

Motorcycle Crashes Resulting in Hospital Admissions in South Australia: Crash Characteristics and Injury Patterns

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Abstract

This study examined records from the Royal Adelaide Hospital for 763 motorcyclists (admitted January 2008-November 2010 and April 2014-December 2016). Records were linked with police-reported crash data and blood test results. Compared with 1617 car drivers admitted over the same periods, motorcyclists were younger, more commonly male, more likely to hold a learner permit, and less likely to be over the legal alcohol limit. Their crashes were more likely to be single vehicle and more common on weekends and in 50 and 80 km/h speed limits. They also had a higher injury severity. Countermeasures to improve motorcycling safety are discussed.

Background

Motorcycle and scooter riders have a high risk of serious or fatal injury if they crash (Johnston, Brooks, & Savage, 2008; Keall & Newstead, 2012; Lin & Kraus, 2009; Van Eslande & Elvik, 2012). In South Australia, motorcyclists account for a substantial proportion of the State's road trauma, comprising 17% of serious injuries and 12% of fatalities between 2012 and 2016 (Baldock, 2018). To identify countermeasures, the present study examined crashes in which a motorcycle (or scooter) rider was injured and admitted to the Royal Adelaide Hospital (RAH) in South Australia.

Method

Records for 763 motorcyclists (including 70 scooter riders) who were admitted (four hours or more) to the RAH (January 2008-November 2010 and April 2014-December 2016) were linked with police-reported crash data and forensic blood test results for alcohol and drugs. Rider characteristics, crash characteristics and injury patterns were examined and comparisons made to 1617 car drivers (and car derivatives, e.g. utility vehicles) admitted to the RAH over the same periods.

Results

Rider characteristics

Compared to injured car drivers, injured motorcyclists were younger (mean age 39.3 versus 44.9 years, $t(2378)=6.7$, $p<.001$) and more commonly male (93% versus 58%). They differed in licence status ($\chi^2_{(5)}=33.8$, $p<.001$), with a larger proportion of motorcyclists holding a learner permit (6% versus 2%) and smaller proportion holding a provisional licence (9% versus 13%). They were less likely to be over the legal limit of alcohol (8% versus 20%, $\chi^2_{(1)}=42.1$, $p<.001$) but did not differ in the likelihood of testing positive to proscribed drugs (methamphetamine, THC and/or MDMA) (19% versus 16%, $\chi^2_{(1)}=1.5$, $p=.220$). Their helmet use was high (98%).

Crash characteristics

Table 2 shows that, compared to crashes involving injured car drivers, those involving injured motorcyclists were overrepresented on weekends, during the afternoon, in single vehicle crashes, on sloping roads, on curved roads, on roads with speed limits of 50 and 80 km/h, during daylight hours, in dry weather and on dry roads.

Table 1. Crashes involving injured motorcyclists compared to injured car drivers

Variable	Test statistic	Nature of difference
Day of week	$\chi^2_{(6)}=25.1, p<.001^*$	Motorcycle crashes more common on weekends (39% vs 29%)
Time of day	$\chi^2_{(3)}=49.5, p<.001^*$	Motorcycle crashes more common during the afternoon (50% vs 39%), car crashes between midnight and 6am (5% vs 13%)
Crash location	$\chi^2_{(1)}=2.7, p=.103$	No difference, metro or rural (50%-50% vs 54%-46%)
Single/multiple vehicle	$\chi^2_{(1)}=5.0, p=.025^*$	Motorcycle crashes more commonly single vehicle (53% vs 48%)
Vertical alignment	$\chi^2_{(3)}=80.3, p<.001^*$	Motorcycle crashes more common on sloping roads (23% vs 9%)
Horizontal alignment	$\chi^2_{(1)}=25.7, p<.001^*$	Motorcycle crashes more common on curved roads (32% vs 22%)
Road surface	$\chi^2_{(1)}<.1, p=.872$	No difference, sealed or unsealed (96% sealed for both groups)
Speed limit	$\chi^2_{(7)}=58.3, p<.001^*$	Motorcycle crashes more common on roads with speed limits of 50 (21% vs 17%) and 80 km/h (20% vs 11%), car crashes on roads with speed limits of 100 km/h or higher (28% vs 19%)
Light conditions	$\chi^2_{(1)}=52.5, p<.001^*$	Motorcycle crashes more common during daylight (80% vs 65%)
Weather conditions	$\chi^2_{(1)}=13.1, p<.001^*$	Motorcycle crashes more common in dry weather (95% vs 90%)
Road conditions	$\chi^2_{(1)}=16.9, p<.001^*$	Motorcycle crashes more common on dry roads (93% vs 87%)

* $p<.05$.

Injury patterns

Motorcyclists had a higher severity of injury than car drivers (mean Injury Severity Scale 9.2 versus 6.4, $t(1192)=5.7, p<.001$) and were more likely to sustain injuries to multiple body regions (75% had injuries to two or more regions versus 60%, $\chi^2_{(1)}=22.3, p<.001$). Additionally, linear regression ($F(7, 372)=6.1, p<.001$) showed that older age ($t=3.0, p=.003$), higher blood alcohol concentration ($t=4.3, p<.001$) and higher speed limit ($t=2.8, p=.005$) increased injury severity for motorcyclists.

Conclusions

This study provides a detailed picture of current crash and injury patterns for a high-risk road user group, which is necessary to facilitate future improvements in their safety. Based on present findings, motorcycling safety can be improved through countermeasures related to: Graduated Licensing Systems (e.g. inclusion of on-road test of abilities for novice riders before being allowed on the road), infrastructure (e.g. improving road surfaces on curves, improving and maintaining delineation and curve warning signage, and widening lanes and sealed shoulders on curves), motorcycle technology (e.g. advances in combined braking, traction control and anti-lock braking systems) and clothing (i.e. encouraging use of clothing that provides superior protection).

References

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