Eskisehir Medical Journal
Eskişehir Tıp Dergisi

Eskisehir Med J. 2025; 6(2): 130-139
doi: 10.48176/esmj.2025.194

Original Article / Araştırma Makalesi

IMPACT OF THE COVID-19 PANDEMIC ON MOTORCYCLE ACCIDENT SEVERITY AND DEMOGRAPHIC CHARACTERISTICS: A RETROSPECTIVE EMERGENCY DEPARTMENT STUDY

COVID-19 PANDEMİSİNİN MOTOSİKLET KAZASI CİDDİYETİ VE DEMOGRAFİK ÖZELLİKLER ÜZERİNDEKİ ETKİSİ: RETROSPEKTİF BİR ACİL SERVİS ÇALIŞMASI

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ABSTRACT

Introduction: This study aimed to assess injury severity and the demographic and clinical characteristics of patients admitted to the emergency department following motorcycle accidents before and after the COVID-19 pandemic.

Methods: A retrospective study was conducted on patients presenting to the emergency department of a university hospital due to motorcycle accidents during the two years before and after the pandemic. Comparisons between the pre- and post-pandemic periods were made regarding age, sex, injury severity, injury sites, employment status as couriers, and ethanol positivity. Injury Severity Score (ISS) >15 was the primary endpoint. Statistical analysis used Chi-square or Fisher's exact test for categorical variables, and Student's t-test or Mann-Whitney U test for continuous variables, with $p < 0.05$ considered significant.

Results: A total of 112 pre-pandemic and 354 post-pandemic patients were included in the study. The mean age was 28.98±9.75 years, with 91.2% male. The proportion of patients with ISS >15 was similar across periods (4.5% vs. 4.8%, $p = 0.883$). Ethanol-positive patients had higher ISS scores, and more maxillofacial fractures, pneumothorax/hemothorax, and lung contusions. Among the study population, 21.2% were couriers, with radius/ulna fractures more common in couriers than non-couriers.

Conclusion: Post-pandemic, motorcycle accidents increased, with a higher proportion of couriers. ISS scores remained similar between pre and post-pandemic periods. Safe driving techniques education, law regulations, and awareness regarding alcohol use are needed.

Keywords: COVID-19, Emergency medicine, Injury Severity Score, Motorcycle, Trauma

ÖZET

Giriş: Bu çalışmanın amacı, COVID-19 pandemisinden önce ve sonra motosiklet kazaları sonucu acil servise başvuran hastaların yaralanma şiddetini ve demografik ve klinik özelliklerini değerlendirmektir.

Yöntemler: Pandemiden önceki ve sonraki iki yıl içinde motosiklet kazaları nedeniyle bir üniversite hastanesinin acil servisine başvuran hastalar üzerinde retrospektif bir çalışma yürütülmüştür. Pandemi öncesi ve sonrası dönemler arasında yaş, cinsiyet, yaralanma şiddeti, yaralanma bölgeleri, kurye olarak çalışma durumu ve etanol pozitifliği açısından karşılaştırmalar yapılmıştır. Yaralanma Şiddeti Skoru (ISS) >15 birincil son noktaydı. İstatistiksel analizde kategorik değişkenler için Ki-kare veya Fisher'ın kesin testi ve sürekli değişkenler için Student'ın t-testi veya Mann-Whitney U testi kullanılmış olup $p < 0,05$ anlamlı kabul edilmiştir.

Bulgular: Çalışmaya toplam 112 pandemi öncesi ve 354 pandemi sonrası hasta dâhil edilmiştir. Ortalama yaş 28,98±9,75 yıldı ve %91,2'si erkekti. ISS >15 olan hastaların oranı dönemler arasında benzerdi (%4,5'e karşı %4,8, $p = 0,883$). Etanol pozitif hastalarda daha yüksek ISS puanları ve daha fazla maksillofasiyal kırık, pnömotoraks/hemotoraks ve akciğer kontüzyonları vardı. Çalışma popülasyonunun %21,2'si kuryeydi ve kuryelerde radius/ulna kırıkları kurye olmayanlara göre daha yaygındı.

Sonuç: Pandemiden sonra motosiklet kazaları arttı ve kuryelerin oranı daha yüksekti. ISS puanları pandemi öncesi ve sonrası dönemlerde benzer kaldı. Güvenli sürüş teknikleri eğitimi, yasal düzenlemeler ve alkol kullanımı konusunda farkındalık gereklidir.

Anahtar kelimeler: COVID-19, Acil tıp, Yaralanma Şiddeti Skoru, Motosiklet, Travma

INTRODUCTION

On March 11, 2020, the World Health Organization officially announced the Novel Coronavirus Disease (COVID-19) outbreak as a global pandemic. As of December 1, 2024, the total number of confirmed COVID-19 cases globally had surpassed 776 million, with reported deaths amounting to 7,077,725 (1). The pandemic has profoundly affected healthcare systems, social structures, and economies across the globe. In response to the crisis, numerous public health measures were implemented to curb the spread of the virus, including social distancing and isolation protocols, the suspension of non-essential services, the enforcement of hygiene practices such as mask-wearing and hand washing, and widespread

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Submission Date: 26.04.2025 **Acception Date:** 21.05.2025
Cite as: Kir V, Genc S, Koca A, et al. Impact of the COVID-19 pandemic on motorcycle accident severity and demographic characteristics: A retrospective emergency department study. Eskisehir Med J. 2025; 6(2): 130-139. doi: 10.48176/esmj.2025.194

lockdowns. These interventions significantly altered daily life, resulting in an increased demand for non-face-to-face services, particularly delivery services. Furthermore, concerns regarding the risk of infection in public transportation systems prompted a surge in the use of motorcycles as an alternative mode of travel.

Worldwide, traffic accidents are the primary cause of mortality among young individuals (2). Motorcyclists face a 30-fold higher risk of being involved in an accident and a 9.3-fold higher risk of dying from accident-related injuries compared to other road users (3). Data from the Turkish Statistical Institute reveal a steady increase in motorcycle registrations, from 3,211,328 in 2018 to 3,744,370 in 2021 (4). Motorcycles are commonly employed in delivery services due to their ability to navigate traffic congestion efficiently and their lower transportation costs. The increased demand for delivery services during the pandemic, coupled with public avoidance of mass transportation, has contributed to a rise in motorcycle use. In times of crisis, such as the pandemic, understanding the demographic and clinical characteristics of trauma-related injuries can inform efforts to prevent accident-related harm and improve trauma care strategies.

This study aimed to examine the injury severity, as well as the demographic and clinical characteristics, of patients admitted to the emergency department (ED) following motorcycle accidents before and after the COVID-19 pandemic. Additionally, the study explored the impact of working as a courier and the presence of elevated ethanol levels on the injury profiles of patients involved in motorcycle accidents requiring emergency care.

METHODS

Study design

This study retrospectively analyzed patients who presented to the ED of a university-affiliated practice and research hospital due to motorcycle accidents during the two years before and the two years following the onset of the COVID-19 pandemic. The analysis focused on injury severity and characteristics. Before conducting the study, approval was obtained from the Human Research Ethics Committee of the School of Medicine, Ankara University (approval date: January 26, 2023; decision number: İ01-46-23).

Setting

The research was carried out at the Ankara University School of Medicine, İbni Sina Practice and Research Hospital, which has a bed capacity of 936 and receives approximately 45,000 annual ED visits. Data from patients who presented to the ED due to motorcycle accidents during the two years before and two years after March 11, 2020—the date on which the World Health Organization officially declared COVID-19 a pandemic— were analyzed. This date also coincides with the first confirmed COVID-19 case in Türkiye, and was therefore used to define the pre- and post-pandemic periods. The data were retrieved by reviewing patient records, epicrisis reports, laboratory test results, and radiological findings.

Participants

The study sample was identified through a review of the healthcare document management system of the hospital. Patients who presented to the ED over four years and were diagnosed with motorcycle accidents (ICD-10 codes V20-V29) were selected for inclusion. Individuals excluded from the study included those for whom the Injury Severity Score (ISS) could not be calculated due to missing data, as well as those under 18.

Variables

The study examined both demographic and clinical variables. Demographic and epidemiological data included age, sex, application period (pre-pandemic/post-pandemic), time of application (08.00-15.59, 16.00-23.59, 00.00-07.59), and employment status as a courier (Yes/No). Clinical features included the shock index and Glasgow Coma Scale (GCS). Laboratory tests assessed hemoglobin (g/dL), lactate (mmol/L), and ethanol levels (positive: ≥10 mg/dL, negative: <10 mg/dL). Data regarding helmet use at the time of the accidents were not documented in the patient records and therefore could not be included in the analysis.

The types of injuries identified in the patients were categorized as skull fractures, maxillofacial fractures, epidural/subdural/subarachnoid hemorrhage/brain contusion, cervical vertebral fractures, thoracolumbar vertebral fractures, rib fractures, pneumothorax/hemothorax, lung contusions, liver/kidney/spleen injuries, intra-abdominal hemorrhage, pelvic fractures, upper extremity (clavicle, scapula, shoulder joint, humerus, elbow, radius/ulna, wrist, and hand bones) fractures, and lower extremity (femur, knee joint, tibia/fibula, ankle, and foot) fractures. These injuries were recorded as "present" or "absent."

ISS was used to assess the severity of injury in patients. Injury severity was categorized as non-minor (ISS ≥9) and major (ISS >15) based on the calculated ISS. Although various ISS classification schemes exist, these thresholds were selected based on their clinical relevance and were used consistently throughout the statistical analysis (5). Major trauma (ISS >15) was considered the primary endpoint of the study. Secondary endpoints included in-hospital mortality, patient outcomes in the ED, and the need for surgical intervention. Additionally, patient subgroups were analyzed based on employment status as couriers and positive/negative ethanol levels.

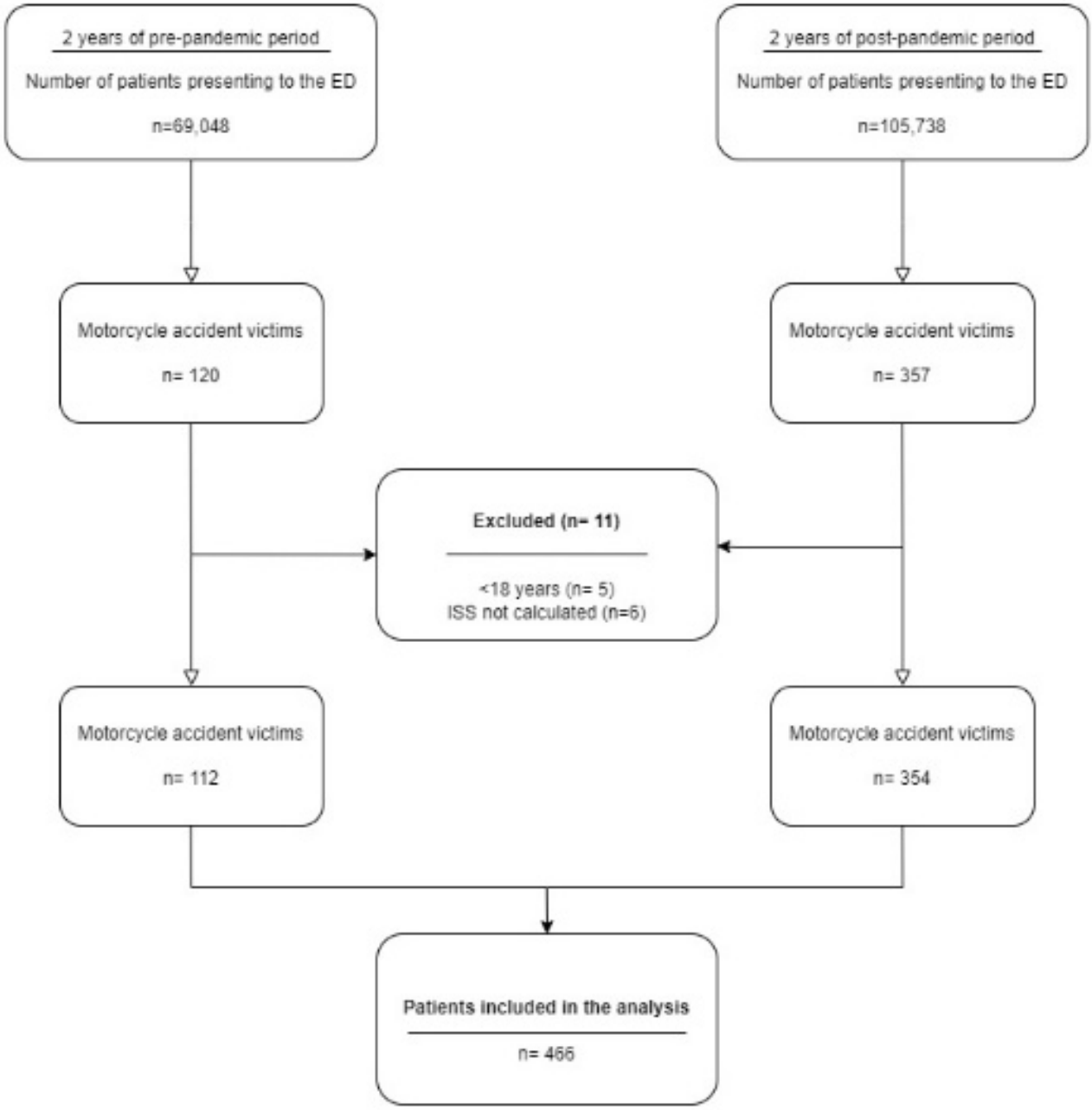
Statistical Analysis

Descriptive statistics were employed to summarize the data, with categorical variables expressed as frequencies and percentages. Numerical data were presented as means and standard deviations for variables following a normal distribution and as medians and interquartile ranges (IQR) for those exhibiting a non-normal distribution. For comparisons between groups, the Chi-square test or Fisher's exact test was used for categorical variables. For continuous variables, the Student's t-test was applied to normally distributed data with two independent groups, while the Mann-Whitney U test was used for non-normally distributed data. A p-value of <0.05 was considered statistically significant. All statistical analyses were conducted using SPSS version 23.0 (IBM SPSS Statistics for Windows, Version 23.0, Armonk, NY: IBM Corp.).

RESULTS

A total of 69,048 patients presented to the ED of İbni Sina Practice and Research Hospital during the pre-pandemic period (March 11, 2018–March 10, 2020), and 105,738 patients presented during the post-pandemic period (March 11, 2020–March 10, 2022). Data were collected for 120 patients in the pre-pandemic period and 357 patients in the

Figure 1. The patient flow chart of the study



post-pandemic period who sought care due to motorcycle accidents. Five patients were excluded for being under 18, and six for incomplete data preventing ISS score calculation. A total of 466 patients were included in the analysis, with 112 from the pre-pandemic period and 354 from the post-pandemic period. The patient flow diagram is shown in **Figure 1**, and the bar chart depicting the monthly number of motorcycle accident-related ED admissions over the four-year study period is presented in **Figure 2**.

In this study, 425 (91.2%) patients were male and 41 (8.8%) were female, with a mean age of 28.98±9.75 years. Analysis of the time of ED visits revealed that the highest number of admissions occurred between 16.00 and 23.59 (n=264, 56.7%). Additionally, 21.2% (n=99) of the patients were employed as couriers. The demographic and clinical characteristics of the study participants are provided in **Table 1**.

Before the pandemic, the most prevalent types of injuries were lower extremity fractures (13.4%), upper extremity fractures (8%), thoracolumbar vertebra fractures (3.6%), maxillofacial fractures (2.7%), and rib fractures (2.7%). In the post-pandemic period, the most frequent injuries included lower extremity fractures (11.6%), upper extremity fractures (10.2%), rib fractures (3.4%), thoracolumbar vertebra fractures (2.5%), and maxillofacial fractures (2.5%). No statistically significant differences were found when comparing the types of injuries between the pre-pandemic and post-pandemic periods (**Table 2**).

The primary endpoint of our study was an ISS >15. Among the 112 patients in the pre-pandemic period, 5 (4.5%) had an ISS >15, while in the post-pandemic period, 17 of 354 patients (4.8%) had an ISS >15. No significant difference was observed between the two periods (p=0.883). When comparing the rates of minor trauma (ISS <9), 75.9% of patients in the pre-pandemic period and 77.7% of patients in the post-pandemic period had an ISS <9 (p=0.694) (**Table 3**). Furthermore, no significant differences were found between the pre- and post-pandemic periods regarding patient outcomes or the need for surgical intervention (**Table 3**).

Ethanol levels were found to be positive in 9.2% of patients in the pre-pandemic period and 7.2% in the post-pandemic period. Patients with positive ethanol levels had significantly higher ISS scores compared to those with negative ethanol levels. Additionally, maxillofacial bone fractures, pneumothorax/hemothorax, and lung contusions were more prevalent in patients with positive ethanol levels (**Table 4**). Among the study population, 9.8% of patients in the pre-pandemic period and 24.9% in the post-pandemic period were employed as couriers. Radius/ulna fractures were more common in couriers than in non-couriers (**Table 4**).

Figure 2. Bar chart of monthly number of patients admitted to the emergency department due to motorcycle accidents

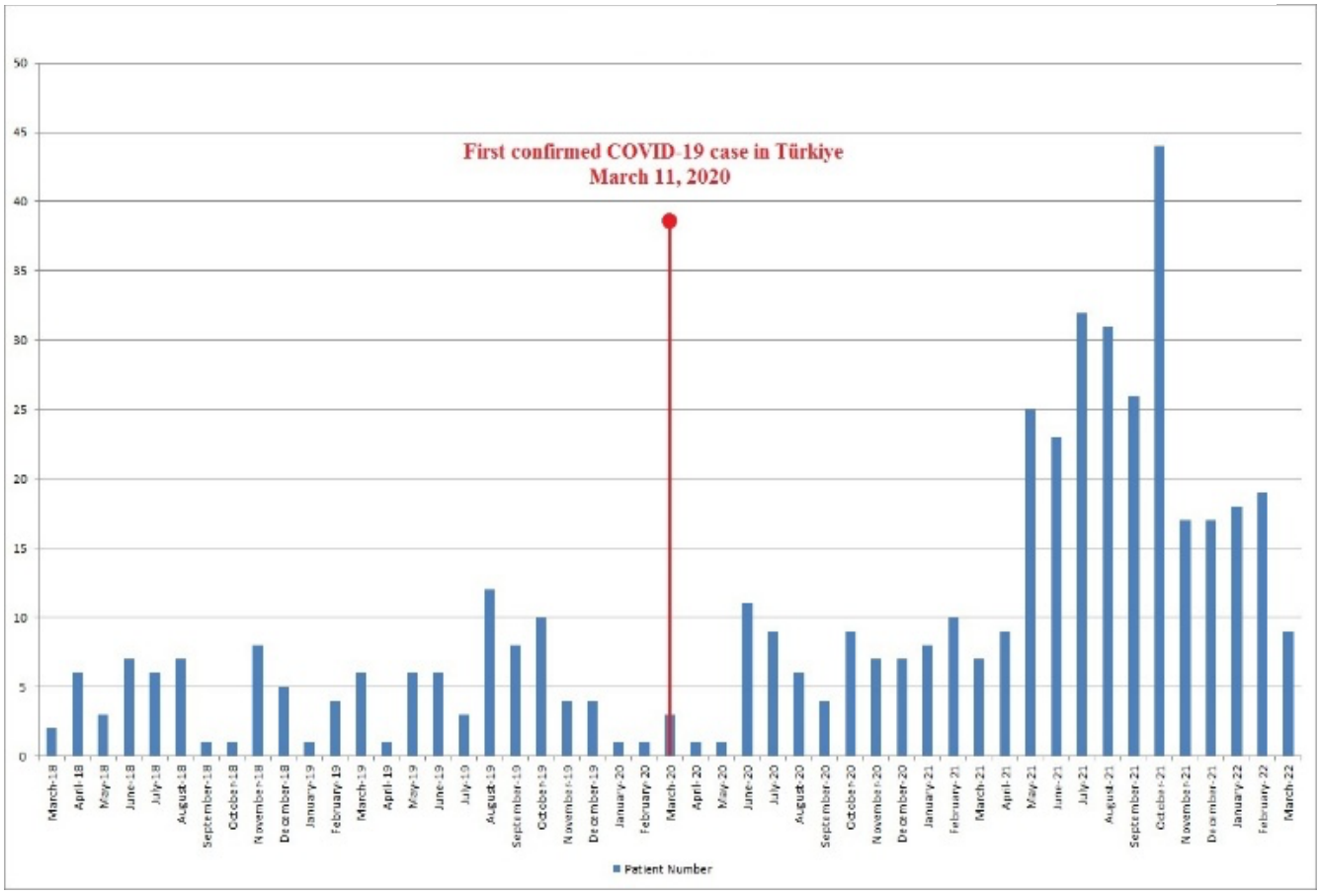


Table 1. Baseline characteristics of the study population

	Pre-pandemic period (n=112)	Post-pandemic period (n=354)	p
Sex, n (%)			
Male	95 (84.8)	330 (93.2)	**0.006**
Female	17 (15.2)	24 (6.8)	
Age (years), median (IQR)	28 (12)	25 (11)	**0.005**
Application Time, n (%)			
08.00-15.59	33 (29.5)	108 (30.5)	0.977
16.00-23.59	64 (57.1)	200 (56.5)	
00.00-07.59	15 (13.4)	46 (13.0)	
Courier, n (%)			
Yes	11 (9.8)	88 (24.9)	**0.001**
No	101 (90.2)	266 (75.1)	
Shock Index, median (IQR)	0.69 (0.107)	0.68 (0.133)	0.220
Glasgow Coma Scale, median (IQR)	15 (0)	15 (0)	0.708
Hemoglobin (g/dL), median (IQR)	15.1 (1.8)	15 (1.8)	0.784
Lactate (mmol/L), median (IQR)	1.1 (1.5)	1.3 (1.9)	0.377
Ethanol (n=455), n (%)			
Negative	99 (90.8)	321 (92.8)	0.506
Positive	10 (9.2)	25 (7.2)	

Abb. IQR: Interquartile range

In this study, one patient died in the hospital. The patient was a 66-year-old male who presented during the post-pandemic period. He was not employed as a courier, had a negative ethanol level, and had a GCS of 3 upon arrival at the ED. The patient sustained skull fractures, subarachnoid hemorrhage, multiple rib fractures, and hemothorax.

DISCUSSION

In our study, we observed a three-fold increase in the number of patients presenting to the ED due to motorcycle accidents in the post-pandemic period (n=112 vs. 354). A similar study conducted in Türkiye also reported a two-fold increase in the number of ED visits due to motorcycle accidents in the post-pandemic period (n=74 vs. 153) (6). Another study in Türkiye noted that 129 patients presented to the ED due to motorcycle accidents in the year before the pandemic, compared to 1,006 patients in the two years following the pandemic's onset (7). In Brazil, a study analyzing motorcycle accidents through the Information System on Land Transport Accidents reported a decrease in the number of motorcycle accidents from 6,206 in the year before the pandemic to 5,402 in the year after (8). The increase in motorcycle accidents observed in the post-pandemic period may be attributed to a preference for motorcycle use over public transportation due to infection risks, as well as a rise in the number of motorcycle couriers. Differences in the rates of motorcycle accidents between countries before and after the pandemic may reflect variations in socioeconomic status, preferred modes of transportation, and the measures implemented during the pandemic.

The majority of motorcycle accident victims (89-95%) are male (9,10). In our study, we found that the proportion of male patients presenting to the ED due to motorcycle accidents was higher in the post-pandemic period (84.8% vs. 93.2%). Studies comparing the pre- and post-pandemic periods have shown no significant change in the gender distribution of motorcycle accident victims, with males consistently comprising the majority of cases (6,8). A study conducted in Brazil examining motorcycle accidents before and after the pandemic found that the highest incidence of injuries occurred in the 20-39 age group in both periods (8). Similarly, a study in Türkiye revealed that the average age of patients presenting to the ED due to motorcycle accidents was comparable before and during the pandemic (24.74 vs. 25.72 years) (7). In contrast, our study found a lower average age in the post-pandemic period. This shift may be attributed to the reduction in job opportunities and the increase in home delivery services during the pandemic, which likely led a younger demographic, seeking new employment, to turn to delivery services.

In retrospective trauma studies, an ISS >15 is commonly used to define major trauma. Motorcycle accidents are considered one of the primary mechanisms of high-energy trauma. In the study by Yun et al., the mean ISS for patients

Table 2. Injury types in motorcycle accidents during pre-pandemic and post-pandemic periods

	All patients n (%)	Pre-pandemic period n (%)	Post-pandemic period n (%)	p
Skull fractures	8 (1.7)	1 (0.9)	7 (2)	0.686
Maxillofacial bone fractures	12 (2.6)	3 (2.7)	9 (2.5)	1
Traumatic Brain Injury*	5 (1.1)	0 (0)	5 (1.4)	0.344
Cervical vertebra fractures	2 (0.4)	0 (0)	2(0.6)	1
T/L vertebra fractures	13 (2.8)	4 (3.6)	9 (2.5)	0.523
Rib fractures	15 (3.2)	3 (2.7)	12 (3.4)	1
Pneumothorax/hemothorax	5 (1.1)	2 (1.8)	3 (0.8)	0.598
Pulmonary contusion	10 (2.1)	3 (2.7)	7 (2)	0.709
Liver/kidney/spleen injury	4 (0.9)	2 (1.8)	2 (0.6)	0.245
Intra-abdominal hemorrhage	1 (0.2)	0 (0)	1 (0.3)	1
Pelvic fractures	6 (1.3)	2 (1.8)	4 (1.1)	0.634
Clavicle fractures	11 (2.4)	2 (1.8)	9 (2.5)	1
Scapula fractures	4 (0.9)	1 (0.9)	3 (0.8)	1
Shoulder fractures	4 (0.9)	1 (0.9)	3 (0.8)	1
Humerus fractures	3 (0.6)	0 (0)	3 (0.8)	1
Elbow fractures	1 (0.2)	0 (0)	1 (0.3)	1
Radius/ulna fractures	14 (3)	3 (2.7)	11 (3.1)	1
Wrist fractures	4 (0.9)	1 (0.9)	3 (0.8)	1
Hand fractures	14 (3)	3 (2.7)	11 (3.1)	1
Femur fractures	9 (1.9)	0 (0)	9 (2.5)	0.122
Knee fractures	3 (0.6)	2 (1.8)	1 (0.3)	0.145
Tibia/fibula fractures	29 (6.2)	7 (6.3)	22 (6.2)	0.989
Ankle fractures	9 (1.9)	3 (2.7)	6 (1.7)	0.454
Foot fractures	18 (3.9)	5 (4.5)	13 (3.7)	0.778
Upper extremity fractures	45 (9.7)	9 (8)	36 (10.2)	0.505
Lower extremity fractures	56 (12)	15 (13.4)	41 (11.6)	0.607
Total patients	**466**	**112**	**354**	

Abb. T/L: Thoracolumbar

* Traumatic Brain Injury: Epidural hematoma, subdural hematoma, subacanoid hemorrhage and/or brain contusion,

admitted to the ED following motorcycle accidents was 9, with 18% of patients categorized as having major trauma (ISS >15) (9). In the study by Choi et al., the mean ISS was 10.6, and the rate of major trauma (ISS >15) was 23.2% (10). In our study, we found that the median ISS for patients presenting to the ED due to motorcycle accidents was 1 (IQR=4) in the pre-pandemic period and 1 (IQR=5) in the post-pandemic period. The rate of patients with major trauma (ISS >15) was 4.7%. Specifically, the rate of major trauma was 4.5% in the pre-pandemic period and 4.8% in the post-pandemic period. Comparisons between the pre- and post-pandemic periods indicated no significant difference in the ISS values, suggesting that trauma severity remained consistent across both periods.

The most common injury sites in motorcycle accidents are the lower extremities (43.7-56.9%), upper extremities (31.1-32.6%), and head-neck region (27.9-33%) (9,10). In the study conducted by Ankarath et al., the most commonly observed injuries in motorcycle accidents were skeletal system injuries (94.3%), followed by thoracic (17.4%) and abdominal (12.8%) injuries (11). In our study, the most common bone fractures observed in patients admitted to the ED due to motorcycle accidents were lower extremity fractures (12%), upper extremity fractures (9.7%), rib fractures (3.2%), thoracolumbar vertebral fractures (2.8%), and maxillofacial fractures (2.6%). We found no significant difference between the pre- and post-pandemic periods in terms of injury types. However, in a study comparing motorcycle accidents before and after the pandemic, cardiac injuries (1.6% vs. 0%) and pelvic injuries (7% vs. 1%) were more common in the pre-pandemic period, while extremity injuries were more prevalent in the post-pandemic period (77.5% vs. 96.1%) (12).

Table 3. Comparison of trauma severity, patient outcomes, and surgical interventions in pre-pandemic and post-pandemic periods

	Pre-pandemic period (n=112)	**Pre-pandemic period (n=354)**	**p**
ISS, median (IQR)	1 (4)	1 (5)	0.461
Major trauma (ISS >15), n (%) ISS ≤15 ISS >15	 107 (95.5) 5 (4.5)	 337 (95.2) 17 (4.8)	0.883
Minor trauma (ISS <9), n (%) ISS <9 ISS ≥9	 85 (75.9) 27 (24.1)	 275 (77.7) 79 (22.3)	0.694
Patient outcomes, n (%) Discharge from ED Hospital admission ICU admission Against medical advice In-hospital mortality	 96 (85.7) 9 (8) 4 (3.6) 3 (2.7) 0 (0)	 312 (88.1) 31 (8.8) 6 (1.7) 4 (1.1) 1 (0.3)	0.528
Surgery, n (%) In the first 24 h In >24 h Refusal No surgery	 6 (5.4) 5 (4.5) 0 (0) 101 (90.2)	 17 (4.8) 19 (5.4) 2 (0.6) 316 (89.3)	0.843

Abb. ISS: Injury Severity Score, IQR: Interquartile range, ED: Emergency Department, ICU: Intensive Care Unit.

Table 4. Comparison of ethanol positive/negative and courier/non-courier patients

	Ethanol Positive (n=35)	Ethanol Negative (n=420)	p	Courier (n=99)	Non-Courier (n=367)	p
Sex, n (%)			0.542			**0.002**
Male	31 (88.6)	383 (91.2)		98 (98.9)	327 (89.1)	
Female	4 (11.4)	37 (8.8)		1 (1)	40 (10.9)	
Age (years), median (IQR)	28 (12)	26 (11)	0.816	25 (10)	27 (11)	0.063
Application time, n (%)			0.149			0.188
08.00-15.59	8 (22.9)	130 (31)		37 (37.4)	104 (28.3)	
16.00-23.59	25 (71.4)	232 (55.2)		52 (52.5)	212 (57.8)	
00.00-07.59	2 (5.7)	58 (13.8)		10 (10.1)	51 (13.9)	
ISS, median (IQR)	3 (12)	1 (4)	**0.002**	1 (9)	1 (3)	0.864
Maxillofacial bone fractures, n (%)			**<0.001**			1
Present	7 (20)	5 (1.2)		2 (2)	10 (2.7)	
Absent	28 (80)	415 (98.8)		97 (97.9)	357 (97.3)	
Pneumothorax/hemothorax, n (%)			**0.004**			1
Present	3 (8.6)	2 (0.5)		1 (1)	4 (1.1)	
Absent	32 (91.4)	418 (99.5)		98 (98.9)	363 (98.9)	
Pulmonary contusion, n (%)			**0.034**			0.696
Present	3 (8.6)	7 (1.7)		1 (1)	9 (2.5)	
Absent	32 (91.4)	413 (98.3)		98 (98.9)	358 (97.5)	
Radius/ulna fractures, n (%)			0.084			**0.015**
Present	3 (8.6)	11 (2.6)		7 (7.1)	7 (1.9)	
Absent	32 (91.4)	409 (97.4)		92 (92.9)	360 (98.1)	

Abb. IQR: Interquartile range.

Motorcycles are commonly preferred for courier services due to their compact size, agility, fuel efficiency, and ease of maneuvering through traffic congestion. The increased demand for home delivery services during the pandemic has resulted in a rise in the number of motorcycle couriers. In our study, we observed a rise in the proportion of motorcycle accident victims who were couriers in the post-pandemic period (9.8% vs. 24.9%). Similarly, Kaya et al. reported a higher proportion of motorcycle accident victims who were couriers post-pandemic (25.7% vs. 39.9%) (6). In our study, we also found that the average age of motorcycle accident victims who were couriers was lower (25 vs. 27 years), and nearly all of them were male (98.9%). Given that the majority of couriers involved in motorcycle accidents were young men, this population warrants particular attention in terms of labor-related injuries. The increased demand for courier services has led less experienced motorcycle drivers to enter the field, and the intense work tempo and time pressures faced by couriers may contribute to non-compliance with safe driving practices and traffic regulations, potentially increasing the risk of accidents. When comparing couriers and non-couriers in terms of injury types, we found that radius/ulna fractures were more common among couriers. The frequent need for maneuvering in urban traffic, the accident mechanism involving motorcycle tipping, and the less frequent use of protective gear for the forearm may make couriers more susceptible to radius/ulna fractures and forearm injuries.

Alcohol consumption, even at levels ranging from 10 to 40 mg/dL, can impair driving performance and contribute to accidents (13). In motorcyclists, alcohol consumption increases the likelihood of crashes, is associated with more severe injuries, and raises mortality rates (14). Additionally, elevated blood alcohol levels are linked to a higher risk of fatal crashes (15). Alcohol-impaired motorcyclists often exhibit distinct injury patterns compared to sober drivers (16). Approximately 20% of motorcycle crashes are attributed to alcohol use (17,18), and those involved in crashes with positive alcohol levels tend to have higher ISS and a greater incidence of head trauma (17,18). Yadollahi and Pazhuheian, in their study, found that as ethanol levels increased in motorcycle accidents, the average ISS also rose (4.11 for <80 mg/dL, 6.54 for 80-150 mg/dL, and 7.9 for >150 mg/dL) (19). In our study, 7.6% of injured individuals had a positive ethanol level, with no significant difference observed between the pre- and post-pandemic periods (9.2% vs. 7.2%). Maxillofacial injuries (20% vs. 1.2%), pneumothorax/hemothorax (8.6% vs. 0.5%), and lung

contusion (8.6% vs. 1.7%) were more prevalent in cases with positive ethanol levels compared to those with negative levels. In addition to specific injury types, the mean ISS was significantly higher in ethanol-positive patients, indicating a greater overall injury severity in this group. This finding aligns with previous research suggesting that alcohol impairs both cognitive and motor functions, which may lead to higher-speed impacts, reduced protective responses during crashes, and consequently more severe trauma. These findings highlight the need for public education regarding the dangers of riding motorcycles under the influence of alcohol, as well as the implementation of stricter legal regulations.

The mortality rate among patients admitted due to motorcycle accidents varies based on the socioeconomic development of the country; however, it generally averages around 5% in developed nations (9,10,20,21). Head trauma is the primary cause of mortality in motorcycle accidents (22,23). Factors influencing mortality from motorcycle accidents include age (20), the nature of the trauma (e.g., motorcycle-vehicle collisions) (23), helmet use (24,25), alcohol consumption, and injury sites (26). However, data on helmet usage were not available in our dataset, and thus, the relationship between helmet use and the observed incidence of head and maxillofacial injuries could not be assessed. The incidence of fatalities from motorcycle accidents could be reduced through the widespread adoption of safe driving practices, particularly the use of protective equipment such as helmets, public education on alcohol and substance use, and the implementation of stringent legal regulations.

Limitations

Given that the study was conducted at a single center, the findings may not be entirely generalizable to all patient populations. Additionally, factors such as socioeconomic status, vehicle preferences, habits related to the use of protective equipment, and pandemic-related restrictions in different countries could influence both the frequency and severity of motorcycle accidents. Furthermore, due to the inability to assess helmet use and other protective gear among patients admitted for motorcycle accidents, we were unable to evaluate the impact of protective equipment on the severity and types of injuries sustained.

CONCLUSION

Following the pandemic, there has been a notable increase in the number of motorcycle accident victims, with a higher proportion of couriers compared to the pre-pandemic period. The Injury Severity Score (ISS) values of motorcycle accident victims remain comparable between the pre- and post-pandemic periods. In patients presenting to the ED due to motorcycle accidents, the most frequent fractures are those of the lower extremities, followed by upper extremities, thoracolumbar vertebrae, maxillofacial structures, and ribs. Ethanol-positive motorcycle accident victims are more likely to sustain maxillofacial fractures, pneumothorax, hemothorax, and lung contusions, while couriers are more prone to radius/ulna fractures. Given the rising incidence of motorcycle accidents, there is a pressing need for enhanced education, stricter regulations, and greater emphasis on safe riding practices, protective equipment use, and the detrimental effects of alcohol and drug consumption.

* This manuscript was prepared from a medical specialization thesis (Council of Higher Education, Thesis Center, Thesis No: 842336).

Ethics Committee Approval: This study was approved by the Human Research Ethics Committee of the Ankara University School of Medicine (date: 26.01.2023, number: İ01-46-23).

Informed Consent: Due to the retrospective design of this study, informed consent was waived.

Authorship Contributions: Idea/Concept:SG, Design:SG, VK, Supervision:-, Data Collection and Processing:VK, SG, Analysis or Interpretation:SG, VK, MG Literature Search:SG, VK, AK, OP, Writing:SG, VK, Critical Review: SG, VK, AK, MG, OP, References and Fundings:-Materials: -.

Conflict of Interest: None declared by the authors.

Financial Disclosure: None declared by the authors.

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