

# An In-Depth Study of Motorized Two-Wheeler Accidents in India

Arjun P, Arjun CT, Rajkamal S, Santhosh Kumar G, AM Hassan, Ravishankar R, J Padmanaban

In India, 1 in 20,000 people die and 12 in 70,000 people sustain serious injuries every year due to road accidents [1]. A significant portion of these crashes and injuries involve motorized two-wheelers (M2Ws). Researchers from JP Research India (JPRI) have been conducting in-depth accident investigation on National Highways in South India for the last few years. This paper presents injury findings relating to M2W crashes.

## I. METHODS

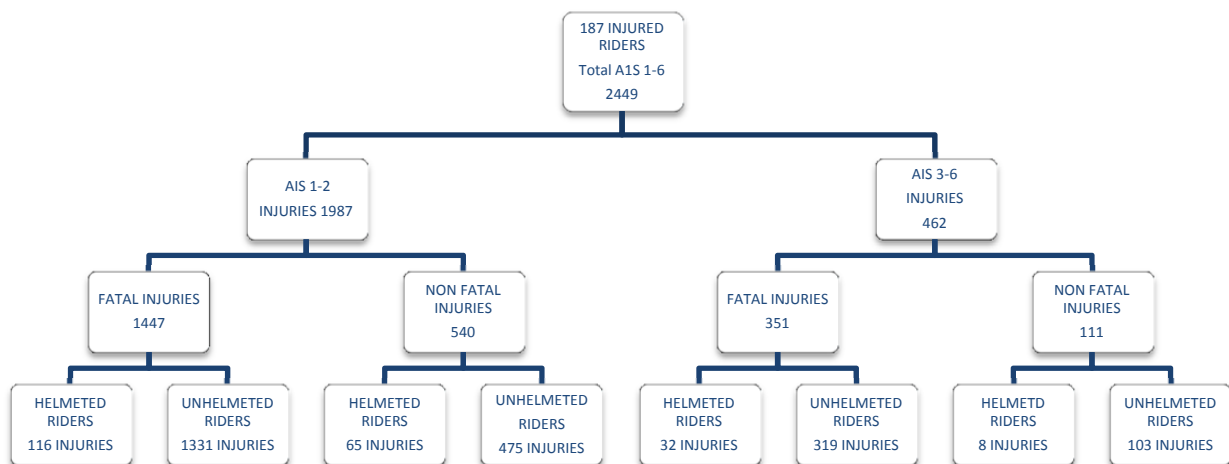
This study uses data on M2W (primarily motorcycle) accidents from the RASSI (Road Accident Sampling System – India) database [2]. RASSI is a comprehensive database based on the format of international databases in the USA, Germany and the UK, but developed for Indian conditions. For the RASSI project, JPRI teams perform on-site and follow-up crash investigations, collecting timely and detailed accident, vehicle, occupant and road user data and performing vehicle damage coding, accident reconstruction and injury coding. Information is coded into a computerized RASSI database. All injuries are coded in RASSI, not just the maximum severity injury; thus, a rider who suffers a fatal injury is likely also to have seen multiple AIS 1-2 injuries. These additional data allow careful analysis of the types of contact and injury seen in M2W crashes in Southern India.

## II. INITIAL FINDINGS

Over the past three years, JPRI has investigated over 2,000 crashes; 670 of these were in-depth investigations of Coimbatore-area crashes. Of these 670 crashes, 182 were M2W crashes for which injury records were available. 72% (134) of these M2Ws were motorcycles and 28% (48) were scooters and mopeds. 41% of these crashes were head-on, 21% were front-side and 19% were sideswipe accidents. The majority of the collision partners for motorcycle accidents were cars (36%) and heavy vehicles (36%), 22% of the riders were young (18-23 years old), and 83% of the motorcycle riders were not helmeted.

Of the 188 M2W riders involved in the 182 crashes, only 1 was uninjured; 51% (96) were fatally injured, and 41% (76) sustained serious non-fatal injuries. Figure 1 shows the full range of injuries seen, by level of severity.

Figure 1: Injuries of M2W Riders by Level of Severity and Helmet Use



Arjun P, Arjun CT, Santhosh Kumar G, Rajkamal S, and R Rajaraman are crash investigators with JP Research India Pvt. Ltd., Coimbatore, Tamil Nadu, India (Tel: +91-422-4400100, Email: reachus@jpresearchindia.com), AM Hassan is a Crash Investigation and Injury Biomechanics Consultant to JP Research India, UK. J Padmanaban is president and founder of JP Research, Inc., Mountain View, California, USA.

Figures 2 and 3 show a higher percentage of head injuries to unhelmeted M2W riders compared to helmeted riders, but this difference is not statistically significant (chi square test,  $p=0.97$ ). These results contradict what is seen in developed countries.

Figure 2: Distribution of Injury Severity (AIS  $\geq 3$ ) by Body Region and Helmet Use

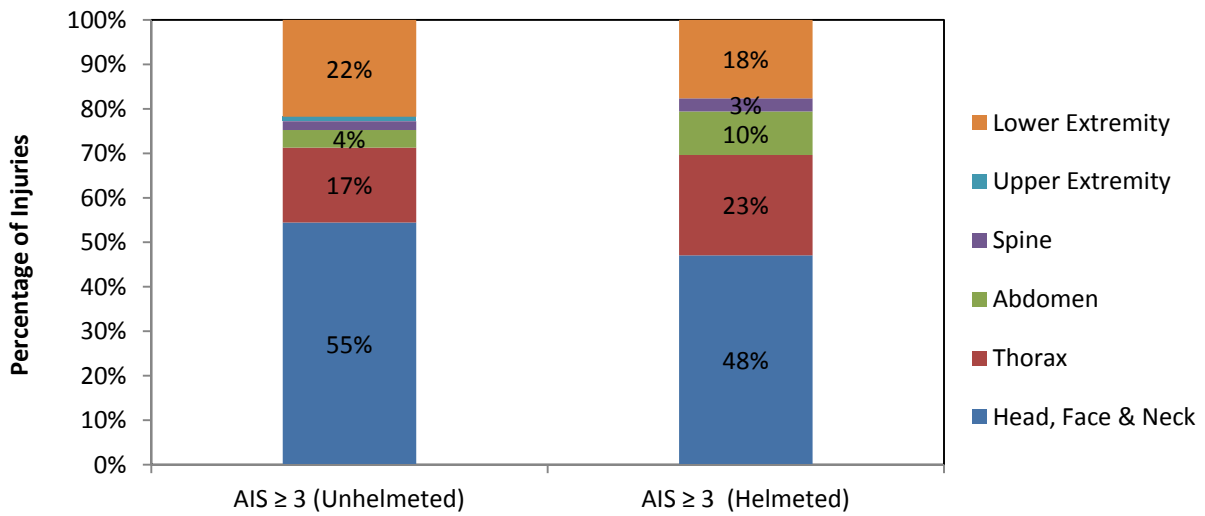
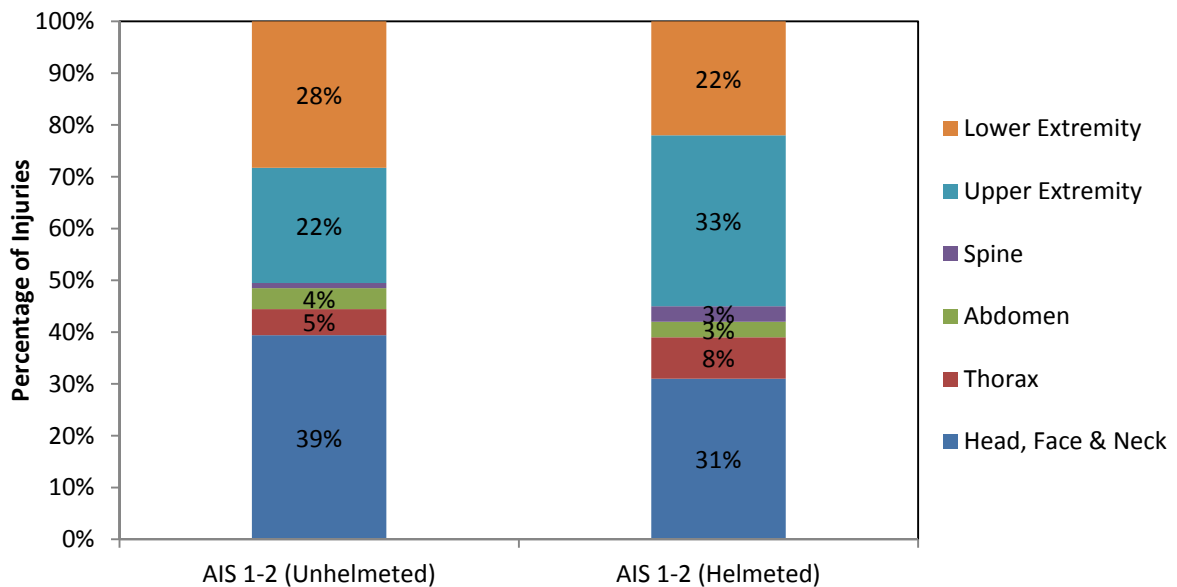


Figure 3: Distribution of Injury severity (AIS 1-2) by Body Region and Helmet Use



**Note:** For both helmeted and unhelmeted riders, serious 'Head' injury counts are higher than those for 'Face & Neck'.

### III. DISCUSSION

There are a number of possible reasons for the non-statistically significant difference seen between head injury rates for helmeted and unhelmeted riders, including improper usage of helmets, helmet design (non-standardized) and crash severity affected by Indian road infrastructure. Also, many riders are run over by traffic on highways after they have been thrown from their bikes. Helmet effectiveness in reducing head injuries is marginalized in such crashes. It is expected that increased law enforcement, infrastructure development, proper helmet use training and design/safety standards for helmets would mitigate injuries to M2W riders in India.

### IV. REFERENCES

- [1] Accidental Deaths & Suicides in India 2012, National Crime Records Bureau, Ministry of Home Affairs
- [2] N. Rameshkrishnan, IRCOBI, 2013