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Brief Reports

E-BIKE–RELATED TRAUMA IN CHILDREN AND ADULTS

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☐ **Abstract—Background: Electric bike (e-bike) usage is growing worldwide, and so is the e-bike–related injury rate. Objective: This study was undertaken to characterize e-bike–related injuries. Methods: Data of all e-bike–related injuries presenting to our level I trauma center between 2014 and 2016 were collected and analyzed. Adult and pediatric (<18 years of age) e-bike–related injuries were then analyzed separately and compared. Results: Forty-eight patients suffering from e-bike–related injuries presented to our trauma center between January 1, 2014 and December 31, 2016. Seventeen (35%) patients were <18 years of age and 40 (85%) were male. The overall most common mechanism of injury was falling off the e-bike in 24 patients (50%), followed by collision with a static object in 9 patients (18.8%). Head (38%) and facial (33%) injuries were most common in children. In adult patients, orthopedic trauma was predominant, with extremity fractures in 35 (73%) followed by significant lacerations in 14 patients (29%). Severe trauma (Injury Severity Score >15) was found in 17 (35%) patients. The duration of hospital stay was 10.8 ± 6 days, 12 patients (25%) required a stay in the intensive care unit, and 21 patients (43.7%) required surgery. Compared to adults, children (<18 years of age) had significantly more head and face injuries (p = 0.05). Conclusion: Our study suggests that e-bike–related trauma may involve serious injuries and have typical injury patterns that resemble those seen in motorcycle-related injuries. Children are more likely to suffer head and face injuries because of their higher head to body ratio. We suggest that these injuries should therefore be triaged appropriately, preferably to a medical facility with proper trauma capabilities.**

☐ **Keywords—e-bike; electric bike; helmets; trauma**

INTRODUCTION

Electric bicycles (e-bikes) are currently the most widely used form of electric transportation in the world. In the last few years, e-bikes have become even more popular (1–3). Approximately 29 million e-bikes were produced in 2010, representing a 24.7% increase compared to 2009 (4). These trends are expected to continue and a worldwide increase in demand is predicted (5).

Despite the significant increase in the number of e-cyclists and the increased potential for fatal injuries from e-bikes, the literature on e-bike injuries is relatively limited. To our knowledge, publications on the analysis of e-bike accidents—particularly related to injury severity—are scarce. The few studies that addressed this issue stated that there is a gradual increase in the incidence of e-bike–related injuries throughout the world (6,7). We conducted a study aimed to describe the pattern and severity of e-bike injuries in children and adults and compare with both motorcycle and non–e-bike trauma.

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Drs. Gross and Weiss contributed equally to this article.

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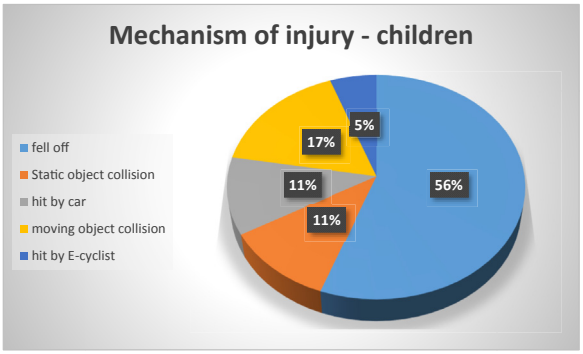

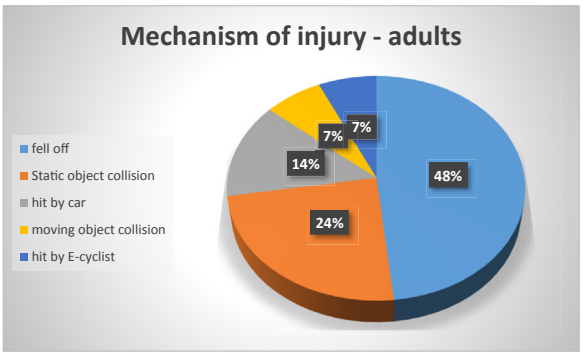

Figure 1. Mechanisms of injury in e-bike–related trauma on presentation to the trauma unit, comparison of children (≤18 years of age) to adults.

METHODS

We retrospectively analyzed the collected data of all victims of e-bike injuries admitted to the Hadassah Hospital level I trauma center in Jerusalem, Israel, between January 1, 2014 and December 31, 2016.

The information consisted of demographics, mechanism of injury, Injury Severity Score (ISS), intensive care unit (ICU) need, region injured, surgical interventions, duration of hospital stay, and outcome. All injuries were divided into anatomic regions (head, face, chest, abdomen, pelvis, upper and lower extremities, and spine). Injury to ≥3 body regions was defined as "injury to multiple regions." Pedestrians hit by e-bikes were also included in the study group.

To better understand the significance of these injuries, we collected data regarding motorcycle and non–e-bike injuries in the same period of time and randomly selected cases to match the number of e-bike injuries.

The study was approved by the institutional review board and consent waiver was received (approval number 0694-16-HMO).

Statistical Analysis

Data are presented as mean and standard deviation (SD) or number of patients and percentage. The chi-squared test was used to compare proportions and the Student's *t*-test was used to compare continuous nonparametric variables. $p \leq 0.05$ was considered statistically significant. Statistical analysis was performed using SPSS software (v 21.0; SPSS Inc, Chicago, IL).

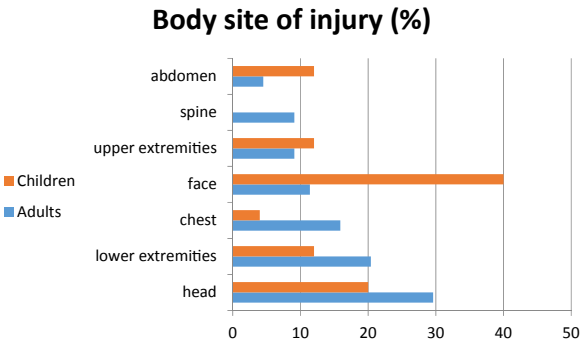

Figure 2. Body site of injury in percentage in e-bike–related trauma on presentation to the trauma unit, comparison of children (≤18 years of age) to adults.

RESULTS

During the aforementioned period, 47 e-bike–related trauma patients presented to our trauma center. The average age at presentation for the e-bike group (± SD) was 29.7 ± 17.9 (range 1–70 years), of which 17 (35.4%) were children <18 years of age and 40 (85.1%) were male. Data regarding helmet use were incomplete, but only 3 of 23 patients (13%) wore helmets. Several different mechanisms of injury were recognized: 24 (50%) fell off the e-bike, 9 (18.8%) collided with a static object (e.g., a wall, column), 7 (14.6%) were hit by a car, 5 (10.4%) ran into a moving object (e.g., car/bus/another bicycle), and 3 (6.3%) patients were pedestrians hit by e-bikes (Figure 1). Head (n = 18; 38%) and face (n = 15; 33%) injuries were predominant in children compared with adults (p = 0.05) (Figure 2). Adults had more extremity fractures (n = 33; 73%), followed by significant skin lacerations (n = 14; 29%) (Figure 3). The average ISS on arrival at the trauma unit was 12.1 ± 9.4 (range 1–47), and severe trauma (ISS >15)

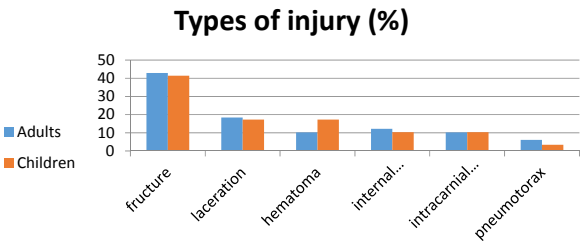

Figure 3. Types of injury in percentage in e-bike–related trauma on presentation to the trauma unit, comparison of children (≤18 years of age) to adults.