Patterns and short-term outcome for patients with commercial motorcycle crash injuries receiving surgical treatment at a national referral hospital in Uganda.

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Abstract-
Background: Commercial motorcycle crash injuries constitute a major health problem in developing countries like Uganda. This study described the short-term outcomes, and factors affecting commercial motorcycle injuries receiving emergency surgical treatment at Mulago National Referral Hospital.
Methods: This was a prospective cohort, hospital-based study. Data were collected using a pretested questionnaire and analyzed using SPSS computer software version 15.
Results: A total of 230 patients were studied and the majority, 206(89.6%) were males with a male to female ratio of 8.6:1 and mean age of 32.2 SD ± 11.8.The range was 4-65 years, median and mode age ranges were, 25 and 27 respectively. Extremities and head injuries were the most common body region injuries affecting (n=150, 65.2%) and (n-115 50%) patients respectively. The majority of the patients were debrided (n=147(63.9%).The overall mean length of hospital stay (LOS) was 14.25 days (ranging from 1-90 days).
The mean length of hospital stay for mortality was 5.8 days with a range of 1-14 days. Patients with, Kampala Trauma Score (KTS) of <7, Glasgow coma scale (GCS) of 3-8, and extremity fractures significantly stayed longer in the hospital with p values of <0.001, 0.002, and 0.003 respectively. The mortality was (n=22, 10%) and this was largely influenced by KTS scores less than 7, severe GCS 3-8, ICU admission this significantly influenced mortality with statistically p values <0.05.
Conclusion: One in 10 patients involved in CMCI sustained fatal injuries. All fatalities had low GCS. The age of the patient, severe trauma, Kampala trauma score of less than 7, on admission, and severe head injury on the Glasgow Coma scale between3-8 significantly influenced mortality. We recommend strict regulation of the commercial motorcycle industry to ensure proper safety gear is used by both the riders and the passengers.

***Keywords*: short term outcomes, commercial motorcycle crash injuries, Mulago hospital**

BACKGROUND:

Commercial Motorcycle crash injuries are a major cause of public health burden (1)and contribute significantly to potentially preventable mortality, morbidity, and disabilities(2-5)The main victims are road users(6, 7), in their productive and reproductive populations(8-10).The problem is increasing at a faster rate in developing countries like Uganda due to the increasing use of motorcycles as easy means of cheap transport(11-13). Motorcycle crash injuries contribute significantly to road traffic injuries and this accounts for 25% of all road traffic injuries seen at Mulago National Referral Hospital. The high prevalence of road traffic injuries impacts negatively on already constrained health care resources (14, 15). The commercial motorcycle, commonly known as Boda Boda in Uganda and Kenya, Okada in Nigeria has gained popularity as an easy and quick cheap means of transport for short distances in the cities and long distances in rural communities. They are efficient in mitigating traffic jam and are available all the time (16,20).
However, their users are at increased risk of getting involved in commercial motorcycle traffic accidents, and these injuries sustained as a result of travelling on these commercial motorcycles, constitute a major public health problem in Uganda (8,11). Injuries related to commercial motorcycle, crashes take a considerable number of lives and resources including consumables and health worker time despite this burden, little if any is known about factors influencing short-term outcomes of patients with commercial motorcycle injuries. The majority of motorcycle crash injuries are preventable and permanent disabilities can be averted. This study described factors that influence mortality, morbidity, and hospital stay in this category of patients.

MATERIALS AND METHODS

Study Design

This was a hospital-based prospective cohort study.

Study Area

The study was conducted at the accident and emergency department at Mulago National Referral Hospital, for four months from January - April 2016. Mulago National Referral Hospital has a bed capacity of 1500 beds, an inpatient load of over 120,000 and

attends to over 480,000 patients annually. Mulago National Referral hospital is situated in Kampala City, Kawempe Division with a catchment area of all districts in Uganda and neighboring countries.

Study Population
Patients who had been involved in road traffic accidents and sustained injuries related to CMCI during the time of the study.

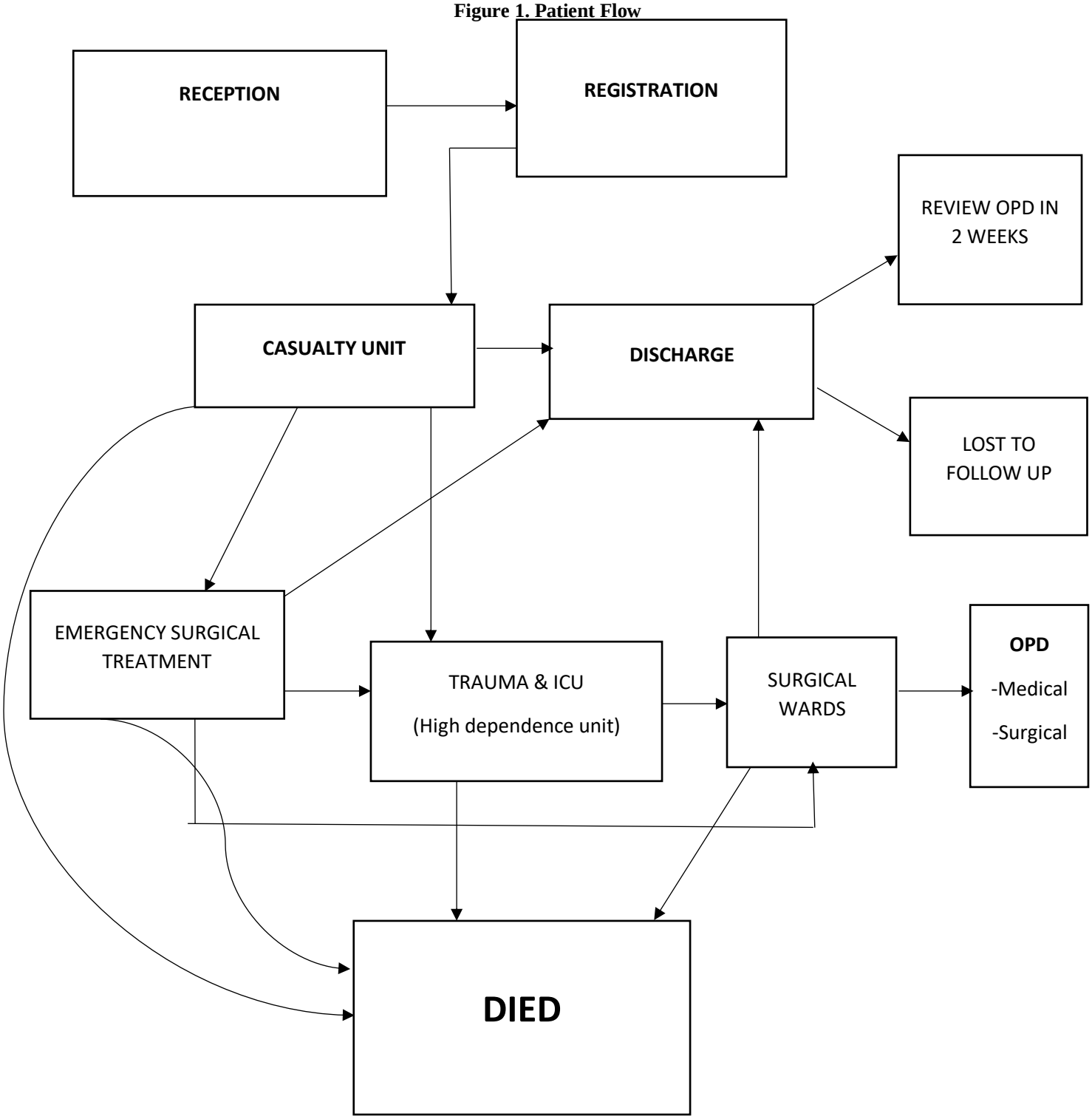
Inclusion and exclusion criteria
Conscious patients who were able to respond to questions and unconscious patients who had attendants who consented by proxy. Patients whose data were incomplete, with underage attendants and those who could not give comprehensible information within 14 days were excluded from the study.

Selection procedure
Patients were received at the front desk and registered in the registration book and then admitted to the casualty unit from where they were resuscitated and stabilized using the Advanced Trauma Life Support (ATLS) principles. Patients were admitted to the emergency ward and investigations were done and appropriate treatment was instituted. The non-probability consecutive sampling method was used to select patients eligible for recruitment.

Enrollment
After obtaining consent, the patient's serial number, initials, sex, education, status, and type of collision were obtained using an interviewer-administered questionnaire. Injury severity was assessed using Kampala trauma score I (17) during secondary survey. The total KTS score was obtained by adding the score for age, systolic blood pressure, respiratory rate, neurological status, and the number of injuries equal to 16. And the patient scored a total of 14-16 for mild injury, a total of 12-13 for moderate injury, and a total score of less than 11 for severe injury. Head injury was assessed using GCS during secondary survey for best motor response by assessing whether the patient would obey simple commands with a score of 6, patients who could withdraw from pain with a score of 5, patients who could localize pain with a score of 4, patient flexed towards pain a score of 3,patients who flexed away from the pain scored 2 and a patient who could not respond a score of 1.The verbal response was assessed and fluent speech scored 5, confused speech scored 4, incoherent speech scored 3, incomprehensive scored 2, and speech scored 1.A total of the scores were calculated and head injury was classified as severe when the total was less than 8, moderate 9-13, and mild 14-15.After physical examination, necessary investigations were requested according to the clinical findings. Brain, Skull, Neck, Chest, and Abdominal Injuries were confirmed by Brain Computerized Tomography, Skull, chest radiography, and abdominal sonography respectively, and results were interpreted by the principal investigator in consultation with the radiologist and the results recorded into questionnaires. Pelvic and limb injuries were examined and confirmed by radiological investigations. The Surgical emergency treatment given to these patients involved operative surgical procedures. Failure to attend the operation, information concerning patients was obtained from theatre registers. Admissions were recorded in patients' files and registration books of the surgical emergency ward.

Patient follow-up was conducted for 14 days, and those not discharged within 14 days were followed up to determine the length of hospital stay. Outcomes were recorded from patients' files and phone calls and these included survivors' deaths, disabilities, discharges, and length of hospital stay (Figure 1).

Figure 1. Patient Flow



DATA MANAGEMENT

Data collection

Pre-tested interviewer administered questionnaires were used to collect data. The questionnaires were checked for errors and completeness in the process of correction. Data entry was double entered into the EPI info version (3.10 with range consistency and validity checked.

Data Analysis

Variables used to create the regression model were Injury severity, Disability developed, Complications present, Length of hospital stay, Injury Mechanism, Participant Demographics, Kampala Trauma score and Glasgow Coma Scale. Statistical data analysis was done using SPSS software version 15.0. Data were summarized in form of proportions and frequency tables for categorical variables. Continuous variables were summarized using mean, median mode, and standard deviation. A p-value was computed for categorical variables and presented in tabular form. Chi-square (x^2) test and Fischer's exact test were done depending on the data set. Multi-variate logistic regression analysis was used to determine predictor variables that were associated with the outcome. A P value of less than 0.05 was considered to constitute a statistically significant difference.

Quality Control

The recruited research assistant who was a nursing officer was trained in data collection by the principal investigator. The principal investigators cross-checked data weekly for completeness with double entry. Data cleaning was done every week, with periodic data evaluation for accuracy, completeness, consistency, and uniformity. The questionnaires were subjected to expert review using a standard evaluation form. All questionnaires were safely stored and locked in a cupboard in the doctor's village to enable reference in case of data loss.

Ethical Consideration

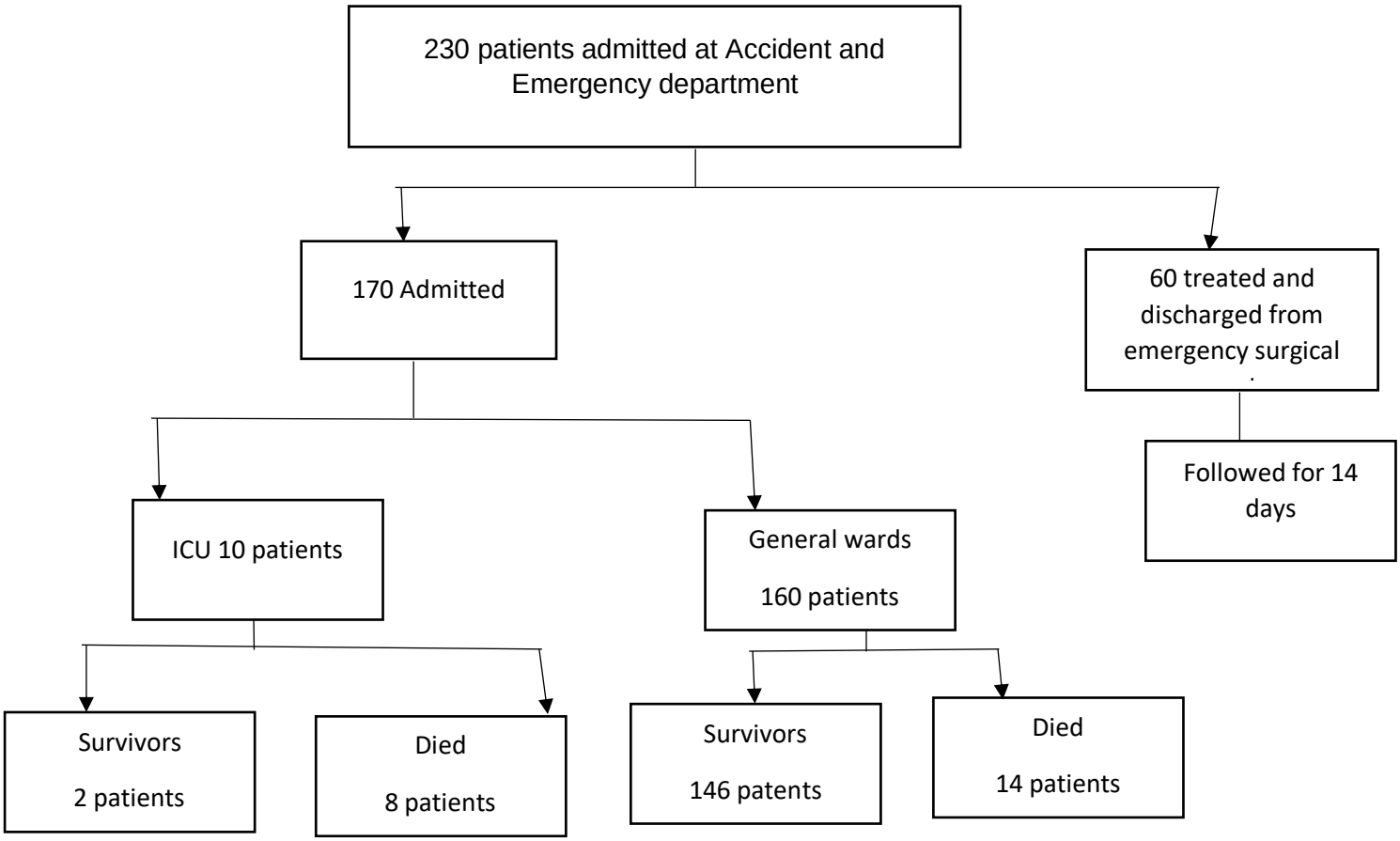
Written informed consent was obtained from all participants who were conscious and the adult care takers consented for the participants who were unconscious. A translated consent form in Luganda was available to the non-English-speaking respondents. Assent was obtained from children below eighteen years and informed consent from adults. Confidentiality was observed by using the patient's initials and using the information obtained from the patients for the purpose for which it was intended. Approval to conduct this study was obtained from the department of surgery Mulago hospital and the Makerere School of medicine, Ethics and Research committee.

RESULTS

Admission pattern

A total of 4575 were involved in road traffic accidents during the study period and 230 patients with commercial motorcycle crash injuries were studied over 4 months. One hundred sixty patients (70%) were admitted to general surgical wards while 10 patients were admitted to the intensive care unit for physiological support. Sixty patients (26%) stayed overnight and they were discharged the following morning upon improvement. All these patients were followed for 14 days (Figure 2).

Figure 2: Patient recruitment Chart



N.B: Loss to follow up was not observed

Table 1: General characteristics of patients with CMCI

Characteristics	N=230	Percentage	Morbidity	Mortality	P-value
Age					
<30	**154**	**65.2**	**138**	**16**	
30-50	**67**	**29.1**	**61**	**6**	
>51	**9**	**5.7**	**9**	**0**	**0.002**
Sex					
F	**24**	**10.4**	**23**	**1**	
M	**206**	**89.6**	**185**	**21**	**0484**
Occupation					
Civil Servant	**26**	**11**	**22**	**4**	
Self-employed	**166**	**72**	**148**	**18**	
Peasants	**18**	**89**	**18**	**0**	
Others	**20**	**9**	**20**	**0**	**0.156**
Education					
Primary	**133**	**51.8**	**118**	**15**	
Secondary	**79**	**34.3**	**76**	**3**	
Tertiary	**16**	**6.9**	**10**	**0**	
University	**8**	**7**	**4**	**4**	**0.002**
Status/Victim's Relationship with motorcycle					
Rider	**110**	**47.8**	**92**	**18**	
Passenger	**78**	**33.9**	**75**	**3**	
Pedestrian	**42**	**18.3**	**41**	**1**	**0.004**

Circumstance of injury

Motorcycle-motor vehicle collisions were responsible for the majority of collisions (42%) of patients followed by motorcycle-motorcycle collisions in (21%) of patients. Finally, motorcycle pedestrians and lone motorcycle collisions constituted 20% and 17% respectively.

Road User Category

Riders were 110(47.8%), passengers were 77(33.5%) and pedestrians were 43 (18.7%) (Table 1).

The site of injury among patients

Table 2: Injury by body region and specific surgical treatment option prescribed to CMCI

Body region	Frequency	Percentage
Musculoskeletal (Limbs)	123	53.7
Head and Neck	81	35.2
Chest	12	5.2
Abdomen	4	1.7
Pelvis	2	0.8
Spines	4	1.7
Multiple injuries	4	1.7
Specific surgical treatment options prescribed to CMCI		
Wound debridement	103	55.9
Closed reduction POP	80	43.4
Closed reduction Ex-fix	40	21.7
Exploratory Laparotomy	13	7.0
Under water seal	9	4.9
Craniotomy	6	3.0

Extremity and head injury were the most common injuries sustained by the victims affecting 123 patients (53.7 %) and 81 patients (35.2 %) respectively (Table 2).

Musculoskeletal injuries included bruises, lacerations, abrasion and de-gloving wounds in 76 patients (33 %) while 47 patients (20.4 %) sustained fractures, additionally 54 patients (23.4 %) had mild head injuries with GCS of 13-15, 23 patients (10 %) had moderate injuries with GCS of 9-12 and 4(1.7) patients had severe head injuries scion less than 8 on GCS.

Further the most presenting complaints among patients who sustained head injuries were headache, vomiting, seizures, and a loss of consciousness. These patients underwent radiological investigations, skull x-ray was performed on 23 patients and of these 5 patients had fractures with a moderate head injury also a brain CT scan was performed on 37 patients and of these, 20 patients had positive findings of cerebral edema, 10 patients had a linear fracture and 6 patients had an epidural hematoma.

Four patients sustained blunt abdominal injury and one of them had a ruptured spleen. Chest injury was recorded in 12 patients with 5 having blunt chest injury including rib fractures, 6 having hem thorax, and one patient with a lung contusion. Six patients had pelvic fractures and they were all stable fractures. Two patients had spine injuries and of these 1 had sustained paraplegia and another had quadriplegia.

PATIENT INJURY SEVERITY

Patients' injury severity was assessed using Kampala Trauma Score I. According to the Kampala Trauma Score majority of the patients (58%) had mild injuries (score of 14-16); (32%) patients sustained moderate injuries with (score of 11-13) while 2% had severe injuries with KTS of below 11.There was no mortality in patients with moderate injuries compared to severe injuries with 100% mortality. According to multi logistic analysis, these differences were statistically significant with a p-value of less than 0.001.

One hundred sixty of all patients (70%) were admitted to the general surgical wards, while 60 patients had an overnight stay and were discharged upon improvement. Ten patients were admitted to ICU for ventilator support and transferred to the trauma unit after stabilization. One hundred eighty-four underwent surgery. Wound debridement was the commonest operative procedure and accounted for 52% (103 patients). External fixation was done (43.4%) of patients while closed reduction and plaster of Parish application were done on 21.7% of the study population. Underwater seal drainage was performed on 9 patients and laparotomy was done on 7% of the study participants.

PATIENT OUTCOME

Out of the 230 injured patients, 208 (90%) survived and of these, 197 patients (94.7%) were discharged upon improvement without disabilities while the remaining 11(5.3%) were discharged with permanent disabilities. The disabilities include; loss of limbs (11.1%) n neurological deficits (16.7%), paraplegia and quadriplegia as well as post-traumatic seizures. Mortality occurred in 10% (22) of patients. The length of hospital stays from 1 day to 21 days with a mean and median of 6.7 ± 1.4 and 5.6 days.
Multivariate logistic analysis showed that a severe Kampala Trauma score of less than 7 on stayed longer in hospital with a p-value of less than 0.002 (Table 3).

Table 3: Relationship between KTS, GCS, need for ICU, survivors, and non survivors.

Measure	N=230	%	Survivors	Non survivors	P-value
GCS					
Mild	114	50	114	0	
Moderate	94	41	94	0	
Severe	22	9	0	22	0.002
KTS					
Mild	134	58	134	0	
Moderate	74	32	74	0	
Severe	22	10	22	22	0.001
Need for ICU	10	4.3	2	8	0.003

The age of the patient, severe trauma, Kampala trauma score of less than 7, on admission, and severe head injury on the Glasgow Coma scale between 3-8 significantly influenced mortality with a p-value of <0.002, 0.001, 0.002 respectively (Table 3).

DISCUSSION

In this study, we found out that majority of patients with commercial motorcycle crash injuries who were attended to at Mulago National Referral Hospital were young male adults in their most productive age group. Male predominance in this study is due to increased participation in high-risk activities. Young adults in Uganda experience high unemployment levels and they are more likely to have reasons to move from place to place in search of employment. Young adults represent an active group that partakes such as reckless riding, over speeding and overloading.
Males are more often exposed to traffic both as passengers and riders as they traverse long distances to work and often are involved in the use of automobiles as a leisure activity. Most victims were passengers on commercial motorcycles. These were mainly passengers who were possibly injured as they rushed through heavy traffic in pursuit of their business. This observation has also been reported in other studies (8).
Passengers who were self-employed were the most injured group because of the rush through heavy traffic to get to their business and similar observations (8). Self-employment involves trade which requires participants to move from one place to another and to maximize the profit they usually opt for cheaper available means of transport such as commercial motorcycles.
The majority of the victims had attained secondary education level and this was comparable to observations reported in Nigeria, where it was found that the self-employed who were mostly passengers and riders had attained secondary education (18). This could be explained by the fact that those with lower levels have limited chances of getting multiple jobs limiting their exposure to

commercial transport. In this study, the majority of commercial motorcycle injuries victims were found to be passengers in contrast to the results from a study where commercial motorcycle crash injuries were mainly riders(12).

COMMERCIAL MOTORCYCLE CRASH INJURY PATTERN

Circumstance of injury

The main mechanism of CMCI was due to motorcycle-motor vehicle related (19).

Motorcycle to motor vehicles occurs commonly because motorcycle riders often ignore road safety measures making them more vulnerable to accidents with other motorized vehicles (12).In our study, we noted that most of the injuries involved extremities, head, and neck. This was in agreement with the Rwandese and the Tanzanian reports (14, 20).

Victims as they came were exposed to several treatment options. The majority to debridement/surgical toilet and suture while others were surgically amputated comparably to other centers and the treatment outcomes are favorable since 89% are discharged well. At Mulago National Referral Hospital, a high turnover of CMCI is experienced compared to other centers in East Africa. We experience a mortality rate of 10% of CMCI victims and this figure is comparable to Kenya at 5%, Rwanda at 9%, and Tanzania at 17% as reported by other scholars (14, 20).

The CMCI injuries are not a big burden to the hospital bed occupancy since 70% of victims are discharged by the following day upon improvement although a small portion of patients stays longer on the other units like the Neurological ward, ICU, and orthopedic wards with high consumption of limited hospital resources.

Prolonged hospital stay strains the scarcity of health service delivery and reduces the productivity of the population through time lost during hospitalization and disabilities (11).

Length of hospital stay is attributed to the presence of major trauma, severe head injury, and several patients with long bone fractures (14, 20).

The overall mortality in this study was higher than the one reported in Rwanda and Kenya but lower than the one reported in Tanzania (14).

The factors responsible for mortality in this study were major trauma at admission, Kampala Trauma Score of less than 7, severe head injury with Glasgow coma score of 3-8, and a need for admission to ICU for ventilation and physiological support.

LIMITATIONS

Helmet use was not studied but it has been mentioned in other studies that it protects against head injury between 80%-90%.Being a hospital-based study, the patient selection might have been affected immensely. We also did not include patients who died on arrival.

CONCLUSIONS

Commercial motorcycle crash injuries are still common and constitute a major health concern at Mulago Hospital. Young adult males in their productive age are commonly affected. Passengers are the largest group affected by these commercial motorcycle crash injuries. Extremities and head injuries are the most common regions of the body injured among these victims. All fatalities had low GCS. The factors demonstrated to affect outcome were; being a motorcycle passenger, pattern of injury, and Kampala Trauma Score.

RECOMMENDATIONS

We recommend strict regulation of the motorcycle industry to ensure proper safety gear is used by both the riders and the passengers. Creating alternative employment could reduce the number of motorcycles in Kampala city that intern reduces the number of motorcycle related accidents.

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