E-Bike Orthopaedic Injuries Amongst Pediatric and Adolescent Patients at a Level I Trauma Center

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INTRODUCTION:
Electronic bicycle (E-bike) use is on the rise in the United States. E-bikes are a convenient, cost-effective, environmentally friendly transportation option that do not require a license to operate. However, these conveniences come with significant injury risks. The aim of this study is to quantify the rates and patterns of orthopaedic injuries related to e-bike use compared to standard pedal bikes in pediatric and adolescent patients.
METHODS: A retrospective review was performed reviewing all trauma activations associated with micromobility (e-bike, bicycle, e-bike versus auto, bicycle versus auto) for patients < 18 years of age from 2017 to 2023 at a single, level 1, tertiary referral pediatric hospital. Patients were stratified by micromobility mode. Demographic data including age, sex, race, ethnicity, and home address were obtained from the medical record. Socioeconomic neighborhood disadvantage via area deprivation index scores (ADI) were calculated based on residential postal code. Mechanism of injury, length of stay (LOS), use of helmets, presence of orthopaedic injuries, head injuries, thoracic injuries, injury severity scale (ISS), Glasgow coma scale (GCS), requirement for operative treatment (orthopaedic versus non-orthopaedic reasons), and ICU admissions were evaluated. Continuous data were found to be non-parametric and were evaluated with the Mann-Whitney U test. Categorical data were evaluated with Pearson's chi-square or Fisher's exact test. Statistical significance was defined as $p < 0.05$.
RESULTS: Over the 6-year period of study, 338 pedal bike or e-bike-related trauma activations were identified. E-bike were increasingly responsible for these trauma activations throughout the study period, increasing from only 1.75% in 2017 to 39% in 2023. Patients in e-bike accidents were more likely to be older (12.6 vs. 10.3 years, $p < 0.001$) and more likely to have more socioeconomic advantage (based on ADI state quartile) (1.7 vs. 2.8 $p < 0.001$) than those involved in pedal bike accidents. Moreover, patients involved in e-bike accidents were more likely to sustain extremity injuries (OR = 4.2, $p < 0.001$) and sustained more fractures (0.6 vs 0.2 fractures, $p < 0.001$) as compared to those involved in pedal bike accidents. Patients in pedal bike accidents were less likely to be wearing a helmet (OR = 3.0, $p < 0.001$) and more likely to sustain head injuries (OR = 2.4, $p < 0.001$) compared to e-bike accidents. There were no significant differences in length of stay, ICU admissions, or operative treatment requirements between groups.
DISCUSSION AND CONCLUSION: E-bikes have risen in popularity over recent years, as have associated injuries. This mode of micromobility can reach greater speeds, harboring the potential for higher energy injuries, especially in children who are not familiar with or licensed in the use of motorized mobility. This study cohort demonstrated an increasing incidence of e-bike-related trauma activations, with an increasing incidence of associated extremity injuries and fractures. These findings highlight the need for focused strategies surrounding injury prevention, regulation, and education regarding e-bike usage in addition to further investigation regarding orthopaedic injury patterns and prevention.