




## Research Article

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# PROSPECTIVE ANALYSIS OF E-SCOOTER ACCIDENTS IN DIYARBAKIR CITY, LOCATED IN SOUTHEASTERN TÜRKİYE

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## Abstract

**Objectives:** Although the use of e-scooters is new, e-scooter traumas have also increased as they began to be used. Our aim in this study is to draw attention to the increasing number of e-scooter accidents and to contribute to the measures that can be taken in this regard.

**Materials and Methods:** We planned the study when we started to receive scooter injuries that we had never encountered in the emergency department of our hospital. As a result of our research, we learned that the use of scooters in our province started in the first quarter of 2022. After creating the study plan and obtaining the approval of the ethics committee, we started collecting cases. From the scooter accidents admitted to the emergency department of our hospital, we included all patients with complete information, including those who agreed to participate in the study and who gave parental consent from accident victims under the age of eighteen. Patients who provided false and incomplete information and refused to participate in the study were not included.

**Results:** While the total number of patients admitted was n=247, n=205 patients were included in our study. Of the patients admitted to the emergency department, 39% (n=80) were female and 61% (n=125) were male. When the trauma sites of the patients were analyzed, it was found that 78.05% (n=160) had extremity trauma, 19.51% (n=40) had head-neck trauma, and 2.44% (n=5) had vertebral trauma.

**Conclusion:** We are of the opinion that serious injuries can be prevented and e-scooters can be made a safer means of transportation by making the necessary legal arrangements, eliminating the infrastructure problem of the cities, building appropriate roads and expanding the use of personal protective equipment.

**Keywords:** Emergency department, e-scooter, trauma, micro-mobility.

## Introduction

Micromobility is a fairly new concept, and its definition is being developed day by day. In its most general definition, micromobility is a system in which small vehicles, especially electric scooters and bicycles, are rented or owned within the city and used for short-term transportation.<sup>1,2</sup> Using just human-powered vehicles, like bicycles, skateboards, scooters, and skates, is known as micromobility.<sup>3,4</sup> Since their introduction in 2017, electric scooters have been used in major cities across the US, Europe, New Zealand, and Singapore to address a variety of transportation-related policy objectives.<sup>5-8</sup>

The official regulation regarding the e-scooter system in Turkey came into force with the "E-scooter Regulation," published in the official newspaper on April 1, 2021. The regulation defines an electric scooter as "an electric vehicle that has a maximum speed of 25 km/h, has wheels, a brake mechanism, can have steps and a handle, can include a vertical steering mechanism, and can be used while standing." The age limit for using an e-scooter is set at 15. As stated in the general issues regarding the use of e-scooters, it was noted that if there is a separate bicycle lane, the highway cannot be used, its use is not allowed in areas where the maximum speed is over 50 km/h, and more than two electronic scooters cannot be used side by side. In addition, it was mentioned in more detail that it could not be used in a way that would endanger traffic safety and where parking is allowed and prohibited. It was stated that passengers other than the driver cannot use the e-scooter.<sup>9</sup>

Regrettably, as e-scooters become more and more popular, injuries related to them have also started to rise in recent times. Given how recently e-scooters were introduced to the public, there is comparatively little global data on musculoskeletal injuries associated with their use. However, new research from the USA, Singapore, Austria, Germany, and New Zealand indicates that this is a developing issue.<sup>5-8,10,11</sup>

E-scooters are usable, particularly when helmets and other personal protection equipment are not worn, and they may accommodate two riders. Furthermore, we frequently witness e-scooter drivers on main roads due to the absence of designated e-scooter routes. Companies have issued cautions about using these e-scooters, which have a maximum speed of 25 km/h. However, because cities lack proper infrastructure, numerous countries have reported injuries from e-scooter incidents.<sup>12,13</sup>

The population-adjusted frequency of injuries connected to e-scooters in the United States rose from 1.53 per 100,000 persons in 2014 to 9.22 per 100,000 people in 2019.<sup>7</sup> Similarly, once an urban e-scooter sharing system was implemented in New Zealand, there was a notable rise in e-scooter-related injuries, from two to 35 per week. Serious injuries were found to have significantly increased, particularly to the axial bones and extremities.<sup>8</sup> According to recent research, e-scooters are frequently linked to high-energy trauma and have

the potential to inflict major musculoskeletal injuries.<sup>11</sup> There have been documented deaths from e-scooter incidents in Texas, London, and Washington.<sup>14,15</sup>

Our goal in doing this study was to look at the demographic breakdown of e-scooter incidents that came to our emergency room. The effects of e-scooters on public health will be clarified by an examination of e-scooter accidents, and the significance of laws governing their usage will increase.

## Materials and Methods

When we started to receive scooter injuries that we had never encountered before in our hospital emergency department, we planned the study. As a result of our research, we determined that the use of scooters started in the first quarter of 2022 in our province. After creating the study plan and obtaining the approval of the ethics committee, we started to collect cases. We conducted our study in the emergency medicine clinic of the Health Sciences University Gazi Yaşargil Training and Research Hospital in Diyarbakır Province. We recorded scooter injuries that applied to the emergency clinic within three months after obtaining ethics committee approval. We included all patients with complete information, who agreed to participate in the study, and who gave parental consent from accident victims under the age of eighteen who were admitted to the emergency department of our health sciences university, Gazi Yaşargil Training and Research Hospital. Patients who did not consent to participate in the study, patients with incomplete information, and patients whose parental consent could not be obtained were not included in the study. While the total number of applicants was 247, 205 patients were included in our study. We examined these patients in terms of age, gender, trauma area, pathological positivity of the patient, the relevant clinic that intervened in the patient's pathology, need for surgical intervention, treatment done, need for hospitalization, discharge, and, if hospitalized, duration of hospitalization. None of our patients had protective equipment.

The informed consent form was obtained from patients. The authors declare that human rights were respected according to the Declaration of Helsinki. The research protocol was reviewed and approved by the Health Sciences University Gazi Yaşargil Training Research Hospital Clinical Research Ethics Committee (date: 21.04.2022, number:77).

### *Statistical Analysis*

The SPSS program was used for analysis. First of all, the distribution of the data was examined by performing Shapiro-Wilk's test. The Student's test was used for continuous variables if there was a normal distribution, and the Man Whiney U test was used if there was no normal distribution. Quantitative variables are shown as mean±SD (standard deviation) and median (minimum /maximum) in the tables, while categorical variables

are shown as n (%). Variables were examined at a 95% confidence level, and those with a p-value less than 0.05 were considered significant.

## Results

Of the patients admitted to the emergency department, 39% (n=80) were female and 61% (n=125) were male. The youngest patient was 13 years old, and the oldest was 44 years old. The average age was measured at  $22.93 \pm 8.085$ . When the trauma area of the patients was examined, 78.05% (n=160) were found to be extremity trauma, 19.51% (n=40) were head and neck trauma, and 2.44% (n=5) were vertebral trauma. While 75.61% (n=155) of the patients had a soft tissue laceration, 24.39% (n=50) had a fracture in any region (extremity, head and neck, vertebra). All of the patients who applied were discharged with full recovery as a result of the treatment processes. When the inpatients were evaluated in terms of gender, 50% (n=15) were female and 50% (n=15) were male. Of the 30 patients who received inpatient treatment from the hospital, 4.87% (n=10) were admitted to the intensive care unit, and 9.76% (n=20) were admitted to the relevant clinical service. The characteristics of the patients are shown in Table 1.

There was no statistical significance between gender and trauma site, indication for hospitalization, duration of hospitalization, and surgical needs of the patients. P values were respectively ( $p=0.105$ ,  $p=0.203$ ,  $p=0.603$ ,  $p=0.916$ ). A significant statistical finding was found between the relevant clinic that treated the patient and the patient's surgical need ( $p = 0.005$ ). A statistically significant finding was found between the positive findings found in the patients and the need for surgery ( $p<0.001$ ). A statistically significant value was found between the hospitalization status of the patients and their surgical needs ( $p<0.001$ ). A statistically significant value was found between the discharge status of the patients and their surgical needs ( $p<0.001$ ).

**Table 1.** The characteristics of the patients

<b>Gender (n=205)</b>	
Female	39% (n=80)
Male	61% (n=125)
<b>Age (n=205)</b>	
Smallest	13
The oldest	44
Mean±SD	22.93±8.085
<b>Trauma Zone (n=205)</b>	
Extremity	78.05% (n=160)
Head Neck	19.51% (n=40)
Vertebra	2.44% (n=5)
<b>Positive Finding (n=205)</b>	
Incision	75.61% (n=155)
Fracture	24.39% (n=50)
<b>Intervention Made (n=205)</b>	
Dressing	70.73% (n=145)
Plaster- Splint	21.95% (n=45)
Suture	7.34% (n=15)
<b>Intervening Expert (n=205)</b>	
Emergency Medicine	73.17% (n=150)
Orthopedics	19.51% (n=40)
Brain Surgeon	2.44% (n=5)
Plastic Surgery	2.44% (n=5)
Dentist	2.44% (n=5)
<b>Need for Surgery (n=205)</b>	
Surgery	12.2% (n=25)
No Surgery	87.8% (n=180)
<b>Discharge and Admission (n=205)</b>	
Outpatient Discharge	85.37% (n=175)
Lie Down	14.63% (n=30)
<b>Hospitalization Duration (n=30)</b>	
5 Days	2.44% (n=5)
6 Days	2.44% (n=5)
7 Days	2.44% (n=5)
10 Days	4.87% (n=10)
11days	2.44% (n=5)

## Discussion

Because of their affordability and ease of use, e-scooters have grown popular in our nation, but accidents involving them are on the rise. Certain nations and localities have implemented laws governing the usage of e-scooters. However, it has come to light that users do not strictly adhere to regulatory requirements, such as age restrictions and the use of protective gear.<sup>16</sup> E-scooters are becoming more and more common because it's easy to rent them instead of buying one, which has led to an increase in e-scooter-related injuries. Similar to our

study, prior research has shown that patients in their 30s were the most common age group for scooter-related injuries.<sup>17</sup>

The age of use of e-scooters varies from country to country (it is 12 years in France, 14 years in Germany, and 16 years in the Netherlands).<sup>18</sup> Although the age of use should be over 15 according to the legislation in Turkey, we also encountered users under this age in our study. Despite this, the fact that individuals are legally prohibited from using e-scooters due to their age is one of the first reasons why it is necessary to introduce additional measures and controls. Although e-scooters are designed for one person to ride, in our study, it was observed that two people are often together on this type of vehicle. This situation supports the idea that legal regulations are insufficient and campaigns and inspections should be carried out to prevent injuries caused by e-scooter accidents. Gender determination has not been made very often in studies on e-scooter use. In our study, 39% (n=80) were female, and 61% (n=125) were male. Although the male population is more likely to use e-scooters, our study showed that e-scooter accidents may occur at similar rates in both genders.

It's been noted from earlier research that a relatively small percentage of e-scooter incidents involve the use of protective gear.<sup>16,19</sup> According to Trivedi et al.'s research, 94.3% of e-scooter users did not wear a helmet.<sup>16</sup> 95.7% of patients who applied to the emergency room after an e-scooter accident did not wear a helmet, according to another survey.<sup>20</sup> The fact that none of the patients who applied for our study had protective gear on them confirmed the findings of previous investigations. The fact that e-scooters are relatively new in the city where we reside could be one of the factors contributing to the high percentage of helmet non-use.

Furthermore, research comparing the use of E-scooters and bicycles in the literature notes that the most basic safety precaution, donning a helmet, is more prevalent while using bicycles than it is when using E-scooters.<sup>18</sup>

According to a study, head trauma accounted for 40% of patient admissions to the emergency room.<sup>20</sup> Major cerebral hemorrhage was recorded in 1.1% of e-scooter riders in Copenhagen research.<sup>21</sup> 5.2% was the maxillofacial fracture rate in the Bressler et al. research. Nonetheless, 66% of the patients did not wear a helmet during the events.<sup>22</sup> 19.51% (n= 40) of the head and neck trauma in our study was found. According to Trivedi et al.'s study, the hospitalization rate for e-scooter accidents was 6%, while the rate for critical care was 0.8%.<sup>16</sup> In another study, the hospitalization rate was determined to be 5.7%, and the intensive care hospitalization rate was 1.4%.<sup>20</sup> In our study, these rates are 14.6% (n=30) and 4.87% (n=10), respectively. These high rates suggest that incidents involving e-scooters can cause catastrophic injuries and expensive medical bills. It is possible to construct regions where e-scooters can utilize their own roads by making infrastructure arrangements. Major trauma can thus be avoided.

In one study, the most injured areas in E-scooter accidents were the lower and upper extremities,<sup>23</sup> and in another study, the injured areas were determined as the extremities, while fractures were most frequently seen

in the upper extremities.<sup>11</sup> In our study, the most common injuries were determined to be extremity traumas 78% (n=160). The most frequent extremity injuries and the most severely damaged locations in recent studies are similar to injuries connected to the usage of motorized two-wheeled vehicles or E-scooters in traffic with identical traffic laws published in the literature. This demonstrates the need for protective gear to be advised and worn, particularly for users of e-scooters, in order to safeguard delicate body parts. This circumstance makes it clear that the policies outlined in numerous articles of comparable legislation must be put into action and closely observed.<sup>24</sup>

### *Limitations*

The patients under 18 years of age whose parental consent could not be obtained and whose relatives could not be reached were not included in the study. We were not able to question the patients' experience of scooter use. Alcohol and drug use of the accident victims could not be questioned. However, the fact that the study was a single-center study is one of the limiting factors.

In conclusion, because they are inexpensive, eco-friendly, and simple to rent owing to applications, e-scooters have replaced other forms of mobility in our daily lives. We think that if the infrastructure issue in cities is resolved by enacting the required laws, constructing suitable roads, and increasing the usage of personal protection equipment, serious injuries can be avoided, and e-scooters can be made a safer mode of transportation. It should be noted that the usage of e-scooters in these regions poses dangers for traffic, pedestrians, and drivers, which could increase the severity of the accident, given that the accident sites are primarily pedestrian sidewalks or main streets. Although there are some limitations in our study, effective and remarkable results were obtained for the region we live in. We believe that it will contribute to both the evaluation of patients applying to the emergency department in terms of trauma and the organization of the city in terms of public health.

**Ethical Considerations:** The research protocol was reviewed and approved by the Health Sciences University Gazi Yaşargil Training Research Hospital's Clinical Research Ethics Committee. The study was conducted in accordance with the Declaration of Helsinki (date: 21.04.2022, number: 77).

**Conflict of Interest:** The authors declare no conflict of interest.

**Informed Consent:** An informed consent form was obtained from patients.



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