The Effects of the COVID-19 Pandemic on Patients with Trauma Presented to the Emergency Department

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Abstract

BACKGROUND: The present study aims to examine the characteristics of patients with trauma who applied to the emergency department in parallel periods before and after the novel Coronavirus Disease 2019 (COVID-19) outbreak and analyze the effects of social change on traumatic injuries.

METHODS: In this study, medical records of patients who presented to the emergency departments of seven hospitals operating as a tertiary training and research hospital in Istanbul between March-June 2018, March-June 2019, and March-June 2020 are due to trauma were retrospectively analyzed. The clinical and demographic characteristics of traumatic injuries before and after the pandemic were compared.

RESULTS: In our study, 4088 trauma patients' data were reviewed; 1279 in March-June 2018, 1684 in March-June 2019, and 1125 in March-June 2020. When the total number of patients was examined, it was noticed that the number of patients decreased significantly during the COVID-19 pandemic. No significant difference was found between the periods regarding sex and trauma mechanisms of the patients. The mean age was higher in patients admitted in 2020 compared to previous years. In our study, incidences of intracranial hemorrhage, femur fracture, lung injuries, and mortality rates were higher in March-June 2020 compared to previous parallel years.

CONCLUSION: In March-June 2020, compared to the previous year, there was a 34% decrease in trauma cases admitted to the emergency department. Albeit no difference was found between the periods regarding trauma mechanisms, the higher mortality in the March-June 2020 period indicates that trauma continues to be one of the major causes of death despite the pandemic.

Introduction

Despite increased trauma prevention measures and advances in post-trauma care, trauma-related deaths remain one of the main causes of mortality worldwide (1). Likewise, it has been reported that roughly 3% of all deaths in our country are due to trauma and the most common cause of these deaths is motor vehicle accidents (2).

The COVID-19 pandemic, which broke out in December 2019 and spread worldwide in a short time, still continues to affect millions of people. Morbidity and mortality are tried to be prevented through treatment strategies and widespread vaccination. Upon the declaration of COVID-19 as a pandemic by the World Health Organization, measures, such as lockdown, social isolation, or restriction of crowded organizations, were taken in many countries. Although the measures were reduced from time to time, these measures were repeated at the peak times of the outbreak. Social restrictions also caused a decrease in hospital admissions due to non-COVID-19 causes (3, 4). In the literature, it has been reported that there is a decrease in acute coronary syndrome (5), stroke (6), orthopedic (7, 8), and pediatric trauma (9) cases during pandemic.

Similarly, in our country, it was seen that outpatient clinic applications other than COVID-19 decreased, and elective surgeries were postponed due to social isolation measures (3, 10). However, the patient profile of the emergency departments diversified with the addition of COVID-19 cases. Although studies for certain disease prevalence have been revealed in the literature in this process, our study aims to compare the demographic characteristics of patients with trauma who presented to seven different hospitals before and after the COVID -19 pandemic.

Material And Method

This was a retrospective, multicenter, cross-sectional study, included 4088 patients with trauma who were admitted to Istanbul Gaziosmanpasa Training and Research Hospital, Istanbul Haydarpasa Numune Training and Research Hospital, Istanbul Kanuni Sultan Suleyman Training and Research Hospital, Istanbul Haseki Training and Research Hospital, Istanbul Şişli Hamidiye Etfal Training and Research Hospital, Istanbul Sancaktepe Sehit Prof. Dr. İlhan Varank Training and Research Hospital, and Istanbul Kartal Dr. Lütfi Kırdar Training and Research Hospital Emergency Department. These seven centers where data were collected were tertiary trauma centers in Istanbul, the most populous city of Turkey, to which all age groups applied. Before conducting this study, ethical approval was obtained from the Local Ethics Committee.

In our study, the period before and during the pandemic was divided into three periods as March-June 2018, March-June 2019, and March-June 2020. March-June 2018 and 2019 were the period when COVID-19 cases were not yet identified worldwide, while March-June 2020 was the period when a pandemic was declared worldwide and our country went into total closure. The medical records of the patients admitted to the above-mentioned centers due to trauma on these dates were reviewed retrospectively. Our inclusion criterion was to apply to the emergency department after having acute trauma in any age group. If the same patient presented to the emergency department more than once in the specified date range, only the first admission was taken into consideration. Patients who were transferred from another hospital to surgery, orthopedics or another branch due to trauma were excluded from this study.

Age, sex, trauma mechanism, discharge or hospitalization, and traumatic injuries of the patients were noted down from the hospital records, and the changes in trauma admissions during the pandemic were analyzed.

The primary outcome of our study was to analyze the effects of the COVID-19 pandemic on patients with trauma presented to the emergency department and its effects on trauma-related injuries. Our secondary outcome was to investigate the effects of the pandemic on traumatic deaths and discharges.

Statistical analysis

Continuous data were presented with mean±standard deviation (SD) and with frequency (n) and percentage (%) for the categorical data. The normality assumptions were controlled by the Shapiro-Wilk test. The association between categorical data was determined by Pearson chi-square and Fisher's exact

test. One-way ANOVA was used to compare age among study groups and the Tukey HSD test was used as a post hoc test for significant cases. Statistical analysis was conducted using the software of IBM SPSS Statistics for Windows, Version 23.0 (IBM Corp., Armonk, NY). A two-sided p-value less than 0.05 was considered statistically significant.

Results

In our study, the data of 4088 patients with trauma, 2963 in the pre-COVID-19 period and 1125 in the March-June 2020 period, were analyzed. The mean age of patients who applied in March-June 2018 was 42.6±25.9 years, while it was 41.4±25.7 years for those who applied in March-June 2019, and 44.1±25.1 years for those who applied in March-June 2020. The mean age of the patients who applied in 2020 was significantly higher than those who applied in 2019 (p=0.021) (Table 1). When we examined the number of trauma patients in the March-June periods of 2018, 2019, and 2020, it was noticed that the number of cases during pandemic decreased by 34% compared to 2019. No significant difference was determined regarding sex distribution of the patients by years (p=0.282). When we examined the trauma mechanisms according to 2018, 2019, and 2020, no significant difference was found between the trauma mechanisms of the patients who were admitted to the hospital in the same months before and during the pandemic (Table 2).

The incidence of finger amputation in 2020 (1.2%) was higher than in 2019 (0.4%) (p=0.034), while the incidence of shoulder dislocation in 2020 (0.5%) was higher than in 2018 (0%) (p=0.022), and the incidence of other joint dislocations in 2018 (0.6%) was significantly higher than in 2020 (0%) (p=0.014). Motor accident (p=0.056), occupational accident (p=0.095) and foot sprain (p=0.073) incidences were higher in 2020, and the incidences of falling off a bicycle (p=0.072) in 2019 were higher yet the difference was not significant.

In our study, the incidence of intracranial hemorrhage in 2020 (13%) was higher than in 2018 (9.7%) (p=0.021), while the incidence of lumbar vertebral fracture in 2019 (2.8%) was higher than in 2020 (1.4%) (p=0.049). The incidence of hemothorax in 2020 (3.1%) was higher than in 2018 (1.6%) and 2019 (1.8%) (p=0.026). The lung contusion incidence in 2020 was 5.6%, which was higher than in 2018 (1.3%) and 2019 (2.6%) (p<0.001). Incidence of intestinal perforation (1.3%) was significantly higher in 2018 than 2019 (0.1%) and 2020 (0.4%) (p<0.001). While the incidence of urinary bladder injury in 2020 (0.7%) was higher than in 2018 (0.1%) (p=0.033), the incidence of intra-abdominal fluid in 2020 (4.1%) was higher than in 2018 (2.1%) and 2019 (2%) (p=0.001), the soft tissue injury rate in 2018 (15.8%) was higher (p=0.021) than in 2019 (12.4%), and the incidence of simple cuts or abrasions (17.9%) in 2020 was higher than in 2018 (12.2%) and 2019 (12.5%) (p<0.001). When the distribution of fracture types by years was analyzed, the incidence of costal fracture (3.6%) in 2019 and 2020 was higher (p<0.001) than in 2018 (p<0.001), while the rate of radius fracture and hand phalanx fracture (8.6% and 3.6%) in 2019 were higher (p=0.005 and p=0.030, respectively) than in 2020 (5.5% and 2%). The incidence of femoral fracture in 2020 (22%) was higher than in 2019 (17.5%) (p=0.009). The incidence of muscle tears in 2019 (3.1%) was significantly higher than in 2018 (1.6%), while the rate of other tears in 2018 (9.4%) was significantly

higher than in 2019 (5.5%) and 2020 (6%) ($p=0.011$ and $p<0.001$) (Table 3). The rate of patients who died in 2020 (4.3%) was significantly higher than in 2018 (2.1%) and 2019 (2.4%) ($p=0.003$). In 4052 patients who were negative for COVID-19, the exitus rate (3.6%) in 2020 was higher than in 2018 (2.1%) ($p=0.037$). While 72.2% of the 36 patients with COVID-19 PCR positive were discharged and 2.8% were referred, 25% were exitus (Table 4).

Discussion

In our study, we found out that there was a 34% decrease in trauma cases admitted to the Department of Emergency in the March-June 2020 period compared to the previous year. Besides, no significant difference was determined between the mentioned periods regarding trauma mechanisms. However, we found a higher post-traumatic death rate during the pandemic.

The decrease in trauma cases during the pandemic period may be due to the decrease in traumatic injuries because of the social restrictions and lockdown mandates, or because patients after minor trauma did not apply to hospitals for fear of COVID-19 contamination. Similar to our study, Harnett et al. compared March 29-April 25, 2020 with March 31-April 27, 2019, and found that there was a 42% decrease in the Department of Emergency admissions (11). İlhan et al., in their single-center study, revealed a 60% decrease in trauma admissions during the pandemic (12). In another study comparing before and after lockdown, it was shown that post-traumatic hospitalization decreased by 30.9% during the lockdown period (13). In another study conducted with 618 patients, it was stated that the need for open surgery increased in the pandemic period compared to the pre-pandemic period, although a 25% decrease was detected in the patients who applied to the emergency department for surgical reasons during the pandemic period (10). In the study investigating the injury-related hospitalization of 21 hospitals between March 15-April 30, 2016-2020, it was shown that hospitalization decreased by 26% during the lockdown period (14).

Regarding the trauma mechanisms, Chiba et al. found a 38.7% reduction in motorcycle accidents, a 42.5% reduction in auto versus pedestrian accidents, a 28.4% reduction in bicycle accidents. However, they did not report a significant reduction in motor vehicle accidents during pandemic (15). Besides, DiFazio et al. reported a 75% reduction in motor vehicle accidents and a 28.9% reduction in falls, along with a 44.9% reduction in trauma admissions during the lockdown period of the pandemic (16). Moreover, İlhan et al. detected a significant decrease in pedestrian injuries during the pandemic (12). On the other hand, in our study, unlike these studies, the trauma mechanism was similar in the specified periods of all three years. Albeit a significant decrease in traumatic injuries was an expected finding during the pandemic, it was remarkable for us that the trauma mechanism did not change. The reason for this may be that although there are social restrictions and lockdowns, a substantial group, such as people with special work permits or motor couriers, is exempt from these bans. In addition, although the decrease in the number of vehicles on the road relieves Istanbul traffic, the trauma mechanism may not change compared to previous years due to the use of vehicles at higher speeds on relatively empty roads. When we examined the traumatic injuries in our study, the fact that intracranial bleeding, hemothorax, lung

contusion, intestinal perforation, urinary system injury, free fluid in the abdomen, soft tissue injury, rib fracture, and femur fracture were detected more frequently in the March-June 2020 period compared to previous parallel years support the exposure to high-energy trauma during the pandemic period. Hence, we consider that the enforcement of traffic rules and raising public awareness about traumas are of considerable importance even during lockdown periods.

Chiba et al. revealed that mortality decreased during the lockdown period compared to the previous year (15). On the other hand, Yasin et al. showed that mortality was higher during the pandemic period in their study, in which they included 750 road traffic collision patients during the pre-COVID-19 period and 499 road traffic collision patients during the COVID-19 period (17). Likewise, when we looked at the post-traumatic death rates in our study, there was a significant increase in the death rate in 2020. The reason for this may be the occurrence and mortality of high-energy traumatic injuries at higher speeds in reduced traffic. Furthermore, a more elective approach to the patients due to the pandemic and the waiting for the PCR results for the operation during the pandemic might increase the mortality. The current study has some limitations. Firstly, it was a retrospective study and therefore some data were not available. Trauma scores could not be calculated due to missing data. Although we showed that some injuries were more common in the Covid-19 period in our study, we could not compare the trauma scores with the pre- and post-Covid-19 periods. Secondly, although we conducted a multicenter study, regional studies with larger participation are needed to analyze the effects of the Covid-19 pandemic and social isolation on trauma.

Conclusion

In line with the literature, lockdown and social isolation measures mandated in many countries due to the pandemic resulted in a remarkable decrease in the number of traumas admitted to hospitals in our country. However, when we examined the trauma mechanism during the lockdown, there was no significant change compared to the previous parallel years, but the mortality rate was higher, especially with intracranial hemorrhage, femur fracture, and lung injuries. These findings indicate that trauma remains one of the major causes of death despite the pandemic. Thus, it supports the significance of planning trauma care and necessary measurements in today's peak day of COVID-19 and a likely new lockdown period to prevent mortality.

Declarations

Consent for publication:

No applicable

Competing interests:

The authors declare that they have no competing interests.

Availability of data and materials:

The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials.

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Authors' contributions:

MC, BGY designed this study and made additional contributions to its design. MC, BGY,RG,ŞÇ and ÖS conceived and conducted statistical analyses, with additional advice regarding analyses. RG and BGY drafted the manuscript and all authors approved the final manuscript.

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Tables

Table 1. Demographic characteristics

Demographics	**2018 (n:1279)**	**2019 (n:1684)**	**2020 (n:1125)**	**p**
Sex, n (%)				
Female	470(36.7)	581(34.5)	381(33.9)	0.282
Male	809(63.3)	1103(65.5)	744(66.1)	
Age (years), mean±SD	42.6±25.9[a.b]	41.4±25.7[a]	44.1±25.1[b]	**0.021**

Pearson chi-square test. One-way ANOVA with post-hoc Tukey HSD test. Same letters in a row denote the lack of statistically significant difference.

Table 2. Mechanism of Injury

Mechanism, n (%)	2018 (n:1279)	2019 (n:1684)	2020 (n:1125)	p
Motor vehicle accident	102(8)	110(6.5)	74(6.6)	0.254
Auto versus pedestrian	190(14.9)	243(14.4)	149(13.2)	0.507
Motorcyle accident	61(4.8)	106(6.3)	79(7)	0.056
Fall from high place	125(9.8)	178(10.6)	113(10)	0.766
Stab wound	48(3.8)	62(3.7)	50(4.4)	0.557
Firearm injuries	32(2.5)	58(3.4)	42(3.7)	0.189
Bicycle accident	23(1.8)	33(2)	10(0.9)	0.072
Burn	8(0.6)	4(0.2)	8(0.7)	0.127
Blunt assault	56(4.4)	61(3.6)	45(4)	0.578
Industrial injury	34(2.7)	65(3.9)	47(4.2)	0.095
Ingress of foreign body	12(0.9)	17(1)	14(1.2)	0.745
Limb impingement	1(0.1)	2(0.1)	2(0.2)	0.863
Suicide	2(0.2)	0(0)	0(0)	0.174

Pearson chi-square test, Fisher's Exact test, Same letters in a row denote the lack of statistically significant difference,

Table 3. Diagnoses per year.

Main diagnosis , n (%)	2018 (n:1279)	2019 (n:1684)	2020 (n:1125)	p
Cranial fracture	138(10.8)	204(12.1)	116(10.3)	0.283
Intracranial hemorrhage	124(9.7)[a]	172(10.2)[a.b]	146(13)[b]	**0.021**
Cervical vertebral fracture	11(0.9)	9(0.5)	13(1.2)	0.191
Thoracic vertebral fracture	24(1.9)	29(1.7)	18(1.6)	0.873
Lumbar vertebral fracture	27(2.1)[a.b]	47(2.8)[a]	16(1.4)[b]	**0.049**
Thoracic injury	39(3)[a]	82(4.9)[b]	87(7.7)[c]	**<0.001**
Hemothorax	21(1.6)[a]	31(1.8)[a]	35(3.1)[b]	**0.026**
Pneumothorax	25(2)	54(3.2)	31(2.8)	0.112
Lung contusion	17(1.3)[a]	43(2.6)[a]	63(5.6)[b]	**<0.001**
Costal fracture	13(1)[a]	60(3.6)[b]	41(3.6)[b]	**<0.001**
Cardiac injury	5(0.4)	2(0.1)	0(0)	0.064
Great vessel injury	8(0.6)	11(0.7)	6(0.5)	0.936
Internal organ injury	56(4.4)	61(3.6)	52(4.6)	0.371
Liver injury	18(1.4)	16(1)	10(0.9)	0.379
Spleen injury	11(0.9)	19(1.1)	9(0.8)	0.624
Intestinal perforation	16(1.3)[a]	1(0.1)[b]	4(0.4)[b]	**<0.001**
Kidney injury	8(0.6)	7(0.4)	2(0.2)	0.236
Urinary bladder injury	1(0.1)[a]	5(0.3)[a.b]	8(0.7)[b]	**0.033**
Intra-abdominal free fluid	27(2.1)[a]	34(2)[a]	46(4.1)[b]	**0.001**
Simple incisions/ graze	156(12.2)[a]	211(12.5)[a]	201(17.9)[b]	**<0.001**
Orthopedic fracture	910(71.1)	1231(73.1)	813(72.3)	0.502
Humeral fracture	103(8.1)	162(9.6)	97(8.6)	0.314
Ulna fracture	70(5.5)	76(4.5)	44(3.9)	0.182
Radius fracture	83(6.5)[a.b]	144(8.6)[a]	62(5.5)[b]	**0.005**

Metacarpal bone fracture	28(2.2)	33(2)	29(2.6)	0.549
Hand phalanx fracture	30(2.3)[a.b]	60(3.6)[a]	23(2)[b]	**0.030**
Pelvic fracture	98(7.7)	134(8)	86(7.6)	0.938
Femur fracture	258(20.2)[a.b]	294(17.5)[a]	248(22)[b]	**0.009**
Tibia fracture	182(14.2)	252(15)	162(14.4)	0.837
Fibula fracture	71(5.6)	112(6.7)	87(7.7)	0.099
Metatarsal fracture	42(3.3)	49(2.9)	45(4)	0.286
Foot phalanx fracture	20(1.6)	27(1.6)	21(1.9)	0.819
Muscle tears	20(1.6)[a]	53(3.1)[b]	22(2)[a.b]	**0.011**
Other fractures	120(9.4)[a]	92(5.5)[b]	68(6)[b]	**<0.001**

Pearson chi-square test, Fisher's Exact test. Same letters in a row denote the lack of statistically significant difference.

Table 4. Recent outcome of patients by year

Outcome. n (%)	**2018 (n:1279)**	**2019 (n:1684)**	**2020 (n:1125)**	**p**
All patients (n:4088)				
Discharge	1238(96.8)[a]	1633(97)[a]	1072(95.3)[a]	**0.003**
Referral to another hospital	14(1.1)[a]	10(0.6)[a]	5(0.4)[a]	
Exitus	27(2.1)[a]	41(2.4)[a]	48(4.3)[b]	
Covid 19 PCR negative patients (n:4052)				
Discharge	1238(96.8)[a]	1633(97)[a]	1046(96.1)[a]	**0.037**
Referral to another hospital	14(1.1)[a]	10(0.6)[a]	4(0.4)[a]	
Exitus	27(2.1)[a]	41(2.4)[a.b]	39(3.6)[b]	
Covid 19 PCR positive patients (n:36)				
Discharge	-	-	26(72.2)	**-**
Referral to another hospital	-	-	1(2.8)	
Exitus	-	-	9(25)	

Pearson chi-square test, Same letters in a row denote the lack of statistically significant difference.