

Severity and Pattern of Motorcycle Injuries in Emergency Department of a Tertiary Trauma Care Hospital

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ABSTRACT

Introduction: Motorbike serves as cheap means of transportation in middle- and low-income countries. Accidents are common with motorcycle because of reckless driving, human error, bad road conditions, traffic rule violations, excessive speed and lack of protective helmets and clothing. Road traffic accidents due to motorcycle injuries poses increased burden in terms of cost of care and mortality in Nepal in upcoming years

Methods: This was a prospective, descriptive study conducted in a patient presenting with motorbike accident in National Trauma Centre, Kathmandu, Nepal from 2025 AD to 2026 AD after institutions review board approval. Data were collected based on site of injury, substance abuse, whether helmet was worn or not, status of victim and mean injury severity score was assessed.

Results: Five hundred eighty-four (70.53%) were male whereas female patient comprised of 244 (29.47%) of total cases with mean age of the patients found to be 35.47 ± 8.53 . Five hundred sixty-five (68.24%) patients were rider while 263 (31.76%) were pillion rider. Extremities are commonly involved body region comprising of 91.31% of total injuries encountered. All rider had worn helmet during motorbike accident while none of the pillion rider had worn helmet. Seventy-six (9.18%) patients had history of substance abuse (alcohol). The mean Injury Severity Score (ISS) was 5.48 ± 6.53 and mean survival prediction score (Ps) of patients was 0.94 ± 0.05 .

Conclusions: Motorbike accident is an important cause of morbidity and mortality in productive age group presenting in emergency department of tertiary trauma care hospital of Nepal.

Keywords: Motorbike Accident; Injury Severity Score; Survival Prediction Score.

INTRODUCTION

Globally, motorcycle crashes account for 60% of road traffic injuries and nearly 23% of mortality among road users is attributed to motorcycle riders.¹ Studies from developing countries like Nigeria, India and Pakistan where motorcycle serve as a cheap means of transportation showed that increased burden in terms of morbidity and mortality.¹⁻³ RTI is the leading cause of trauma related morbidity and mortality. While there are some published epidemiological reports on RTI in the region, studies on the mechanism of causation of road traffic crashes (RTC) Accidents are common with motorcycle because of reckless driving, human error, bad road conditions, traffic

rule violations, excessive speed and lack of protective gears.¹ Over speeding causes higher Injury Severity Score (ISS) resulting in increased mortality.⁴ Survival prediction following motorbike accident is often used to evaluate the quality of trauma care which is assessed based on patients clinical parameters like age, Glasgow coma scale score, systolic blood pressure, respiratory rate, ISS.⁵ This study aims to describe pattern of the motorcycle injuries, ISS and survival prediction of the patients presenting at Tertiary Trauma Centre Hospital of Nepal.

METHODS

This was a prospective observational study conducted

in a patient presented with motorbike accident in emergency Department of National Trauma Centre, Kathmandu, Nepal from April 2025 AD to January 2026 AD in after ethical approval from ethical review board (ERB) Nepal Health Research Council (NHRC) (ref: 2365) and the informed consent of the patient was taken. Using a Cochran's formula, total sample size was calculated as 360 with 95 % confidence interval and 5% margin of error with study from National Trauma Centre showing the prevalence of Lower Limb injuries due to RTA found to be 62.62%.⁶ All the Motorcycle related Injuries coming to the Emergency Department (ED) of National Trauma Centre, Mahankal, Kathmandu were included in the study whereas the patient primarily treated in Emergency department of other centre and brought dead patient were excluded from the study. Data collection regarding age, sex, injured body parts, use of helmet, Substance use, Injury Severity Score and survival prediction was done

prospectively by collecting information in a proforma. ISS was calculated as the sum of the squares of the highest Abbreviated Injury Scale (AIS) code [each ranging from 0 to 6: 1-minor, 2-moderate, 3-serious, 4-severe, 5-critical, 6-maximum(currently untreatable)] in each of the 3 most severely injured ISS body regions (6 body regions in total: head or neck, face, chest, abdominal or pelvic contents, extremities or pelvic girdle, external). It ranged from 3 (least) to 75 (most injured). If an injury was given an AIS 6, the ISS was automatically set at 75.⁷

Survival prediction score (Ps) was accessed by using formula: $\log(Ps/1-Ps) = \text{logit}(Ps) = -9 + cISS - cAGE + cSBP + cGCS + cRR/2$, where -9 becomes -7 if the predictor variable of cRR or cISS is missing.⁵ Where Ps: probability of survival, GCS: Glasgow coma scale score SBP: Systolic blood pressure, RR: Respiratory rate, ISS: Injury Severity Score.

Table 1: Injury severity score⁵

Coded value	Glasgow coma scale score (GCS)	Systolic blood pressure (mmHg)(SBP)	Respiratory rate (/min)(RR)	Age (years)	Injury Severity Score (ISS)
4	13-15	>89	10-29		<16
3	9-12	76-89	>29		16-24
2	6-8	50-75	6-9		25-40
1	4-5	1-49	1-5	>=55	41-65
0	<4	No pulse	0	0-54	>65

The area under the receiver-operating characteristic curve (AUROCC), which distinguishes between survival and non-survival. High probability of survival when $Ps > 0.5$ and Low probability of survival (higher risk of mortality) when $Ps < 0.5$. The statistical analysis was done by using SPSS (Statistical Package for Social Sciences, version 20). Descriptive statistics like frequency, percentage, mean, standard deviation were used to assess the parameters such as age, sex, injured body parts, use of helmet, Injury Severity Score, Substance use.

This study was commenced after ethical approval from NHRC. Informed consent was taken from participants prior to enrolment. All participants were voluntarily enrolled and allowed to withdraw at any point from study. Participants had no extra financial burden for the study purpose

This data will be stored in password protected laptop for one year after the completion of study and it will be accessed by researchers only.

RESULTS

We included all eight hundred twenty-eight patients who presented in our ED with motorbike accident during our study period.

Out of total patient, 584 (70.53%) were male whereas female patient comprised of 244 (29.47%) of total cases. The mean age of the participants was 35.47 ± 8.53 . (Table 2)

Table 2: The demographic profile of patient with Motorbike accident.

Variables	Variables	N (%)
Sex	Male	584(70.53)
	Female	244(29.47)
Age group	18-25	317(38.29)
	26-40	281(33.94)
	41-65	202(24.40)
	>65	28(3.37)

Five hundred sixty-five (68.24%) patients who presented in our ED with motorbike accident were rider while 263(31.76%) were pillion rider. All rider had worn helmet during motorbike accident while none of the pillion rider had worn helmet during accident. (Figure 1)

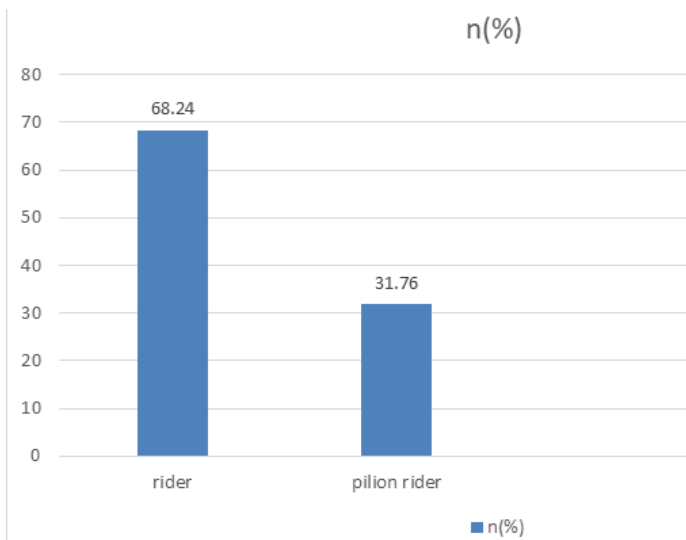


Figure 1: Patient as rider or pillion rider during motorbike accident

Seventy-six (9.18%) patients had history of substance abuse (alcohol) while 752(90.82%) had no any history of substance abuse (alcohol). (Figure 2)

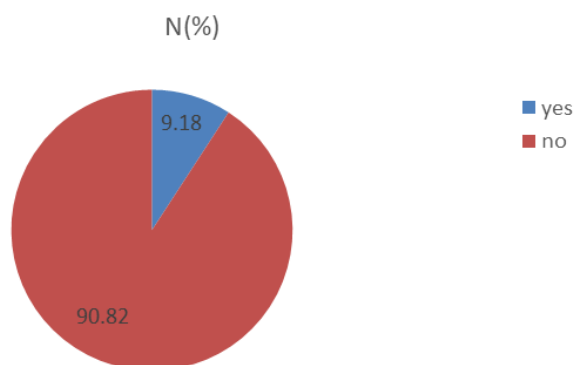


Figure 2: History of Substance use (alcohol) by patient with Motorbike accident

Seven hundred fifty-six (91.31%) patients had injury to their extremities following motor bike accident and 357(43.12%) had more than one body parts injury during the accident. (Table 3)

Table 3: Most commonly injured body region during motor bike accident.

Region	N (%)
Head & Neck	87(10.51)
Face	207(25.00)
Chest	365(44.01)
Abdomen	67(8.10)
Extremity	756(91.31)
External	78(9.42)

The mean Injury Severity Score (ISS) was 5.48 ± 6.53 and mean survival prediction score (Ps) of patient with motorbike accident was 0.94 ± 0.05 . (Table 4)

Table 4: Injury Severity Score (ISS) and survival prediction score (Ps) of patients with motorbike accident was 0.94 ± 0.05

variable	Mean $\pm$ SD
Injury Severity Score (ISS)	5.48 ± 6.53
survival prediction score (Ps)	0.94 ± 0.05

DISCUSSION

Road traffic accidents are leading cause of mortality, contributing to 2.1% of death globally and predicted to be highest contributor to global mortality by the year 2020.⁸ Middle income and low-income countries like Nepal are most commonly affected globally. Motorbikes serve as cheap means of transportation in Nepal and motorbike accident is the most common road traffic injuries.⁹ Head injuries, neck injuries, chest and abdomen injuries, pelvis injuries and limb injuries were commonly injured parts during RTA leading to mortality and morbidity among the patients.¹⁰

Our study showed that male patient and young adult patients of age group 18-40 years are commonly involved motorbike accident which is similar to the finding of the study conducted in 2015, 2017, 2021, and 2022.^{3,9,11,12} The similarity between these finding may be due to involvement of population from low income and middle income countries where motorbike is a cheap means of transportation for daily activities of living for working group of people age 18-40 years.

The striking finding in our study was the all the rider (comprises of 68.24%) who sustain motorbike accident had claimed that they have worn helmet and none of the pillion rider (comprises of 31.76%) had worn helmet. This finding may be due to strict traffic rule that mandate the compulsory use of helmet by rider. This use of helmet had significantly decreases head and cervical spine injuries which comprises only 10.51% of the total injuries thereby reducing morbidity/mortality and also decreasing the Out Of Pocket (OOP) expenditure of the patient. These finding are supported by similar study in China in 2017, 2019 and Pakistan in 2021.¹³⁻¹⁵ we have not looked at the length and cost of hospital stay, details of medical and surgical management. These details would have reflected more about patient OOP.

Only 9.18% patients had history of substance abuse (alcohol) in our case which is similar to the study conducted in 1979. this finding may be due strict adherence zero alcohol tolerance national policy while driving.¹⁶ However motorbike accident may be due to other substance abuse like narcotics, marijuana and strict policy to deal these

substance abuse should also be formulated.

Most commonly involved body region during motorbike accident was upper and lower extremities. These findings are similar to the study conducted in Nepal and Turkey.^{16,17} These findings may be due fact that these parts are vulnerable to injury after motor bike accident and also due to lack of protective upper and lower limb riding gears.

The mean Injury Severity Score (ISS) was 5.48 ± 6.53 which is similar to the finding in study done in South Korea and Kenya.^{19,20} This similarity may be due to the protective effect of helmet use, as well as the enrollment of patients sustaining low-velocity bicycle injuries in their study, both of which are associated with lower ISS values. While our Injury Severity Score is less than study conducted in 2022 which showed ISS of 17.6 ± 15.4 .²¹ The lower ISS in our study likely reflects a survivorship bias resulting from deficiencies in our pre-hospital care system; specifically, patients with the most severe injuries, who would otherwise account for higher ISS, frequently succumb during transportation.

The mean survival prediction score (Ps) of patient with motorbike accident was 0.94 ± 0.05 , which is similar to survival prediction conducted in 2013.²² The Ps score is meant for quick assessment of survival probability in the clinical setting in Asian Population however there are limited studies regarding these topic hence further studies regarding the survival prediction score with follow-up of the patients are needed to access the utility of such scoring tools.

The limitation of this study was that this study was

conducted at a single Centre, the results are not representative of the whole Nepal. Further multi-Centre studies are required. Another limitation of this study was that we couldn't identify and analyze which body region injuries predisposes more morbidity and mortality to patient presenting with multiple body regions injuries. The major limitation of this study was that we calculated the survival prediction score but we cannot verify our finding as most of the critically ill patient with multiple regions injuries need ICU and HDU and due to limited capacity of ICU and HDU in our center most of the patient were referred to other center and were lost to follow up.

CONCLUSIONS

Motorbike accident is an important cause of morbidity and mortality in productive age group presenting in tertiary trauma centre of Nepal. And with various survival prediction score tool available, further studies regarding the survival prediction score with follow-up of the patients are needed to access the utility of such prediction scoring tools.

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Conflict of Interest: None

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