Research Article

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E-Scooter Injuries Reported to US Emergency Rooms In 2020-Epidemiology and Injury Mechanisms and Helmet Use

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Abstract

Micromobility has become an increasing form of transportation the past 10 years. Products such as electronic scooters (e-scooters), bicycles and mopeds conserve energy and can be maintained at much less cost than motor vehicles. As the use of e-scooters increases, so does the risk for injury. The purpose of this study is to identify risk factors and mechanisms for e-scooter-related injuries. Methods included the use of a nationwide emergency room database identifying admissions related to e-scooter use. Variables analyzed included age, race/ethnicity, location, diagnosis, disposition and bodily location of the injury. Additional variables were developed to identify the use of a helmet and the mechanism for injury from narrative included in the database. Results indicated most e-scooter injuries were from falls with incidents with motor vehicles were second most common. Fractures, contusions and lacerations were the most common diagnosis with concussions occurring in 3% of the cases. The use of a helmet was recorded in 30% of the cases with the risk for concussion 23.4 times greater among individuals reported as not wearing a helmet. Results indicate that there are dangers involved in operating e-scooters no matter the environment. The use of e-scooters is a skill and the cases noted several misuses or improper use and handling of the devices. Recommendations call for proper training of e-scooters before operation along with the mandatory use of helmets to protect from the most serious injuries in involved in or crash.

Keywords: Drugs; E-Scooter; Electronic scooters; Helmet; Injuries

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Introduction

Micro mobility has become an important transportation option to address sustainability and energy conservation. Micro mobility products are products that are designed for smaller transportation trips and have lower speeds than other vehicles such as cars and motorcycles. Bicycles, e-scooters, and mopeds are the most common forms of micro mobility products. Reports have noted the use of e-scooters increased 300,000 trips in 2010 to over 136 million trips in the US, representing a 289% increase in e-scooter usage [1]. The increase in use has also resulted in an increase for the risk of injury. A recent report by the US Consumer Product Safety Commission highlighted an increase in emergency room visits from micro mobility products from 34,000 in 2017 to 57,800 in 2020, a 70% increase [2]. It was noted in the report that most of the injuries from micro mobility products were attributed to e-scooter use. Not clear in the report are the mechanisms for injury from e-scooter use along with the use of helmets and the involvement of motor vehicles and pedestrians. The purpose of the study is to gain further insight into the mechanisms of e-scooter injuries and the increased risk for concussions and head injury from lack of helmet use.

Methods and Materials

Data for the study were obtained from the National Electronic Injury Surveillance System (NEISS) published by the US Consumer Product Safety Commission [3]. The NEISS collects data from a sampling of US Emergency Departments [4]. All injuries associated with product code 5022 were selected as cases including all electronic power scooters. Hover boards or electric skateboards were not including in the analysis. The NEISS includes data on age, gender, race/ethnicity, location, injury diagnosis, injury disposition, involved body part, and alcohol/drug use. Also included in the data is a narrative section that provides further details of the event or incident that resulted in the injury. From the narrative, researchers developed two new variables for injury mechanism and helmet use (yes or no). For injury mechanism the following variables were identified: falls, hit object, alcohol/drugs, vehicle, pedestrian/bicycle, or other. Odds ratios and 95% confidence intervals were calculated for helmet use and the outcome of a concussion or head injury. Upon review of the narrative, the researchers eliminated cases where age was greater than 60 as the majority involved electronic scooter use associated with disability issues and mobility around the home, and not for transportation or recreation.

Results and Discussion

Upon analysis, there were 24,672 total reports from NEISS from e-scooters for the year 2020. Of the total, ages 20-35 represented just over 38% of all emergency room reports with ages 36-59 at 31% of all reports. Children ages 2-12 years were involved in 13% of the e-scooter injuries. More males than females were reported from the cases (70% vs. 30%) and more cases involved Caucasians as compared with other races (41% versus 34%). The most common location attributed to the injuries were the street or highway at 51% followed by home at 29% and other public property at 10%. Over 80% of the cases were seen at the emergency room and then released with almost 12% being admitted to the hospital. There were no deaths from the reports provided from NEISS. The most common body parts involved in the incidents were the head (15%), face (14%) and knee (11%). The shoulder and upper trunk region accounted for another 14% of all injuries. Regarding diagnosis, the majority of injuries were due to

fractures (30%), contusions (20%), and lacerations (15%). Concussions were reported in 3% of all cases. Helmet use was reported for 7,462 (30%) estimated cases with 65% reporting the individual not wearing a helmet. The mechanism of the injury is presented in Table 1. The majority of the injuries were attributed to falls at over 53% and motor vehicles at 25%. Involvement with pedestrians or other objects were both at 5%. The use of alcohol or other drugs was noted to be the primary attributing mechanism in over 5% of all reports. When conducting analysis of the use of a helmet and the likelihood of a concussion, analysis revealed an odds ratio of 23.4 (7.4-39.4) greater odds of sustaining a concussion for individuals that did not wear a helmet.

	N	%
Fall from E-Scooter	13844	56.3%
Motor Vehicle Involvement	6943	28.1%
Hit Object	1239	5.0%
Alcohol/Drugs	1386	5.3%
Pedestrian/Bicyclist	983	4.0%
Other	126	0.5%
Unknown	56	0.2%

Table 1: Estimated Number of E-Scooter Injuries by Primary Mechanism.

*Based on reports from the descriptive narrative presented for each case.

Electric scooter use has proliferated in communities and college campuses in recent years, with shared scooter services available to provide an alternative to walking [5]. In the U.S., shared scooter companies are operating in 100 cities and 26 States. (The advent of these services potentially provides a heightened risk to users as many may not be familiar with operational guidelines and injury risks. Our findings corroborate the limited research to date which has found head and face injuries to be the most common body-site injured and reason for an emergency department of hospital visit [6-8]. With regard to diagnosis, fractures made up 30% of all emergency department visits, which is in accordance with prior studies [7,9] Prevention of head and face injuries are likely reduced by wearing a helmet, as we found an increase in the odds of concussion among non-helmet users. Helmet use among e-scooter riders is negligible, with an estimated 13% of injured riders having worn a helmet [7] However, our findings revealed 30% of injured riders had worn a helmet, though in most cities in the U.S. it is not mandatory. To date, few countries mandate helmet use among e-scooter riders. In Queensland, Australia, approximately 50% of users have been found to wear a helmet, though a mandate is in place in the Capital of Brisbane. Therefore, enforcement of laws and mandates becomes important in adoption of the behavior [10] along with education. Given the e-scooter business model of renting scooter, the provision of helmet is a more difficult proposition when compared to personal bicycle use. Renting of helmets is an option, though in many locals, dockless vehicles predominate, which means users can drop them off anywhere within a GPS location, which impedes helmet access.

The majority of injuries involved falls from an e-scooter. Given that e-scooters are a relatively new venture, it is reasonable to hypothesize that user inexperience and lack of training and education may play a role in falls. While many municipalities provide online education and safety training for scooter operation, the effectiveness and adoption of the training programs is unknown. Moreover, hazardous road surfaces have been noted as a contributing factor in crashes involving falls from scooters, and attributed to over 20% of all crashes [11]. Should e-scooter remain a popular device, municipalities will need to consider infrastructure and road and sidewalk maintenance. Additionally, redesigned of scooter to adapt to rougher terrain may also aid in the reduction of injuries associated with hazardous surface conditions.

Crashes with motor vehicles accounted for a notable amount of injuries, and corroborated findings form others [9]. While we could not ascertain fault or whether or not the motor vehicle was moving, the speed at which scooters can maneuver (15-30 MPH), may increase the likelihood of impact injuries. While some municipalities allow the riding of e-scooters on sidewalks, predominantly they are viewed as a motor vehicle in their own right and are therefore relegated to street use. Given that e-scooters riders present as not much taller than a pedestrian, though travel at a much higher speed, crashes with other vehicles present a major concern. Therefore, the use of bike lanes, wearing of highly visible clothing, and use of protective equipment may aid in the prevention of crash incidents.

Our study is not without limitations inherent in the NEISS data. Injuries are limited to emergency department visits, therefore more minor injuries will be missed, along with fatalities. While narrative text entries were utilized, we were unable to discern injury severity. However, we were able to limit our analyses to those injuries involving electric scooters via narrative text entree as products in this category are coded together as electric vehicles. Therefore, we were able to eliminate injuries associated with other products such as electric skateboards, bicycles, and hoverboards. Lastly, we could ascertain incidence rates as exposure data regarding use of electric scooters was void [12].

Conclusion

Electronic scooters may be beneficial and play an important role in reducing carbon emissions in cities and towns worldwide, particularly for short trips, whereby users may opt for a scooter instead of a motor vehicle. However, safety should be prioritized, and will likely require multiple interventions including access to helmet use along with other protective equipment, infrastructure and city designs with alternative sources of transportation included in plans, enforceable laws and policies pertaining to both scooter operators and motor vehicles, and design aspect of electric scooters to afford the operator the safest product. Whether or not electric scooters become a staple in transportation is unknown, however popularity is surging, as well as associated injuries.

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