

---

## Emerging epidemic of head injuries related to electric scooter use by under-18-year-olds

### *Traumatismo craneoencefálico asociado al uso de patinete eléctrico en población pediátrica: una epidemia emergente*

María Iriondo Muruzábal<sup>1</sup>, Carla González Grado<sup>1</sup>, Victoria Trenchs Sainz de la Maza<sup>2,4</sup>, Carles Luaces<sup>2,4</sup>

Personal mobility vehicles have become popular worldwide. Among them, electric scooters have positioned themselves as a common alternative means of transport.<sup>1,2</sup> However, despite their advantages, it should be noted that in some countries a significant increase in deaths and hospitalizations in the adult population related to their use.<sup>3</sup> Electric scooters can reach high speeds and, added to the poor protection of the users, make them very vulnerable in falls, and traumatic injuries to the extremities and traumatic brain inju-

ry (TBI) are frequent.<sup>4,5</sup> Although a priori they are devices for adults, in our emergency department (ED) we have the impression that these accidents have also increased in children. The aim of this study is to compare the number and clinical-epidemiological characteristics of patients consulting a pediatric ED for TBI associated with the use of scooters between the period before and after their generalization.

We present a descriptive-observational study conducted in the ED of a tertiary maternal and child hospital in Barcelona

that receives about 110 000 pediatric visits per year. Consultations of children under 18 years of age for TBI associated with scooter use during 5 years (2016-2020) were selected and 2 groups were established according to the period in which they were seen, before or after the generalization of the use of the electric scooter. Period-1 was considered from 1-1-2016 to 31-12-2017 and period-2 from 1-1-2019 to 31-12-2020. Cases attended in 2018 (considered transitional) were excluded, those with diseases that increase the risk of intracranial injury and reconsultations within the same episode were excluded. The computerized clinical history of the patients was reviewed after

**Table 1.** Clinical-epidemiological characteristics of the patients who consulted for scooter-associated TBI

Characteristics	Period 1 N = 72 n (%)	Period 2 N = 125 n (%)	P value
Age (years) [Median (IQR)]	7.1 (4.9-10.8)	9.2 (5.6-13.7)	<b>.021</b>
Gender: male	47 (65.3)	81 (64.8)	.946
Consumption of intoxicants*	0	3 (2.4)*	.301
Electric scooter**	5 (6.9)	43 (34.4)	<b>&lt; .001</b>
Main driver	72 (100)	104 (83.2)	.01
Moderate-severe TBI	0	7 (5.6)	<b>.049</b>
Polytrauma	0	4 (3.2)	.299
Cranial CT	11 (15.3)	33 (26.4)	.071
ICI	2 (100)	4 (66.7)	.630
Hospital admission	3 (4.2)	12 (9.6)	.166
Admission to intensive care	1	3	
Length of stay (days) [Median (IQR)]	2 (1-4)	2 (1-5)	

Quantitative variables are expressed as median and interquartile range, categorical variables as count and percentage.

Values in bold denote statistical significance ( $P < .05$ ).

\*2 alcohol and one cannabis, all drivers > 16 years, 2 electric scooter drivers.

\*\*34 drivers [23 (67.6%) < 16 years]; 12 passengers and 2 pedestrians. Only one passenger was recorded as wearing a helmet.

TBI moderate-severe: head injury Glasgow scale < 14 points; CT: computed tomography; ICI: intracranial injury; IQR: interquartile range.

obtaining the approval of the Hospital Ethics Committee (PIC-54-21).

A total of 198 patients were included: 72 from period-1 and 125 from period-2. Table 1 shows their clinical-epidemiological characteristics. Of the 7 cases with moderate-severe TBI, 6 involved an electric scooter. Fifteen patients were admitted, 13 due to TBI and 2 for surgery for long bone fracture. One

of the severe cases, with cranial fracture and intracranial injury, presented sequelae at discharge (central diabetes insipidus, language disorder). The other patients progressed favorably.

This study shows that the widespread use of electric scooters, as has been described in adults,<sup>2,3</sup> is linked to an increase in TBI in children and adolescents. The age of the patients has increased, possibly due to the

greater number of motorized vehicles involved. Even so, the number of children under 16 years of age involved in accidents with electric scooters is noteworthy, especially considering that the regulations in Barcelona do not allow minors to use them.

In conclusion, accidents related to electric scooters are a growing problem with major health, social and economic repercussions. To address this problem, it is essential to raise public awareness of the potential risks and promote prevention through the implementation of safety-based legislation.

## References

- 1 Yang J, Hu Y, Du W, Powis B, Ozanne-Smith J, Liao Y, et al. Unsafe riding practice among electric bikers in Suzhou, China: an observational study. *BMJ Open*. 2014;4:e003902.
- 2 Kobayashi LM, Williams E, Brown CV, Emigh BJ, Bansal V, Badiee J, et al. The emerging epidemic of e-scooters. *Trauma Surg Acute Care Open*. 2019;4:e000337.
- 3 Tan AL, Trauma Coordinators and Trauma Service Representatives; Nadkarni N, Wong TH. The price of personal mobility: burden of injury and mortality from personal mobility devices in Singapore - a nationwide cohort study. *BMC Public Health*. 2019;19:880.
- 4 Faraji F, Lee JH, Faraji F, MacDonald B, Oviedo P, Stuart E, et al. Electric scooter craniofacial trauma. *Laryngoscope Invest Otolaryngol*. 2020;5:390-5.
- 5 Bresley AY, Hanba C, Svider P, Carron MA, Hsueh WD, Paskhover B. Craniofacial injuries related to motorized scooter use: a rising epidemic. *Am J Otolaryngol*. 2019;40:662-9.

**Author Affiliations:** <sup>1</sup>Pediatrics Service, Hospital Sant Joan de Déu Barcelona, Esplugues de Llobregat, Barcelona, Spain. <sup>2</sup>Influence of the environment on child and adolescent well-being, Institut de Recerca Sant Joan de Déu, Esplugues de Llobregat, Barcelona, Spain. <sup>3</sup>Emergency Department, Hospital Sant Joan de Déu Barcelona, Esplugues de Llobregat, Barcelona, Spain.

<sup>4</sup>University of Barcelona, Barcelona, Spain.

Email: victoria.trenchs@sjd.es

**Conflict of Interests Disclosure:** None reported.

**Author Contributions, funding, and ethical responsibilities:** All authors have confirmed their authorship, the absence of external funding, and the maintenance of confidentiality and respect for patient rights in the document of author responsibilities, publication agreement, and assignment of rights to EMERGENCIAS. The patient has confirmed his/her consent for his/her personal information to be published.

**Article not commissioned by the Editorial Committee and with external peer review.**

**Editor in charge:** Xavier Jiménez Fàbrega.

**Correspondence:** Victoria Trenchs Sainz de la Maza. Servicio de Pediatría, Hospital Sant Joan de Déu Barcelona, Pg. de Sant Joan de Déu, 2, 08950 Esplugues de Llobregat, Barcelona, Spain.