals with thoracic trauma who were referred to the Forensic Medicine Outpatient Clinic of a university hospital for forensic reporting were included in the study. Data were obtained from forensic reports prepared by the Department of Forensic Medicine, medical documents in the patient files, and records in the hospital automation system.

Patients were evaluated in terms of age, age group, gender, type and origin of the incident, type of incident, type of injury, type of bone fracture, number of rib fractures, degree of fracture, presence of life-threatening condition, blood ethanol level, type of treatment, treatment method applied, department where treatment was received, presence of surgical intervention, length of hospital stay, and characteristics of thoracic injury. Radiological findings were based on radiology reports; no independent image re-evaluation by researchers was performed.

Injuries were classified according to their potential to threaten life and the impact of bone fractures or dislocations on bodily functions, and were analyzed under the "Guideline for the Forensic Medical Evaluation of Injury Offenses Defined in the

Turkish Penal Code" [Turkish version: Türk Ceza Kanununda Tanımlanan Yaralama Suçlarının Adli Tıbbi Değerlendirilmesi Kılavuzu (5)], which was updated in June 2019.

Statistical analyses were performed using SPSS version 29 software. Descriptive statistical methods (mean, standard deviation, median, frequency, percentage, minimum, maximum) were used in the evaluation of the data. Pearson chi-square test, Fisher's exact test, and Fisher-Freeman-Halton test were applied for the comparison of qualitative variables. A p-value of <0.05 was considered statistically significant. The study was conducted with the approval of the relevant institutional ethics committee (Decision number: 49, date: 19/03/2024).

RESULTS

In this study, among the 3965 patients referred to the Forensic Medicine Outpatient Clinic of a university hospital between 2021 and 2023 for the issuance of a forensic report, 227 cases (5.7%) were found to involve traumatic thoracic injuries.

Demographic Characteristics

The mean age of the patients was 39.56±17.11 years, with ages ranging from 6 to 83. According to age distribution, the highest number of incidents was in the 19–29 age group (n=57, 25.1%), followed by the 50–59 (n=42, 18.5%) and 40–49 (n=40, 17.6%) age groups. The lowest number of cases was found in the 0–18 age group (n=20, 8.8%). Regarding gender distribution, 76.7% (n=174) of the cases were male and 23.3% (n=53) were female (Table 1).

Table 1. Distribution of demographic characteristics

	Mean±SD	39.56±17.11
	Median (Min-Max)	39 (6-83)
Age (years)	0-18 years	20 (8.8)
	19-29 years	57 (25.1)
	30-39 years	39 (17.2)
	40-49 years	40 (17.6)
	50-59 years	42 (18.5)
	>59 years	29 (12.8)
Sex	Male	174 (76.7)
	Female	53 (23,3)

SD: Standard deviation

Clinical Characteristics

The most common type of injury was rib fracture (n=99, 43.6%), followed by lung parenchyma injury (n=82, 36.1%) and clavicle fracture (n=52, 22.9%). Bone fractures were detected in 78.4% (n=178) of the cases, and when the degrees of fractures were examined, 46.7% (n=106) were moderate, 31.3% (n=71) were severe, and 0.4% (n=1) were mild. A life-threatening condition was identified in 52% (n=118) of all cases. Surgical treatment was applied in 31.3% (n=71) of the patients, with the most common intervention being chest tube placement in 32 cases (14.1%). Additionally, 27.3% (n=62) of the patients required hospitalization for 8–20 days (Table 2).

Blood ethanol level was unknown in 153 cases. Among the 74 cases with available data, 23.0% (n=17) had no detectable alcohol in the blood, 45.9% (n=34) had levels <50 mg/dL, 5.4% (n=4) had levels between 50–99 mg/dL, 8.1% (n=6) had levels between 100–200 mg/dL, and 17.6% (n=13) had levels >200 mg/ dL, Extra-thoracic injuries were present in 60.8% (n=138) of the cases. Among these, the most common accompanying traumas

were extremity injuries (n=80, 35.2%) and head-neck injuries (n=77, 33.9%) (Table 2).

Among the 82 cases of lung tissue injury, 69 were due to blunt trauma and 13 due to penetrating trauma. In 51 of these cases, rib fractures were also present, and in the majority, the rib fractures and lung injuries were located on the same side.

Table 2. Distribution of clinical characteristics

Variables		n(%)
Type of ınjury*	Rib Fracture	99 (43.6)
	Sternum Fracture	20 (8.8)
	Clavicle Fracture	52 (22.9)
	Scapula Fracture	27 (11.9)
	Pneumothorax	33 (14.5)
	Hemothorax	27 (11.9)
	Major Vascular Injury	1 (0.4)
	Lung Tissue Injury	82 (36.1)
Bone fracture	None	49 (21.6)
	Present	178(78.4)
Fracture type*	Rib Fracture	100 (44.1)
	Sternum Fracture	19 (8.4)
	Clavicle Fracture	52 (22.9)
	Skapula Fracture	27 (11.9)
	Vertebral Fracture	27 (11.9)
Life-threatening Condition	No	109 (48.0)
	Yes	118 (52.0)
Blood Ethanol Level	Unknown	153 (-)
	Zero	17 (23.0)
	<50 mg/dl	34 (45.9)
	50-99 mg/dl	4 (5.4)
	100-200 mg/dl	6 (8.1)
	>200 mg/dl	13 (17.6)
Treatment Approach	Conservative	156 (68.7)
	Surgical	71 (31.3)
Surgical Treatment Type	None	156 (68.7)
	Chest tube	32 (14.1)
	Intercostal Blockage	21 (9.3)
	Surgery	17 (7.5)
	Chest tube + Surgery	1 (0.4)
Length of Hospital Stay	Outpatient	41 (18.1)
	1-7 days	114 (50.2)
	8-20 days	62 (27.3)
	>20 days	10 (4.4)
Extrathoracic Injuries	No	89 (39.2)
	Yes	138(60.8)
Type of Extrathoracic Injury*	Head and Neck	77 (33.9)
	Abdominal	25 (11.0)
	Extremity	80 (35.2)

*Multiple injuries and fractures were observed.

Findings Related to the Type of Incidents

In terms of incident type, traffic accidents were the most common cause (n=164, 72.2%), followed by stab injuries (n=26, 11.5%) and assaults (n=15, 6.6%). When comparisons were made between incident type and age, origin of the incident, and types of extra-thoracic injuries, no statistically significant difference was found (p>0.05) (Table 3).

Comparisons by Gender

Although no significant difference was found in age distribution between genders (p>0.05), significant differences were observed in some types of injuries. Rib fractures were significantly more common in females than in males (p=0.029). No significant gender difference was found in other types of bone fractures or lung injuries (p>0.05). When incident types were evaluated, thoracic trauma caused by traffic accidents was significantly more common in females compared to males (p=0.002). It was also noted that stab injuries occurred only in male cases (Table 4).

Table 3. Comparisons according to the types of incidents

Types of Incidents								p
Traffic Accident			**Assault**	**Fall from Height**	**Stab Injury**	**Firearm Injury**	**Compression Injury**	
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Age	0-18 years							^{c}0,210
	19-29 years	14 (8.5)	0 (0.0)	2 (18.2)	3 (11.5)	0 (0.0)	1 (33.3)	
	30-39 years	42 (25.6)	4 (26.7)	1 (9.1)	8 (30.8)	2 (25.0)	0 (0.0)	
	40-49 years	25 (15.2)	2 (13.3)	2 (18.2)	6 (23.1)	4 (5.0)	0 (0.0)	
	50-59 years	33 (20.1)	3 (20.0)	0 (0.0)	3 (11.5)	1 (12.5)	0 (0.0)	
	>59 years	31 (18.9)	1 (6.7)	4 (36.4)	3 (11.5)	1 (12.5)	2 (66.7)	
		19 (11.6)	5 (33.3)	2 (18.2)	3 (11.5)	0 (0.0)	0 (0.0)	
Origin of the Incident	Intentional Act	0 (0.0)	15 (100)	1 (9.1)	26 (100.0)	8 (100.0)	0 (0.0)	–
	Accidental	164 (100.0)	0 (0.0)	10 (90.9)	0 (0.0)	0 (0.0)	3 (100.0)	
Extra-thoracic Injury	No	61 (37.2)	5 (33.3)	3 (27.3)	15 (57.7)	3 (37.5)	2 (66.7)	^{c}0,317
	Yes	103 (62.8)	10 (66.7)	8 (72.7)	11 (42.3)	5 (62.5)	1 (33.3)	
Head and Neck Injury	No	107 (65.2)	7 (46.7)	7 (63.6)	22 (84.6)	5 (62.5)	2 (66.7)	^{c}0,193
	Yes	57 (34.8)	8 (53.3)	4 (36.4)	4 (15.4)	3 (37.5)	1 (33.3)	
Abdominal Injury	No	149 (90.9)	14 (93.3)	9 (81.8)	20 (76.9)	7 (87.5)	3 (100.0)	^{c}0,265
	Yes	15 (9.1)	1 (6.7)	2 (18.2)	6 (23.1)	1 (12.5)	0 (0.0)	
Extremity Injury	No	99 (60.4)	12 (80.0)	5 (45.5)	21 (80.8)	7 (87.5)	3 (100.0)	^{c}0,057
	Yes	65 (39.6)	3 (20.0)	6 (54.5)	5 (19.2)	1 (12.5)	0 (0.0)	

^{c}Fisher Freeman Halton Test

Table 4. Comparisons by Gender

		Sex		
		Male	**Female**	
		n (%)	**n (%)**	**p**
Age	0-18 years	17 (9.8)	3 (5.7)	a0,557
	19-29 years	47 (27.0)	10 (18.9)	
	30-39 years	31 (17.8)	8 (15.1)	
	40-49 years	28 (16.1)	12 (22.6)	
	50-59 years	30 (17.2)	12 (22.6)	
	>59 years	21 (12.1)	8 (15.1)	
Type of Injury	Rib Fracture	69 (39.7)	30 (56.6)	a0,029*
	Sternum Fracture	17 (9.8)	3 (5.7)	b0,579
	Clavicle Fracture	42 (24.1)	10 (18.9)	a0,424
	Scapula Fracture	21 (12.1)	6 (11.3)	a0,883
	Pneumothorax	22 (12.6)	11 (20.8)	a0,142
	Hemothorax	20 (11.5)	7 (13.2)	a0,736
	Major Vascular Injury	0 (0.0)	1 (1.9)	b0,233
	Lung Tissue Injury	63 (36.2)	19 (35.8)	a0,962
Type of Incident	Traffic Accident	116 (66.7)	48 (90.6)	c0,002**
	Assault	14 (8.0)	1 (1.9)	
	Fall From Height	9 (5.2)	2 (3.8)	
	Stab Injury	26 (14.9)	0 (0.0)	
	Firearm Injury	7 (4.0)	1 (1.9)	
	Compression Injury	2 (1.1)	1 (1.9)	

aPearson Chi-Square Test, bFisher's Exact Test, cFisher Freeman Halton Test, *p<0,05, **p<0,01

DISCUSSION

In this study, 227 patients with thoracic trauma-related injuries were evaluated among the 3965 cases referred to the forensic medicine outpatient clinic of a university hospital for forensic report issuance between 2021 and 2023. The fact that 76.7% of the cases were male and 23.3% female is closely aligned with the distribution reported by Karbeyaz et al., recording 75.6% male and 24.4% female (6). Similarly, Çakan et al. also reported 86% of the cases as male (7). These findings indicate that traumatic events are more frequently encountered by males.

The mean age of the study population was 39.56±17.11, which is higher than the mean age of 30.4±13.8 reported by Karbeyaz et al., and closer to the mean age of 35 years reported by Yalçınkaya et al. (6,8). The presence of trauma cases across a wide age range shows that thoracic trauma poses a risk across various age groups. These findings also highlight that individuals affected by trauma are not limited to young adults but encompass a broad population, from children to the elderly. This underscores the need for post-trauma care and rehabilitation processes to be planned according to age groups.

In the study, 85% of the thoracic traumas were blunt and 15% were penetrating. Although these rates are consistent with some studies in the literature, the rate of penetrating trauma was lower than in some other studies (8–11). The predominance of blunt trauma can be attributed to the high regional prevalence of traffic accidents. The frequency of penetrating traumas, on the other hand, is closely related to crime rates, levels of individual armament, and assault tendencies in the region. Therefore, the distribution of trauma types can be interpreted not only as a reflection of accidents but also of public safety policies.

When examining incident types, 72.2% of traumas were due to traffic accidents, followed by stab injuries (11.5%) and assault (6.6%). This distribution is higher than the 45.8% traffic accident rate reported by Tekinbaş et al. (11). The relatively lower rate of stab injuries compared to some studies may reflect regional differences in the frequency of such violent events (9). The prominent role of traffic accidents in thoracic trauma should be considered not only in terms of injury frequency but also as a key indicator for emergency healthcare services, traffic safety policies, and preventive public health strategies.

When comparing incident types by gender, thoracic trauma due to traffic accidents was found to be significantly higher in females than in males (p < 0.01). The absence of stab injuries in females and their lower exposure to events involving physical violence is considered to result from sociocultural factors (12,13). It is important to note that this apparent increase in traffic accident-related injuries among females does not necessarily reflect a higher exposure to traffic incidents; rather, it may result from

the relatively lower incidence of other trauma mechanisms, such as violence-related injuries, in this group.

The most common bone fractures were observed in the ribs (43.6%), followed by clavicle (22.9%) and scapula (11.9%) fractures, which is consistent with the literature (10,14). Rib fractures were significantly more common in females than in males. This finding is thought to be associated with a higher prevalence of osteoporosis in women, especially in the postmenopausal period, where reduced bone mineral density increases vulnerability to blunt trauma (15–17).

Clinically, this raises the possibility that some rib fractures in older female patients may not be acutely trauma-related, but rather the result of prior fragility fractures or ongoing healing processes, which complicates forensic trauma dating.

In the context of forensic practice, distinguishing between acute traumatic fractures and pre-existing fragility fractures is critical, as this differentiation directly affects the legal interpretation of injury severity and causality. These findings underscore the importance of integrating age- and sex-informed assessments, bone health data, and standardized fracture evaluation protocols into medico-legal reporting.

When examining the severity of fractures, 46.7% were moderate, 31.3% severe, and 0.4% mild, while 21.6% of patients had no fractures. This distribution is consistent with the forensic assessment criteria outlined in Article 87 of the Turkish Penal Code. In forensic reporting, determining the degree of fracture is directly influential in shaping legal sanctions; thus, standardized

classification systems are of critical importance.

Pneumothorax (14.5%), hemothorax (11.9%), and lung tissue injuries (36.1%) were recorded as the main intrathoracic complications accompanying thoracic trauma. These rates are lower than those reported in some literature and may be related to regional differences, early intervention, and variations in diagnostic approaches (10,14). Early detection of pneumothorax and hemothorax, and effective drainage applications can reduce complication rates. Moreover, the impact of such intrathoracic injuries on mortality and morbidity is decisive in shaping treatment decisions. In the present study, rib fractures were observed on the same side as lung parenchymal injuries in most cases, suggesting a direct traumatic relationship. This finding underscores the need for detailed radiological evaluations in forensic practice, as these injuries may influence the determination of life-threatening conditions under the Turkish Penal Code. Accurate differentiation between acute trauma and possible pre-existing conditions is crucial in medico-legal assessments, making interdisciplinary collaboration with radiologists essential.

In this study, 69.6% of cases received conservative treatment and 30.4% underwent surgical intervention. Chest tube insertion was the most commonly applied surgical method (14.1%). These rates are generally consistent with those reported in the literature, although they may vary depending on trauma mechanisms and patient characteristics (11,18). The predominance of conservative management may be a result of the high prevalence of blunt trauma in this study.

The rate of extrathoracic injuries was 60.8%, most frequently affecting the head-neck (33.9%) and extremities (35.2%). These rates were higher than those reported in some other studies and indicate that the individuals were exposed to severe trauma (11,14,19). Particularly in multi-trauma patients, the importance of a multidisciplinary approach becomes evident, as trauma is not confined to a single anatomical region and may lead to systemic effects.

Limitations

This study includes only cases that were referred to the forensic medicine outpatient clinic of a university hospital for forensic reporting. Therefore, the findings may not reflect the overall thoracic trauma profile of the general population. Additionally, certain imaging and treatment records related to some patients were obtained from external healthcare centers, which may have limited the completeness of the clinical data. Due to the retrospective study design, some variables contained missing information, and causal relationships with potential contributing factors could not be established. Considering these limitations, future multicenter and prospective studies are recommended to validate the present findings.

CONCLUSIONS

This study highlights the significance of demographic characteristics and trauma mechanisms in thoracic trauma cases referred for forensic evaluation. The predominance of blunt trauma and the fact that traffic accidents are the most common cause across all age groups underscore the need for population-wide preventive strategies. The higher incidence

of rib fractures observed in women is considered to reflect the impact of biological vulnerabilities such as osteoporosis on trauma outcomes. Additionally, the association between multiple traumas and inpatient treatment underscores the severity of high-energy injuries.

These findings also underline the importance of distinguishing acute traumatic fractures from pre-existing bone injuries in forensic assessments, which may strengthen the accuracy and objectivity of medico-legal reporting standards.

These findings suggest that forensic medicine data can serve as a valuable guide not only in legal proceedings but also in shaping public health policies and trauma management strategies. Integrating forensic medicine with emergency care and preventive health services through a holistic approach is crucial in reducing trauma-related morbidity.

REFERENCES

1.Sirmali M, Türüt H, Topçu S, Gülhan E, Yazıcı Ü, Kaya S, et al. A comprehensive analysis of traumatic rib fractures: morbidity, mortality and management. Eur J Cardiothorac Surg. 2003;24(1):133–8.

2.Çolak B. Toraks travmasının adli yönü. TTD Toraks Cerrahisi Bülteni. 2010;1:1–11. Available from:

https://toraks.org.tr/site/sf/books/pre_migration/3b8a-915e8953999c0a500f09a0d4e09447f9415cc2e0f7577ea-ad0b3dcca1d9d.pdf

3.Dumanlı A. Künt toraks travması geçiren hastalarda oluşan akciğer kontüzyonu ile hemotoraks/pnömotoraks arasındaki ilişki. Kocatepe Tıp Dergisi. 2020;21(3):217–21.

4.Narayanan R, Kumar S, Gupta A, Bansal VK, Sagar S, Singhal M, et al. An analysis of presentation, pattern, and outcome of chest trauma patients at an urban Level 1 trauma center. Indian J Surg. 2018;80(1):36–41.

5.Türk Ceza Kanunu'nda Tanımlanan Yaralama Suçlarının Adli Tıp Açısından Değerlendirilmesi. [Accessed 2025 May 4]. Available from: https://www.atk.gov.tr/tckyaralama24-11-15.pdf

6.	Karbeyaz K, Gündüz T, Akkaya H, Balcı Y. 225 göğüs travmalı olgunun adli tıbbi değerlendirilmesi. Turkiye Klinikleri J Med Sci. 2010;7(2):73–8.

7.Çakan A, Yuncu G, Olgaç G, Alar T, Sevinç S, Kaya ŞÖ. Toraks travması: 987 hastanın analizi. Ulus Travma Acil Cerrahi Derg. 2001;7(4):241–6.

8.Yalçınkaya İ, Sayır F, Kurnaz M, Çobanoğlu U. Göğüs travması: 126 olgunun analizi. Ulus Travma Acil Cerrahi Derg. 2000;6:91–8.

9.İmamoğlu OU, Öncel M, Erginel T, Tunçay E, Dalkılıç G, Acar H, et al. Toraks travmasına yaklaşım: 110 olgunun özeti. Turk Gogus Kalp Damar Cerrahisi Derg. 1999;7(6):345–50.

10.Çobanoğlu U. 110 olgunun analizi. Turk Thorac J. 2006;7(3):159–62.

11.Tekinbaş C, Eroğlu A, Kürkçüoğlu İC, Türkyılmaz A, Yekeler E, Karaoğlanoğlu N. Göğüs travması: 592 olgunun analizi. Ulus Travma Acil Cerrahi Derg. 2003;9(4):248–52.

12.Gülcemal ME. OECD ülkelerinin suç istatistiklerinin incelenmesi ve Türkiye'nin genel durumu. J Econ Res. 2024;2:1–10.

13.	Dixit S. Role of social norms and culture in gender violence. Int J Res Sci Innov. 2024;10(1).

14.Özçelik C, Balcı AE, Eren Ş, Ülkü R, Dablan M, Eren MN. Toraks travmaları: on yıllık deneyim. Ulus Travma Acil Cerrahi Derg. 2000;6(1):9–44.

15.Kutlu R, Çivi S, Pamuk G. Postmenopozal kadınlarda osteoporoz sıklığı ve FRAX™ skalası kullanılarak 10 yıllık kırık riskinin hesaplanması. J Phys Med Rehabil Sci. 2012;127–8.

16.Kaya N, Bölükbaş N, Atıcı İ, Demetgül M. Kadınların yaşam tarzı değişkenleri ile osteoporoz arasındaki ilişki. Sosyal Politika Çalışmaları Dergisi. 2003;5(2).

17.Tang Y, Hong W, Xu X, Li M, Jin L. Traumatic rib fracture patterns associated with bone mineral density statuses derived from CT images. Front Endocrinol (Lausanne). 2023;14. doi:10.3389/fendo.2023.10754511

18.Altunkaya A, Aktunç E, Kutluk AC, Büyükateş M, Demircan N, Demir AS, et al. Göğüs travmalı 282 olgunun analizi. Turk Gogus Kalp Damar Cerrahisi Derg. 2007;15(2):127–32.

19.Leblebici Hİ, Kaya Y, Koçak AH. Göğüs travmalı 302 olgunun analizi. Turk Gogus Kalp Damar Cerrahisi Derg. 2005;13(4):392–6.