Alcohol is a risk factor for helmet non-use and fatalities in off-road vehicle and motorcycle crashes

Nelofar Kureshi[1], Simon Walling[1], Mete Erdogan[2], Izabella Opra[2], Robert S. Green[2,3], David B. Clarke[1]

[1]Division of Neurosurgery, Dalhousie University; [2]Trauma Nova Scotia, Nova Scotia Health; [3]Departments of Critical Care, Emergency Medicine, Surgery and Anesthesia, Dalhousie University

INTRODUCTION

- **Off-road vehicle (ORV) and motorcycle** use is common in Canada; however, risk of serious injury is heightened if these vehicles are operated while impaired.
- Higher rates of **traumatic brain injury (TBI)** in patients who were intoxicated at time of injury may be due in part to low rates of helmet use.
- **Research Objective:** To evaluate the impact of alcohol intoxication on helmet use and mortality in TBI patients injured while driving an ORV or motorcycle.

METHODS

- Data were collected (2002-2018) from the NS Trauma Registry on all ORV and motorcycle crashes resulting in major TBI (Abbreviated Injury Score [AIS] Head ≥3).
- **Patients were grouped** by blood alcohol concentration (BAC) as BAC negative (<2mmol/L), legal intoxication (2-17.3mmol/L) or criminal intoxication (>17.3mmol/L).
- Using logistic regression, we tested for the effect of helmet non-use on mortality (prehospital, in-hospital).

RESULTS

- Overall, 424 trauma patients were included for analysis (220 ORV drivers, 204 motorcycle drivers).
- **BAC testing** was performed in 66% (146/220) of ORV crashes and 68% (138/204) of motorcycle crashes.
- **Helmet use** was 45% (99/220) among ORV drivers and 88.7% (181/204) among motorcycle drivers.
- **Prehospital death** was observed in 29% of ORV crashes and 18% of motorcycle crashes, and was associated with ISS (OR 1.07) and criminal intoxication (OR 3.12).

DISCUSSION

- **Criminal intoxication** was associated with helmet non-use and any level of intoxication increased the odds of in-hospital mortality.
- Further work is needed to better understand the factors associated with alcohol misuse in this population.

16-year retrospective cohort (2002-2018) | **All major TBI patients in NS (n=5,560)** | **ORV drivers (3.9%; n=220) Motorcycle drivers (3.6%; n=204)**

Legally intoxicated drivers (BAC 2-17.3mmol/L)

were 5-times more likely to die in-hospital (OR 5.63; 95% CI 1.19-26.59)

Compared to BAC Negative drivers; adjusted for age, sex and helmet use

Drivers with BAC>17.3mmol/L were over 3 times more likely to be riding unhelmeted

Compared to BAC Negative; adjusted for age and sex

ALL CRASHES	FATAL CRASHES
OR 3.77 (95% CI 2.17-6.52)	OR 3.94 (95% CI 1.37-11.34)

Criminally intoxicated drivers (BAC >17.3mmol/L)

were more likely to die prehospital (OR 3.12; 95% CI 1.48-6.55) and in-hospital (OR 4.97; 95% CI 1.81-13.67)

Compared to BAC Negative drivers; adjusted for age, sex and helmet use

Scan QR code for more

IWK Health | TRAUMA NOVA SCOTIA | nova scotia health | DALHOUSIE UNIVERSITY

Characteristic	BAC Level: Negative (<2mmol/L) n=144	Legal (2-17.3mmol/L) n=22	Criminal (>17.3mmol/L) n=120
Age**	41.0±15.2	28.0±8.5	37.0±12.7
Male sex*	127 (88.2)	17 (77.3)	113 (94.2)
Vehicle type**			
ORV	37 (25.7)	14 (63.6)	95 (79.2)
Motorcycle	107 (74.3)	8 (36.4)	25 (20.8)
Helmet use**	115 (79.9)	17 (77.3)	60 (50.0)
GCS on ED arrival	10.5±5.2	12.4±4.4	8.9±5.4
Max AIS Head	4.1±0.9	4.1±0.9	3.9±0.9
ISS*	35.5±18.3	35.9±17.9	29.6±16.3
TTA	87 (60.4)	13 (59.1)	69 (57.5)
Mortality			
Prehospital	33 (26.4)	5 (27.8)	33 (32.0)
In-hospital	16 (14.8)	4 (23.5)	17 (19.5)

Table 1. Characteristics of study cohort grouped by BAC level. Data are presented as n (%) or mean ± SD. ORV = off-road vehicle; GCS = Glasgow Coma Scale; ED = emergency department; AIS = Abbreviated Injury Scale; ISS = Injury Severity Score; TTA = trauma team activation. *P<0.05. **P<0.001

Variable	OR	95% CI	P value
Prehospital Mortality			
Age	1.00	0.99-1.04	0.21
Helmet use	2.47	1.12-5.46	0.03
Max AIS Head Score	1.15	0.72-1.84	0.55
Injury Severity Score	1.07	1.04-1.09	<0.001
BAC level			
Negative	Reference	-	-
Legal intoxication	1.31	0.34-4.95	0.69
Criminal intoxication	3.12	1.48-6.55	0.003
In-Hospital Mortality			
Age	1.05	1.02-1.09	0.002
Helmet use	2.06	0.77-5.54	0.15
Max AIS Head Score	3.86	1.91-7.81	<0.001
Injury Severity Score	1.05	1.01-1.08	0.02
BAC level			
Negative	Reference	-	-
Legal intoxication	5.63	1.19–26.59	0.029
Criminal intoxication	4.97	1.81–13.67	0.002

Table 2. Factors associated with prehospital and in-hospital mortality. OR = odds ratio; CI = confidence interval; BAC = blood alcohol concentration.