




## Editorial

# Current Status of Traumatic Brain Injury in India

Chirag Jain<sup>1</sup>  Indira Devi B.<sup>1</sup> Dhananjaya I. Bhat<sup>2</sup> Dhaval P. Shukla<sup>1</sup><sup>1</sup>Department of Neurosurgery, National Institute of Mental Health and Neurosciences, Bengaluru, Karnataka, India<sup>2</sup>Department of Neurosurgery, RV Aster, Bengaluru, Karnataka, India

Indian J Neurotrauma

Traumatic brain injury (TBI) is one of the biggest challenges faced by neurosurgeons globally. The Global Burden of Disease Study 2019 showed a 11.1% increase in the age-adjusted incidence rate of TBI (from 499 per 100,000 in 1990 to 554 per 100,000 in 2019) and a 22.4% increase in age-adjusted prevalence (from 818 per 100,000 in 1990 to 1,002 per 100,000 in 2019) in India.<sup>1</sup> This contrasts starkly with a 5.5% decrease in incidence and a 0% change in the prevalence of TBI at the global scale.

Road traffic accidents account for the major proportion of head injuries.<sup>2</sup> A World Bank 2021 report showed that India accounts for almost 10% of global crash-related deaths, despite having only 1% of the world's vehicles.<sup>3</sup> For comparison, the United States saw 2.21 million accidents in 2018 resulting in 27,461 deaths, while India saw 480,652 accidents in 2018 (one-fifth of the number in the United States) resulting in 150,785 deaths (>5 times the number in the United States). More than half of these crash deaths affect pedestrians, bicyclists, and motorcyclists and greater than 66% occur in rural areas.

The lack of access to trauma care, particularly neurotrauma care, is a major obstacle to prevention of these road traffic deaths. Other factors that contribute include the poor availability of ambulance and transport services, the absence of prehospital care, and, perhaps, most significantly, the lack of adequate health care resources for low-income households. Low-income households reported twice the number of deaths postcrash compared to high-income households.<sup>3</sup> The glaring issue is the dearth of facilities available for low-income patients and the overburdened state of the existing facilities. As the World Bank report points out, there is an urgent need to improve the accessibility and inclusivity of health infrastructure and coverage as well as improve postcrash emergency care.

The WHO Global Status Report on Road Safety 2023 also highlights the disproportionately high number of fatalities in lower middle-income countries.<sup>4</sup> The highest number of fatalities occurred in the South East Asian region (330,222 deaths or 28% of the global burden). Only 35 countries have

legislation mandating five core areas of safety equipment and India is one of them. India is also one of the 166 countries with specific legislation on drink driving, even though it does not meet the WHO best practice legislation of a blood alcohol concentration (BAC) limit of  $\leq 0.05$  g/dL for general driving population. India is also one of the 54 countries that meets the WHO best practice legislation for helmet use. Out of five WHO best practice laws, India meets two—related to helmet use and seat-belt use. There is no law related to speed limit and India does not meet the WHO criteria for drink driving or child-restraint system use.

The mere presence of a law requiring a helmet for riding motorbikes does not ensure that such a practice is widely adopted. Studies show only 22 to 51% prevalence of helmet use among riders.<sup>5–7</sup> Helmets reduce the risk of brain injury by up to 74%.<sup>4</sup> The Motor Vehicle Act of India requires all riders of a motorbike who are older than 4 years to wear “protective gear” under Section 129. Section 138 of the Central Motor Vehicles Rule requires the provision of two helmets to buyers of two-wheelers. The low utilization rate of helmets despite the existence of these laws requires urgent steps to rectify the situation.

One of the reasons that riders may choose not to wear a helmet is that they are just not convinced of the fact that a helmet is necessary and would confer significant protection against head injury. Another reason is the lack of stringent punishment for not wearing a helmet. In a few states, the fine for not wearing a helmet is only Rs. 500 and in Uttarakhand and Gujarat, the fines were lowered from Rs. 1,000 to Rs. 500. Only in Maharashtra, Bihar, Haryana, Tripura, and Assam is it possible to have your driver's license canceled if you are not wearing a helmet. Stringent punishment as well as regular checks by the traffic police may help ensure a higher helmet utilization rate, apart from community-wide awareness programs. Even the presence of such laws and regular enforcement may be insufficient until the riders themselves believe in the safety provided by helmets. The improper use of helmets by riders such as the use of half-helmets or the incorrect strapping of a helmet go on to prove that the

**Address for correspondence**  
Indira Devi B, MBBS, MS, MCh,  
Neurosurgeon, D106, Casa Ansal  
Apartment, JP Nagar 3rd Phase,  
Bangalore 560078, Karnataka, India  
(e-mail: bidevidr@gmail.com).

DOI <https://doi.org/10.1055/s-0044-1789260>.  
ISSN 0973-0508.

© 2024. The Author(s).

This is an open access article published by Thieme under the terms of the Creative Commons Attribution License, permitting unrestricted use, distribution, and reproduction so long as the original work is properly cited. (<https://creativecommons.org/licenses/by/4.0/>)

Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

riders are only willing to wear these helmets to avoid fines, rather than to protect their brains.

Helmetless riders are not the only safety concern on Indian roads. Poor road quality, innumerable potholes, and lack of lane sense are some of the other contributors to frequent road traffic accidents. Two-wheelers, four-wheelers, trucks, and buses occupy the same lanes and drive at different speeds. Many cities lack a proper footpath infrastructure, jeopardizing the safety of pedestrians. There is an urgent need for the government to focus on improving road safety and infrastructure with a primary focus on preventing road traffic accidents.

A multitude of measures have been instituted to combat the problem of neurotrauma over the last decade. A review by Veerappan et al described efforts made at the national and local level to address the burden of neurotrauma.<sup>8</sup> Programs to improve helmet use have been conducted at the regional level by Andhra Medical College in 2019. The Neurotrauma Society of India (NTSI), Neurological Society of India (NSI), Indian Head Injury Foundation, and SaveLIFE Foundation have developed educational videos encouraging the use of helmets among the public.

As pointed out in a study conducted at National Institute of Mental Health and Neurosciences (NIMHANS), Bengaluru, almost one-third of trauma patients present to the hospital more than 24 hours posttrauma, highlighting the necessity of both quicker hospital transfers and better prehospital care.<sup>9</sup> The Gunupati Venkata Krishna Emergency Management and Research Institute has developed a prehospital care service that now spans 17 states and caters to a population of 750 million in India. Emergency medical technicians (EMTs) from this organization are able to respond to patient calls within 17 minutes in rural areas and transfer patients to hospitals within 2 hours.<sup>8</sup> Apart from quicker hospital transfers and better prehospital care, improving neurotrauma care at the local and regional level would also unburden the tertiary care centers and improve patient care at these centers for patients with severe TBI. Another study demonstrated that 77% of the patients seen at NIMHANS were mild TBI patients, 11% of patients did not require computed tomography (CT) scans, and 48% of patients had normal CT scans.<sup>10</sup> Only 10% of patients required surgical intervention. Provision of CT scanners at more remote centers as well as training the primary care providers to improve referral decision-making can help alter the burden of patient care at the tertiary centers.

The NTSI was established in 1992 under the aegis of the NSI. The NTSI has collaborated with the American Association of South Asian Neurosurgeons and the American Association of Physicians of Indian Origin to provide consensus recommendations for TBI management in India. This document provides recommendations for improving awareness and prevention of TBI, as well as for prehospital and hospital care and rehabilitation of TBI patients. In 2022, The NTSI published the National Guidelines for the Management of Traumatic Brain Injury. These guidelines were a result of a collaboration between the NTSI and the NSI and provide recommendations for prehospital care, hospital care, and neurorehabilitation after TBI.

An issue of significant concern with such guidelines and consensus recommendations is the lack of high-quality evidence pertaining to the Indian TBI population. The NTSI guidelines have been developed using the methodology of focused group discussion. A majority of these guidelines are modified versions of the Brain Trauma Foundation guidelines, which are based on predominantly moderate to low level of evidence through studies performed in high-income countries. It is not prudent to consider the direct application of such guidelines to the Indian neurotrauma scenario.

Two studies highlighted the paucity of research on TBI in India.<sup>11,12</sup> A review of published literature on TBI was able to find only 624 original research articles published from 2006 to 2014 on TBI in India.<sup>11</sup> A systematic review for studies on TBI with greater than 50 patients found only 72 suitable manuscripts from 1990 to 2015.<sup>12</sup> The NTSI has developed its own peer reviewed journal—*Indian Journal of Neurotrauma*—to combat the problem of lack of neurotrauma evidence. The journal has more than 20 volumes and is a repository of the Indian neurotrauma epidemiologic data. One can hope that with sufficient time, high-quality evidence from within the country can be utilized for the formulation of national neurotrauma guidelines.

A recent study published in 2021 defined the epidemiology of almost 15,000 head injury patients during the period of March 2016 to February 2020 treated at PGIMER, Chandigarh.<sup>2</sup> Road traffic accidents accounted for the majority of neurotrauma (61%) cases and the most commonly affected group was males aged 10 to 24 years. One-third of the patients had severe head injuries and only 30% of patients reached the hospital within 6 hours. This scenario has remained mostly unchanged from the epidemiological data published by NIMHANS in 2002.<sup>13</sup> This study highlights the well-known facts about neurotrauma in the Indian scenario. The urgent requirement for better legislation, stronger enforcement of traffic rules, faster hospital transfers and prehospital care, reduction of the burden on tertiary care centers, and the necessity of neurorehabilitation services are important steps forward for ensuring better neurotrauma care.

Neurotrauma care is a resource-intensive setup and requires commitments from neurosurgeons, critical care specialists, intensive care unit (ICU) and trauma nurses, physical therapists, neuropsychologists, and neurorehabilitation professionals. There are only a few dedicated centers in the country that provide such dedicated teams and facilities. Many medical colleges and institutes do not offer neurosurgical training and some of those that do have no neurotrauma facilities. Neurotrauma care always was, is, and will be one of the pillars of neurosurgery and a poor exposure to the field would be detrimental to both the surgeons and the patients. Yet, the rapidly growing disinterest of neurosurgeons in the field of neurotrauma is obvious. Another facet of neurotrauma care that is becoming more and more obvious is the nihilism associated with head injury cases. The insurmountable burden of head injury patients at tertiary care centers makes it difficult to provide appropriate care particularly to patients with severe TBI, especially when they may be easily deemed to be

“untreatable.” When such a sinister self-fulfilling prophecy is at play, the slightest hint of optimism and enthusiasm from neurosurgeons may go a long way in improving outcomes for neurotrauma patients.

#### Funding

None.

#### Conflict of Interest

None declared.

#### References

- 1 Guan B, Anderson DB, Chen L, Feng S, Zhou H. Global, regional and national burden of traumatic brain injury and spinal cord injury, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *BMJ Open* 2023;13(10):e075049
- 2 Karthigeyan M, Gupta SK, Salunke P, et al. Head injury care in a low- and middle-income country tertiary trauma center: epidemiology, systemic lacunae, and possible leads. *Acta Neurochir (Wien)* 2021;163(10):2919–2930
- 3 World Bank. Traffic Crash Injuries and Disabilities: The Burden on Indian Society. Accessed January 28, 2024 at: <https://documents.worldbank.org/en/publication/documents-reports/document-detail/761181612392067411/main-report>
- 4 World Health Organization Global Status Report on Road Safety 2023. Geneva: WHO; 2023
- 5 Wadhvaniya S, Gupta S, Tetali S, Josyula LK, Gururaj G, Hyder AA. The validity of self-reported helmet use among motorcyclists in India. *WHO South-East Asia J Public Health* 2015;4(01):38–44
- 6 Mirkazemi R, Kar A. Socio-economic determinants of helmet-wearing behaviour in Pune city, India. *Int J Inj Contr Saf Promot* 2014;21(04):376–381
- 7 Setty NKH, Sukumar GM, Majgi SM, Goel AD, Sharma PP, Anand MB. Prevalence and factors associated with effective helmet use among motorcyclists in Mysuru City of Southern India. *Environ Health Prev Med* 2020;25(01):47
- 8 Veerappan VR, Nagendra B, Thalluri P, Manda VS, Rao RN, Pattisapu JV. Reducing the neurotrauma burden in India: a national mobilization. *World Neurosurg* 2022;165:106–113
- 9 Pruthi N, Ashok M, Kumar VS, Jhavar K, Sampath S, Devi BI. Magnitude of pedestrian head injuries & fatalities in Bangalore, south India: a retrospective study from an apex neurotrauma center. *Indian J Med Res* 2012;136(06):1039–1043
- 10 Devi BI, Shukla DP, Bhat DI, et al. Neurotrauma care delivery in a limited resource setting-lessons learned from referral and patient flow in a tertiary care center. *World Neurosurg* 2019;123:e588–e596
- 11 Agrawal A, Munivenkatappa A, Shukla DP, et al. Traumatic brain injury related research in India: an overview of published literature. *Int J Crit Illn Inj Sci* 2016;6(02):65–69
- 12 Massenburg BB, Veetil DK, Raykar NP, Agrawal A, Roy N, Gerdin M. A systematic review of quantitative research on traumatic brain injury in India. *Neurol India* 2017;65(02):305–314
- 13 Gururaj G. Epidemiology of traumatic brain injuries: Indian scenario. *Neurol Res* 2002;24(01):24–28