Published in final edited form as:

Traffic Inj Prev. 2018 ; 19(Suppl 2): 183–184. doi:10.1080/15389588.2018.1532234.

Mortality predictors in traumatic brain injury due to motorcycle crashes in Rwanda

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Objective

Which factors predict mortality in patients with traumatic brain injury (TBI) caused by motorcycle crashes (MC) at the emergency department (ED) in a low-income country?

Methods

All acutely injured patients involved in an MC were screened for TBI defined as: reported head trauma, altered consciousness, headache, or visible head trauma. Exclusion criteria were age <10 years, presentation >48 hours after injury, and injuries previously cared for at this ED. The care delivered to enrolled MC-TBI patients was directly observed for the first 4 hours of in the ED then followed until their death or discharge. For this cohort of MC-TBI patients we described data and calculated X^2 statistics then univariate logistic regression for association with mortality. A multivariate logistic regression model of significant variables was refined via backward elimination and C-statistics were calculated.

Data Sources

Over 6 months from October 2013 to April 2014 a prospective, consecutive sample of patients presenting for care at the University Teaching Hospital of Kigali in Kigali, Rwanda was screened for the study inclusion criteria.

Results

153 patients had a mean age of 30.2 years (min 12, max 69, SD 8.6) and included 11 deaths (7.2%). Crude associations between mortality and age, gender, alcohol use, helmet use, ambulance transport and transfers for care did not reach statistical significance. A fully significant model with a C-statistic of 0.96 included **GCS <9** (OR 63.97 (4.92–831.03)), **abnormal heart rate** (OR 60.77 (2.08–1778.75)) and **hypoxia** (OR 34.29 (2.15–546.98)) as strong predictors of mortality.

Crude Mortality Associations, no statistical significance

Characteristics	All Patients (% of Total)	Discharged, 608 (Row%)	Died, 62 (Row %)	X ² Statistics, P Value
Age <= 50	148 (96.7%)	138 (93.2%)	10 (6.8%)	
Age > 50	5 (3.3%)	4 (80.0%)	1 (20.0%)	0.26
Male	130 (86.1%)	120 (92.3%)	10 (7.7%)	
Female	21 (13.9%)	20 (95.2%)	1 (4.8%)	0.63
Alcohol	14 (9.2%)	13 (92.9%)	1 (7.1%)	
No Alcohol	138 (90.8%)	128 (92.8%)	10 (7.2%)	0.99
Helmet	128 (84.8%)	120 (93.8%)	8 (6.2%)	
No Helmet	23 (15.2%)	20 (87.0%)	3 (13.0%)	0.25
EMS transport	60 (52.2%)	55 (91.7%)	5 (8.3%)	
No EMS transport	55 (47.8%)	53 (96.4%)	2 (3.6%)	0.29
Not Transferred	114 (74.5%)	107 (93.9%)	7 (6.1%)	
Transferred	39 (25.5%)	35 (89.7%)	4 (10.3%)	0.39

Mortality predictors in UTHK ED patients with TBI due to a motorcycle crash (n=153)

Characteristics	All Patients (% of Total)	Discharged, 142 (Row %)	Died, 11 (Row %)	X ² , P Value	Crude OR Death (95% CI)	Adjusted OR Death (95% CI)
GCS 13–15	129 (84.3%)	126 (97.7%)	3 (2.3%)			
GCS 9–12	14 (9.2%)	11 (78.6%)	3 (21.4%)		11.45 (2.06–63.64)	2.34 (0.06–94.85)
GCS 3–8	10 (6.5%)	5 (50.0%)	5 (50.0%)	<0.05	42.0 (7.77–227.04)	177.89 (5.80–5451.58)
No Hypoxia (>89%)	130 (96.3%)	125 (96.1%)	5 (3.9%)			

Characteristics	All Patients (% of Total)	Discharged, 142 (Row %)	Died, 11 (Row %)	X ² , P Value	Crude OR Death (95% CI)	Adjusted OR Death (95% CI)
Hypoxic (<90%)	5 (3.7%)	2 (40.0%)	3 (60.0%)	<0.05	37.5 (5.07–277.11)	25.81 (0.44–1521.74)
Normal Heartrate (60–100)	101 (67.8%)	100 (99.0%)	1 (1.0%)			
Abnormal (<60 or >100)	48 (32.2%)	38 (79.2%)	10 (20.1%)	<0.05	26.32 (3.26–212.61)	180.96 (1.40–23351.8)
No Hypotension (SBP >99)	135 (94.4%)	128 (94.8%)	7 (5.2%)			
Hypotension (SBP <100)	8 (5.6%)	5 (62.5%)	3 (37.5%)	<0.05	10.97 (2.17–55.49)	4.81 (0.11–212.10)
0 Other Injuries	123 (80.4%)	117(95.1%)	6 (4.9%)			
1+Other Injuries	30 (19.6%)	25 (83.3%)	5 (16.7%)	<0.05	3.90 (1.10–13.79)	4.40 (0.18–104.42)

Conclusions

Similar to high income country data we found that GCS, heart rate and oxygen saturation should be assessed at triage to identify MC induced TBI patients at high risk of death to assist in prioritizing interventions. Our small sample did not have the statistical power to detect expected helmet related mortality reductions, though these results and anecdotal observation cause us to wonder if broken retention systems, prior helmet impacts and MC dynamics may reflect unmeasured confounders of this relationship and require further study in low and middle income countries where injury burden is highest.