THE OUTCOME OF TRAUMA PATIENTS IN THE MIXED SEMI-CLOSED INTENSIVE CARE UNIT

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ABSTRACT

INTRODUCTION

Nepal due to its geographical condition, inadequate resuscitation on time, and lack of full-time intensivist in a trauma team is a cause of trauma-related morbidity and mortality.

MATERIAL AND METHODS

It was a prospective, descriptive observational cross-sectional study in a level three intensive care unit of National Medical College for six months. All patients >18 years with a history of road traffic accidents, falls, drowning, physical assaults, and self-inflicted violence admitted to the mixed intensive care unit of a tertiary care hospital were included in this study.

RESULTS

One hundred and ninety-one patients were included in this study. 152 (79.5%) were males and 39 (20.4%) were females. Road traffic accident was the most common mode of injury in 166 (86.9%) patients. 178 (93.1%) patients survived and went home, 10 (5.3%) expired, 2 (1%) left the hospital against medical advice (LAMA) and 1 (0.5%) gave do not resuscitate orders (DNR). The mean days on the mechanical ventilator was 3.39 ±2.57 days. Mortality in an intubated patient was 8.6%. Mean length of stay (LOS) in the intensive care unit (ICU) was 4.28 ±4.12 days. Sequential organ failure assessment (SOFA) and acute physiology and chronic health evaluation (APACHE) II scores were a good predictor of outcome, with the SOFA score being the most effective injury severity score predicted mortality with a sensitivity of 88.9%, a specificity of 22%, with an area under receiver operating characteristic (AUROC) curve of 0.543 ±0.092 with cut off score of 5.5.

CONCLUSION

There should be public awareness, and political commitment to reduce the incidence of road traffic accidents and a trauma team consisting of full-time intensivist should be established to decrease the mortality in the intensive care unit.

KEYWORDS

APACHE II, Injury severity score, Intensive Care Units, SOFA, Trauma.

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INTRODUCTION

The geographical condition of Nepal is cause by the inaccessibility of adequate transportation, impossible for rescue, and retrieval teams to reach the standard in the west (8 minutes in urban areas and 11 minutes in rural areas).[1] Trauma management requires a multidisciplinary approach that requires aggressive pre-hospital care and management in the in an intensive care unit for the first 24 hours.[2]

Studies[3,4] have shown that a closed intensive care unit (ICU) run by a full-time intensivist has a better outcome. But, most of the ICU is an open model[5] due to lack of infrastructure, intensivist, training for nurses, and lack of political commitment.[6] There is a lack of evidence on the outcome of semi-closed trauma ICU in a resource-limited setting.

Therefore this study was conducted to know the outcome of semi-closed trauma ICU so that semi-closed trauma ICU can be a model that can be applied in the resource-limited setting in a developing country.

MATERIAL AND METHODS

It was a prospective, descriptive observational cross-sectional study in a level three intensive care unit of National Medical College, Birgunj between Feburary 1, 2021 to July 31, 2021. Ethical approval from the Institutional Review Committee was obtained before enrolment in this study. The ethical approval number was F-NMC/515/077/078. Written informed consent was obtained from the patients or surrogate decision-makers.

All patients >18 years with a history of road traffic accidents, falls, drowning, physical assaults, and self-inflicted violence admitted to the mixed intensive care unit of a tertiary care hospital were included in this study. Patients were excluded if they were younger than 18 years, surrogate decision-maker, or patient did not give written informed consent.

The intensive care unit of a tertiary care hospital includes 26 bedded level III intensive care unit.. The trauma team consists of an intensivist, 4 anesthesiologists, 6 medical officers, nurses, a physiotherapist, general surgeons, orthopedicians, neurosurgeons, oral maxilla-facial surgeons. The nurse-patient ratio was 1:3. An intensivist is a doctor who has done post-graduation in emergency medicine and has additional qualifications as a Doctorate of Medicine in Critical Care Medicine. Consultation with other specialty or sub-specialty was done when required. The decision to extubate, transfer the patient to ward or high dependency unit was made by the intensivist.

The following data was gathered from each patient in the preformed sheet at the time of presentation to the intensive care unit.

Age, sex, occupation, ethnicity, acute physiology and chronic health evaluation (APACHE) II, sequential organ failure assessment (SOFA) score, injury severity score, diagnosis, Intubated or non-intubated, specialty, sub-specialty, co-morbidity, time lag between injury or symptom and presentation to the ICU, mode of admission in ICU. The outcome of the patient was defined as leave against medical advice, do not resuscitate, death and discharge to ward. The patient admitted to the intensive care unit who wishes to leave against the clinicians' advice was referred to as leave against medical advice (LAMA). Do-not-resuscitate (DNR) was defined as a patient who is given all treatment except cardiopulmonary resuscitation and endotracheal intubation but if signed after CPR and intubation, the patient was kept on ventilator support if the withdrawing of support was not requested. LAMA and DNR order was signed by the surrogate decision-maker after discussing with the intensivist and admitting clinician.

The patient was followed in ward until they were discharged home, another hospital, or readmitted to the intensive care unit. The conventional formula for calculation of sample size was not used. Instead, all the patients admitted in with a history of trauma admitted to the Intensive Care Unit of National Medical College for 6 months were our sample size. A convenience sampling was done to maintain the validity and reliability of the study. Bias was reduced by collecting data from all groups of patients.

All data was transferred to the excel sheet and transferred to SPSS-16. Values are presented as mean (± standard deviation SD) or frequency. MEDCALC 19.2.0 is used to compare ROC curves. De Long et al method is used to compare the area under ROC. For determination p-value <0.05 (2-tailed) was considered as statistically significant

RESULTS

702 Patients were admitted to the ICU during the study period One hundred ninety one patients were included in this study. The trauma patients account for 191(27.2%) of total admission in the intensive care unit in our study.

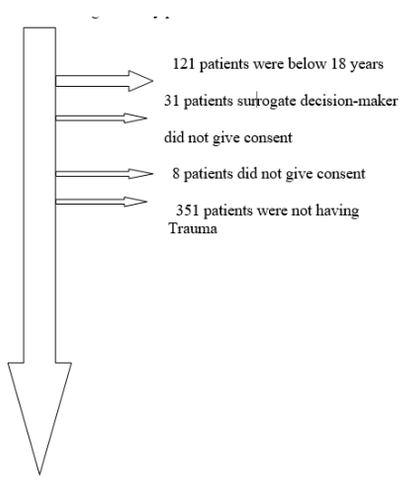

Figure 1. Flow diagram of patients included in this study.

Table 1. Demographic characteristics of the study population

Parameters	n (%)
Age (Years)	
18-35	88(46.0)
36-60	70(36.6)
>60	33(17.2)
Sex	
Male	152(79.5)
Female	39(20.4)
Ethnicity	
Hindu	169(88.4)
Kirat	12(6.2)
Buddhist	6(3.1)
Muslim	3(1.5)
Christian	1(0.5)
Occupation	
Unemployed	52(27.2)
Farmer	46(24)
Housewife	19(9.9)
Student	28(14.6)
Labour	11(5.7)
Businessman	12(6.2)
Technical worker	19(9.9)
Army	3(1.5)
Sportsman	1(0.5)

Table 2. Clinical characteristics of the study population

Parameters	n (%)
Injury severity score	
<15	125(65.4)
>15	66(34.5)
APACHE II Score at the time of admission	
3-10	146(76.4)
11-20	35(18.3)
21-30	9(4.7)
31-40	1(0.5)
SOFA Score at the time of admission	
0-6	181(94.7)
7-12	10(5.2)
13-18	0(0)
19-24	0(0)
Time of presentation to ICU (Hours)	
<6	39(20.4)
6-12	22(11.5)
12-24	35(18.3)
>24	95(49.7)
Mode of admission in ICU	
Direct	39(20.4)
Refer	151(79.0)
Ward	1(0.5)

APACHE II: Acute physiology and chronic health evaluation, ICU: Intensive care unit, SOFA: Sequential organ failure assessment.

Out of 191 patients, 52 (27.2%) patients were without any co-morbidity. Hypertension was found to be the most common co-morbidity in 76 (39.7%) patients.

Out of 191 Patients, mode of injury was road traffic accidents in 166 (86.9%), followed by falls fourteen (7.3%), physical assaults 9 (4.7%) and self-inflicted violence 2 (1.0%).

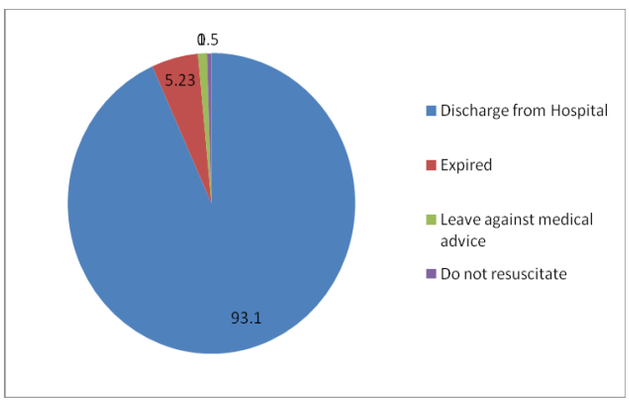

Figure 2. Outcome of trauma patients that were admitted to the intensive care unit.

Our study showed that 178 (93.1%) patients survived and went home, 10 (5.3%) expired, 2 (1%) left the hospital against medical advice (LAMA) and 1 (0.5%) gave do not resuscitate orders (DNR).

Table 3. Outcome of patients according to specialty

Specialty	Discharged n(%)	LAMA n(%)	DNR n(%)	Expired n(%)	Total n(%)
CTVS	17(100)	0	0	0	17(100)
GI SURGERY	4(100)	0	0	0	4(100)
POLY TRAUMA	28(87.5)	1(3.1)	0	3(9.3)	32(100)
NEUROSURGERY	88(94.6)	1(1.07)	1(1.07)	3(3.2)	93(100)
OMFS	7(100)	0	0	0	7(100)
ORTHOPAEDICS	30(88.2)	0	0	4(11.7)	34(100)
OTOLARYNGOLOGY	4(100)	0	0	0	4(100)
TOTAL	178(93.1)	2(1.0)	1(0.5)	10(5.2)	191(100)

CTVS: Cardiothoracic and vascular surgery, DNR: Do not resuscitate, GI surgery: Gastrointestinal surgery, LAMA: Leave against medical advice, OMFS: Oral maxillo-facial surgery.

Out of 191 patients, 46 (24.0%) were intubated and required mechanical ventilation. The minimum days on a mechanical ventilator were 1 day and the maximum was 16 days. The mean days on the mechanical ventilator was 3.39±2.57 days. Mortality in intubated patients was 8.6%.

The minimum length of stay (LOS) for all groups of patients in the ICU was 1 day and the maximum was 37 days. Mean LOS in the ICU was 4.28±4.12 days.

Table 4. Injury severity score to predict mortality in trauma patients

INJURY SEVERITY SCORE								
				95% CI				
TRAUMA	Area	SE	p	Lower Bound	Upper Bound	cutoff	Sensitivity (%)	Specificity (%)
YES	0.543	0.092	0.665	0.362	0.723	5.5	88.9	22

CI: Confidence interval, SE: Standard error.

Table 5. Comparison of APACHE II and SOFA score to predict mortality in trauma patient

TRAUMA	Test Result Variable (s)	Area	SE	p	95% CI		cutoff	Sensitivity(%)	Specificity (%)
					Lower Bound	Upper Bound			
NO	APACHE II	0.706	0.039	<0.001	0.629	0.783	11.5	62.5	68.8
	SOFA	0.738	0.04	<0.001	0.659	0.816	5.5	55.4	83.4
YES	APACHE II	0.765	0.063	0.007	0.64	0.889	9.5	77.8	69.8
	SOFA	0.832	0.055	0.001	0.724	0.939	2.5	88.9	73.1

APACHE II: Acute physiology and chronic health evaluation, CI: Confidence interval, SE: Standard error, SOFA: Sequential organ failure assessment.

The mean APACHE II and SOFA score were 11.8±5.1 and 4.9±2.6 respectively for mortality in our study.

DISCUSSION

Trauma patient accounts for 27.2% of the total admission in the intensive care unit in our study while in other studies[7-9] it varied from 29.66-44.5%. This difference may be because the study was conducted in a rural medical college and patients with trauma may not reach private medical college due to a lack of financial resources.

Male 152 (79.5%) and younger age patient 88 (46.0%) were common in our study which is similar to other studies [7-11] it was 78.2% male and 48% younger patients respectively.

Road traffic accidents 166 (86.9%) were the most common mode of injury in our study which is similar to other studies.[7-11] in which the percentage varied from 85.2% to 86%.

The present study shows that mortality was 5.23% while in the study by Ong et al [9] and Mondello et al[12] mortality was 12.2% and 18.1% respectively. In other studies[7,8,10] the percentage varied from 28.2% to 48.74%. The difference may be because of an efficient trauma team, early resuscitation in an emergency, intervention by the surgical team, and the presence of full-time intensivist in the semi-closed ICU.

In our study, mortality in intubated patients was 8.6% while in other studies it varied from 25-40%.[7-11] This difference may be because of the presence of a full-time intensivist and trauma team.

Neurotrauma was most common in our study which is similar to other studies.[7-12] Mortality in traumatic brain injury patient was 3.22% while in other studies it varied from 10.5% to 30%.[13-16] This difference may be due to early intervention by a neurosurgeon, the presence of neurointensivist, different geographical conditions, and a small group of trauma patients in our study.

Mortality in poly-trauma patient was 9.3% which is similar to the study by Embu et al [7] in which it was 10.2%.

In our study, 100% of patients with chest injury were discharged to home while in the study by Wang et al [17] and Embu et al [7] mortality was 11.2% and 2.59% respectively. This may be due to the small number of chest injury patients in our study.

The cut-off score to predict mortality for injury severity score was 5.5 and AUROC 0.543 in our study while in a study by Servia et al [18] and Restrepo-Alvarez et al[19] AUROC was 0.73 and 0.871 respectively. This difference may be due to the small sample size, and this study was not designed or intended to establish a new cut-off value for injury severity index that can predict mortality in trauma patients, although our current findings warrant future outcome studies to identify such cutoff values.

This study has shown that both SOFA and APACHE II scores were a good predictor of outcome, with SOFA score being the most effective which is similar to a study by Lee et al.[20] The cut-off score to predict mortality for SOFA and APACHE II scores were 2.5 and 9.5 respectively in our study while in a study by Tranca et al[21] it was 4 and 5 respectively. This difference may be due to all groups of trauma patients were included in our study.

Our study has limitations like it was a single-centre, small sample size study. The serial measurement of SOFA score was not done. This study was done in a private medical college consequently the patient population may not be illustrative of all socioeconomic status.

CONCLUSION

Urgent interventions should be taken to reduce the incidence of road traffic accidents and a trauma team consisting of full-time intensivists should be established to decrease the mortality in the intensive care unit. SOFA and APACHE II supplemented with injury severity score should be used to predict mortality for trauma patients.

CONFLICT OF INTREST

None

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