A DESCRIPTIVE CROSS-SECTIONAL STUDY ON CLINICAL PROFILE AND OUTCOME OF DELIRIUM IN TRAUMA PATIENTS IN THE SEMI-CLOSED INTENSIVE CARE UNIT OF A MEDICAL COLLEGE

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ABSTRACT

Introduction

Delirium in trauma patients is common and under diagnosed.

Objectives

This study aimed to identify the risk factors and outcome of delirium in trauma patients in a mixed semi-closed intensive care unit.

Methodology

This descriptive cross-sectional study was done on 77 patients of age 18 years or more admitted for more than 24 hours with the history of road traffic accidents, falls, drowning, physical assaults, and self- inflicted violence in a level three intensive care unit of the National Medical College for six months. The whole sampling method was used in our study and all cases during a given time were included in the study. The Confusion Assessment Method-ICU and Richmond Agitation Sedation Scale were used to diagnose delirium and level of arousal respectively. All data was transferred to the excel sheet and transferred to a statistical package for the social sciences-16. The Chi-square test and Fisher's exact probability test were used to detect the difference between groups in the univariate analysis, as appropriate. The variables were analyzed using binary logistic regression. Any variables which had P<0.2 after the univariable risk regression and all other potential variables associated with the delirium were included for the multivariable risk regression. The level of significance was P<0.05.

Result

Of the 77 ICU admissions 17(22.1%) developed delirium. Hyperactive delirium was the most common motor subtype 9(52.9%). The mean duration of delirium was 3.69±4.06 days. Age, hypertension, blood transfusion, and orthopedic trauma were identified as risk factors for delirium. Delirious patients had a longer length of stay in the ICU (7.0 ±4.6 vs 4.5± 4.1 days) with no impact on the duration of mechanical ventilation, mortality, reintubation, and unplanned extubation.

Conclusion

Age, hypertension, blood transfusion and orthopaedic trauma were identified as the risk factor for delirium in trauma patients that should be identified early to prevent complications such as longer length of stay in the ICU, longer duration of mechanical ventilation, mortality, reintubation and unplanned extubation.

KEYWORDS

Delirium, intensive care units, outcome, risk factors, trauma

INTRODUCTION

Trauma is the third common cause of death and fourth cause of disability in most of the southeastern region countries of Asia including Nepal.[1] Delirium in trauma patient increases morbidity and mortality. Delirium is an acute brain dysfunction and studies have shown that the incidence of delirium in the trauma patients in the intensive care unit (ICU) is between12.5% to 67%depending upon the type, the severity of the trauma, and a diagnostic method used.[2-5]

Sedation management and delirium assessment is a routine procedure in our ICU by treating physicians and ICU staff. The nurse performs and records the result of sedation and delirium by using Richmond Agitation-Sedation Scale (RASS) and confusional assessment method (CAM-ICU) for every patient admitted in the intensive care unit twice a day and whenever a patient experiences a change in mental status.

Studies have shown that the acute phase of trauma is a risk factor for delirium in the ICU but there are limited studies on incidence, risk factors, and outcomes of delirium in trauma patients in developing country.[2,6,7]

This study was conducted to determine the risk factorsand outcome of delirium in trauma patients in a mixed semi-closed intensive care unit.

METHODOLOGY

It was a descriptive cross-sectional study in a level three intensive care unit of the National Medical College between 1st December 2021 to 31st May 2022. The ethical approval from the Institutional Review Committee was obtained before enrolment in this study. The ethical approval number was F-NMC/553/078-079. Written informed consent was obtained from the patients or surrogate decision-makers.

All patients 18 years or older 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 for more than 24 hours were included in this study. Patients who were younger than 18 years, surrogate decision-maker, or those who did not give written informed consent, length of stay in the ICU was less than 24 hours, required cardiopulmonary resuscitation with no return of spontaneous circulation, previously diagnosed disorders like senile dementia, Alzheimer's disease, psychosis, depression, patients with neurological injury, head injuries, do not resuscitate orders given by surrogate members, the patient who were blind and deaf, not able to speak the language of the country where ICU was located were not included in this study.

Each day during rounds, the target RASS score for the patient for the following 24 hours was set by the critical care team. The critical care team decided on sedation drug, regimen, the route of administration and whether the administration was by bolus or infusion. All sedation was stopped between 6 to 8 am daily to assess the Glasgow coma scale.

All variables were subdivided into predisposing factors present, before ICU admission and precipitating factors occurring during critical illness and which are changeable by preventing or therapeutic intervention.

The following information was collected from each patient meeting inclusion criteria on the day of study. Age, sex, ethnicity, occupation, Acute physiology and chronic health evaluation II (APACHE), Sequential organ failure assessment (SOFA), injury severity score, diagnosis, temperature, hemoglobin, hematocrit, serum sodium, potassium, magnesium, calcium, blood sugar, creatinine, urea, albumin, bilirubin, a ratio of aspartate aminotransferase / alanine aminotransferase (AST/ALT). Other information included co-morbidity, blood transfusion during this stay, exposure to a sedative, analgesic, and other drugs, the reason for admission in the ICU, and the category of surgical admission (elective versus emergency) was recorded.

Eligible patients were screened daily for delirium by applying the CAM-ICU score until the day of discharge from the ICU. Level of arousal was measured by using the RASS score which rates a patient's level of agitation or sedation on a 10 point scale ranging from -5 (unarousable, not responsive to voice or physical stimulation) to +4 (combative). Those having a RASS score of -3 to 4 were taken to step two on whom the CAM-ICU scale was applied. The CAM-ICU assesses four features of delirium: (1) acute onset or fluctuating course, (2) inattention, (3) disorganized thinking, and (4) altered level of consciousness. To be CAM-ICU positive, the patient must display features 1 and 2, and either 3 or 4.

The patients who were CAM-ICU positive were labeled as patients having delirium. Then, the detail of individual patients including the type of delirium, duration, drugs, and duration of the drugs used was recorded. Hyperactive delirium is defined as a persistent RASS score of +1 to +4 during all assessments. Hypoactive delirium is defined as a persistent RASS score of 0 to −3 during all assessments and mixed subtype is defined as present when the patients have rating of both hyperactive and hypoactive values.

The outcome of delirium was assessed by mortality during ICU stay, length of stay in the ICU, duration of mechanical ventilation, unplanned extubation and reintubation.

At the time of discharge from ICU duration of mechanical ventilation, length of stay in the ICU, reintubation, unplanned extubation, and mortality in the ICU were recorded.

The conventional formula for calculation of sample size was not used. Instead, all the patients admitted in the Intensive Care Unit of this tertiary care hospital for 6 month were collected. The whole sampling method was used in our study. Bias was reduced by collecting data from all groups of patients.

Data collection was done in a preformed sheet. The preformed sheet included all physiologic variables and demographic variables. All data was transferred to the excel sheet and transferred to SPSS-16. The descriptive data are presented as the number and percentage for categorical

data and mean ± standard deviation for continuous data according to their distribution. Chi-square test and Fisher's exact probability test were used to detect the difference between groups in the univariate analysis, as appropriate.

The variables were analyzed using binary logistic regression. Any variables which had P<0.2 after the univariable risk regression and all other potential variables associated with the delirium were included for the multivariable risk regression. The level of significance was P<0.05.

RESULT

542 Patients were admitted to the ICU during study peri

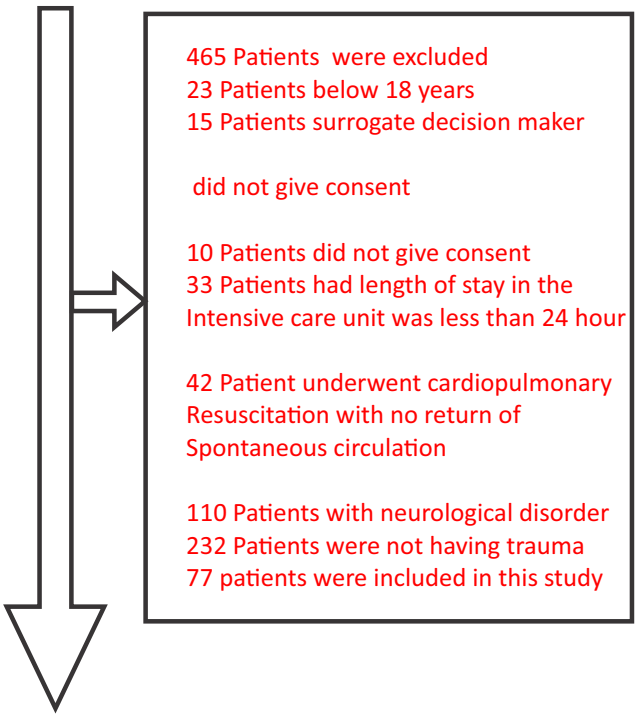

Figure 1 : Flow diagram of patient included in this study.
Figure 1: shows that 77 patients were included in this study.

Table 1: Baseline characteristics of patients with and without delirium

Characteristics	Delirious patients (n=17)	Non-delirious patients (n=60)	P value
Age (Years), Mean±SD	58.8±15.3	39.6±18.8	0.031
Sex (Male/ Female),n	13/4	49/11	0.633
APACHE II, Mean±SD	8.5±5.7	6.4±4.4	0.106
SOFA, Mean±SD	2.0±1.5	1.6±1.9	0.435
Injury Severity Score, Mean±SD	14.8±8.3	14.1±10.7	0.789
Hypertension,n(%)	10(58.8)	19(31.7)	0.014
COPD, n(%)	1(5.9)	7(11.7)	0.49
Diabetes mellitus, n(%)	2(11.8)	3(5.0)	0.659
Regular alcohol consumer. n(%)	15(88.23)	40(66.66)	0.002
Emergency surgery, n(%)	11(64.7)	22(36.7)	0.039
Abdominal surgery, n(%)	0	7(11.7)	0.337
Chest surgery, n(%)	3(17.6)	10(16.7)	0.924
Ortho surgery, n(%)	7(41.2)	10(16.7)	0.031
Reason for ICU admission			
Acute respiratory failure, n(%)	2(11.8)	1(1.7)	0.234
Hypovolemic shock, n(%)	12(70.5)	2(3.3)	0.041
Other, n(%)	10(58.8)	41(68.3)	0.464
Specialty			
Surgery, n(%)	6(35.3)	32(53.3)	0.189
Orthopedics, n(%)	10(58.8)	33(55.0)	0.779

APACHE II: Acute physiology and chronic health evaluation, COPD: Chronic obstructive pulmonary disease, ICU: Intensive care unit, SD: Standard deviationSOFA: Sequential organ failure assessment.

Table 1 shows the baseline characteristics of patients. The incidence of delirium was 17(22.1%). Delirium was hyperactive in 9(52.9%), mixed 6(35.3%), and hypoactive 2(11.7%). The mean duration of delirium was 3.69±4.06 days.

Age, hypertension, history of regular alcohol consumer, emergency surgery during this hospital stay, Hypovolemic shock, and patients who underwent orthopedic surgery were found to be statistically significant for delirium.

Table 2 Univariate analysis of metabolic variables in delirious and non-delirious patient

Characteristics	Delirious patients (n=17) n(%)	Non-delirious patients (n=60) n(%)	P value
Anemia	10 (58.8)	21(35.0)	0.077
Polycythemia	1(5.9)	0	0.221
Raised Urea	1(5.9)	2(3.3)	1
Raised Creatinine	2(11.8)	6(10.0)	0.833
Raised AST/ ALT	10(58.8)	30(50.0)	0.52
Hyperbilirubinemia	6(35.3)	12(20.0)	0.188
Hypoalbuminemia	2(11.8)	13(13.7)	0.363
Mechanical ventilation	5(29.4)	7(11.7)	0.075
Metabolic disorder			
Hypoglycemia	4(23.5)	22(36.7)	0.312
Hyponatremia	0	4(6.7)	0.571
Hyperkalemia	4(23.5)	9(15.0)	0.407
Hypocalcemia	39(35.8)	74(42.3)	0.276
Hypomagnesemia	4(23.5)	22(36.7)	0.312
Hypoxemia	6(35.3)	18(30.0)	0.677
Hypercarbia	1(5.9)	7(11.7)	0.492
Metabolic acidosis	2(11.8)	22(36.7)	0.041
Respiratory acidosis	2(11.8)	2(3.3)	0.445
Blood Transfusion	10(58.8)	16(26.7)	0.013
Analgesic	15(88.23)	20(33.33)	0.032

AST/ALT: Aspartate aminotransferase/Alanine amino - transferase, Anemia: Hemoglobin <12g/dl for females and <13g/dl for males, Raised Urea: Urea>45mg/dl, Raised Creatinine: Creatinine>1.2 mg/dl, Raised AST/ALT: >37/45U/L, Hyperbilirubinemia: Bilirubin >1.2 mg/dl, Hypoalbuminemia: Albumin<3.5 gm/dl, Hypoglycemia: Blood sugar<60 mg/dl. Hyponatremia: Serum sodium<135 MEq/L, Hyperkalemia: Serum potassium>5.5 MEq/L, Hypocalcemia: Serum calcium <8.8 mg/dl, Hypomagnesemia: Serum magnesium<1.7 mg/dl. Polycythemia: Hematocrit >55%

Table 2 shows the univariate analysis of metabolic variables in delirious and non-delirious patients. Metabolic acidosis, blood transfusion, use of analgesic drugs, were seen as a risk factor for delirium.

Table 3: Multivariate analysis of variables related to delirium

Characteristics	OR	OR(95% CI)	P
Age	1.016	1.064-1.012	0.031
Hypertension	4.524	33.952-1.603	0.041
Orthopedics trauma	4.825	33.222-4.212	0.021
Blood transfusion	5.381	25.055-1.156	0.032

CI: Confidence interval, OR: Odds ratio.

Table 3 shows the multivariate analysis of variables related to delirium.

Table 4. Clinical outcomes, complications and mortality

Characteristics	Delirious patients (n=17)	Non-delirious patients (n= 60)	P Value
Duration of MV, Mean±SD, days	2.8 ± 1.1	2.4±1.1	0.502
ICU LOS, days, Mean±SD	7.0 ±4.6	4.5±4.1	0.032
Mortality n(%)	1(5.9)	4(6.7)	1
Complications			
Unplanned extubation, n(%)	0	1(1.7)	1
Reintubation, n(%)	0	0	0

ICU: Intensive care unit, LOS: length of stay, MV: Mechanical ventilation, SD: Standard deviation

Table 4 shows the clinical outcomes, complications, and mortality of the study population. Delirious patients had a significantly longer length of stay in ICU. Mortality was similar between the two groups.

DISCUSSION

The incidence of delirium in our study was 17(22.1%). The incidence of delirium in the other studies ranges from 12.5% to 67%. This difference may be due to differences in definitions, type of trauma, the severity of illness, models of ICU and pain management.

Hyperactive subtype constituted 9(52.9%) of the cases of delirium in our study which is similar to the study by Sabhesan et al. Hypoactive delirium is a common subtype in all groups of patients but studies for the subtype of delirium in trauma patients are lacking.[8]

Emergency surgery, hypovolemic shock, metabolic acidosis, and use of analgesics were statistically significant in univariate analysis but in multivariate analysis, it was not statistically significant. It is because it was a non-randomized, small sample size and cross-sectional study. Bias was reduced by including all patients that were admitted in the intensive care unit during the study period.

Four risk factors for delirium were identified in our study. Age, hypertension, blood transfusion, and orthopedictrauma.

This study showed that age was a risk factor for delirium in trauma patients which is similar to the study by a Roh et al and Bryczkowsko et al. This is because advancing age patients have co-morbidities, physiological changes, metabolic disturbances, and alteration in the level of the neurotransmitter in the brain which predisposes the patient to delirium.[2,7]

Long standing hypertension was identified as a risk factor in our study which is similar to the study by a Kim et al. Hypertension can be associated with a decline in cognitive performance. The vascular damage exposes hypertensive patients to cerebral hypo perfusion and cerebral hypoxia and makes them at higher risk for delirium when admitted in the ICU.[8]

Blood transfusion was identified as a risk factor for delirium in our study which is similar to the study by a Behrends et al and Angles et al. But, the study by a Van der Zanden et al has shown the protective effect of blood transfusion on delirium. Blood transfusion activates the neuro inflammatory and oxidative stress pathway that predisposes to delirium. Therefore, large scale studies are required to know the effect of blood transfusion on delirium.[11-13]

Orthopedic trauma was identified as a risk factor for delirium in our study. Study by Bryczkowsko et al has shown that chest injury has less chance of developing delirium than other injuries. This is because the greater force is required for orthopedic injury that may cause metabolic and biochemical changes than other trauma patients.[7]

This study showed that the length of stay in the ICU was higher in delirious patients that is similar to other studies.[4,9,10,14]

The mortality was similar in delirious and non-delirious patients in our study . This is different in the literature with higher mortality in delirious patients.[13,14] This may be due to small sample size in our study.

The duration of mechanical ventilation was similar in delirious and non-delirious patients. This may be due to the protocolized management of patients by the full-time intensivist in our study.

Reintubation was similar in delirious and non-delirious patients.this may be due to small sample size in our study.

Lorazepam was most common drug used to treat delirium in the intensive care unit in our study because 88.23% of patient in our study were alcoholic and benzodiazepines in a dose is a drug of choice to treat delirium in alcoholic patient. and non-benzodiazepines in non-alcoholic patients which were used in our study.

CONCLUSION

Hyperactive delirium was the most common motor subtype Age, hypertension, blood transfusion and orthopaedic trauma were identified as the risk factor for delirium in trauma patients that should be identified early to prevent complications such as longer length of stay in the ICU, longer

duration of mechanical ventilation, mortality, reintubation and unplanned extubation.

RECOMMENDATIONS

Early identification of risk factors for delirium should be done to reduce the incidence of delirium in trauma patients

LIMITATIONS OF STUDY

Our study has limitations like it was a single-center, small sample size, and non-randomized study. Long-term outcome to detect persistent cognitive impairment was not assessed.

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CONFLICT OF INTEREST

None

FINANCIAL DISCLOSURE

None

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