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A DESCRIPTIVE CROSS-SECTIONAL STUDY ON THE INCIDENCE, RISK FACTOR AND OUTCOME OF DELIRIUM IN SURGICAL PATIENTS IN THE SEMI-CLOSED INTENSIVE CARE UNIT

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ABSTRACT

Introduction: *There is a variation in risk factors and outcome of delirium in surgical patients in different studies. This study was conducted to determine the incidence, risk factors, and outcome of delirium in the surgical semi-closed intensive care unit in a developing country.*

Materials and Methods: *This descriptive study was done in 82 patients of age≥18 years that underwent non-neurological surgery and admitted for more than 24 hours in a level three intensive care unit of medical college from January 10, 2021 to January 9, 2022. The whole sampling method was used in our study. The Confusion Assessment Method-ICU and Richmond Agitation Sedation Scale were used to diagnose delirium and sedation, respectively, along with a checklist to assess risk factors. All data was transferred to the excel sheet and transferred to a statistical package for the social sciences-16. Chi-square test and Fisher's exact probability test were used to detect the difference between groups in the univariate analysis, as appropriate. The risk factors were analysed using binary logistic regression.*

Result: *Of the 82 ICU admissions 28(34.1%) developed delirium. Hyperactive delirium was the most common motor subtype 12(42.8%). The mean duration of delirium was 4.69±5.06 days. Hypertension and alcohol were identified as risk factors for delirium. Delirious patients had a longer length of stay in the ICU (10.1 ±12.7 vs 5.1 ±4.2 days) with no impact on the duration of mechanical ventilation, mortality, reintubation, and unplanned extubation.*

Conclusion: *Early recognition of risk factors for delirium in surgical patients can decrease the mortality and morbidity of surgical patients.*

Keywords: *Delirium; Incidence; Intensive care units; Risk factors; Surgery.*

INTRODUCTION

Delirium in surgical patients is associated with a poor outcome, including increased length of stay (LOS), frequent medical complications, increased cost of care, and mortality.[1]Delirium is an acute brain dysfunction and studies have shown that an incidence of delirium in the surgical intensive care unit (ICU) is between3.6% to 73% depending upon the severity of the illness, type of surgery, and the diagnostic method used.[2-8] The onset is usually over 1–2 days and can deteriorate further with poor prognosis if appropriate intervention is delayed. However, it can be prevented and treated if dealt with urgently. Delirium may be confused with dementia, which has an insidious onset and progressive course with clear consciousness until the end stage.

Delirium is diagnosed if the patient develops inattention, disorganised thinking or coma of abrupt onset and fluctuating course. They may have one or more combination of the following symptoms, which

include alteration in consciousness, cognitive deficit, hallucinations, psychomotor disturbances, lethargy, agitation, alteration in the sleep-wake cycle and emotional disturbances.

Incidence, risk factors, and outcomes of delirium in surgical patients can vary in the same country or between different countries. There are limited studies about delirium in surgical patients from developing countries including Nepal. Understanding the risk factors could lead to a better prognosis through improved prevention and treatment. This study was conducted to determine the incidence, risk factors, and outcome of delirium in the surgical semi-closed intensive care unit in a developing country.

MATERIALS AND METHODS

It was a descriptive cross-sectional study in a level three intensive care unit of National Medical College, Birgunj, Nepal between January 10, 2021 to January 9, 2022. The ethical approval from the Institutional Review Committee was obtained before enrolment in this study. The ethical approval number was F-NMC/512/077/078. Written informed consent was obtained from the patients or surrogate decision-makers.

Patients ≥18 years of age with history of surgery admitted to the mixed intensive care 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 patient 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 neurosurgical, cardiac surgery, do not resuscitate orders given by surrogate members, the patient who were blind and deaf, not ability to speak the language of the country where ICU was located were not included in this study.

Sedation management and delirium assessment is a routine procedure in our ICU by treating physicians and ICU staff. The nurse performed and recorded 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. 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 routine 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. Risk factors associated with delirium was documented and subdivided into predisposing factors present, before ICU admission and precipitating factors occurring during critical illness and which are changeable by preventing or therauptic 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 aminotransfease/alanine aminotransferase (AST/ALT). Other information included co-morbidity, blood transfusion, 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-points 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 labelled 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 rating of +1 to +4 during all assessments. Hypoactive delirium is defined as a persistent rating 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, length of stay in the ICU, duration of mechanical ventilation, unplanned extubation, 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 was 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 was our sample size. 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 and median (25^{th}-75^{th} percentiles interquartile ranges, IQR) 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 risk factors were analysed 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-value<0.05.

RESULTS

Eighty-two patients were included in this study.

Table 1: Baseline characteristics of patients with and without delirium

Characteristics	Delirious patients (n=28)	Non-delirious patients (n=54)	p-value
Age (Years), Mean ± SD	42.6±20.5	38.0±21.1	0.505
Sex (Male/ Female),n	20/8	42/12	0.653
APACHE II, Mean ± SD	10.0±5.6	8.0±6.6	0.342
SOFA, Mean ± SD	2.4±1.3	2.6±2.4	0.776
Injury Severity Score, Mean ± SD	15.5±9.4	16.3±11.5	0.843
COPD, n(%)	2(7.1)	4(7.4)	1
Hypertension, n(%)	16(57.1)	14(25.9)	0.049
Diabetes mellitus, n(%)	2(7.1)	4(7.4)	1
Alcohol. n(%)	18(64.28)	34(62.9)	0.002
Trauma, n(%)	22(78.6)	44(81.5)	0.824
Emergency surgery, n(%)	4(11.8)	22(18.3)	0.523
Abdominal surgery, n(%)	4(14.3)	18(33.3)	0.192
Chest surgery, n(%)	6(21.4)	14(25.9)	0.75
Ortho surgery, n(%)	12(42.9)	10(18.5)	0.095
Reason for ICU admission			
Acute respiratory failure, n(%)	6(21.4)	0	0.034
Septic shock, n(%)	0	4(3.7)	1
Other, n(%)	10(35.7)	28(51.9)	0.326

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

Table 1 shows the baseline characteristics of patients. The incidence of delirium was 28(34.1%). Delirium was hyperactive in 12(42.8%), mixed 10(35.7%), and hypoactive 6(21.4%). The mean duration of delirium was 4.69±5.06 days. Hypertension, alcohol intake, and acute respiratory failure were more in delirious patients.

Table 2: Univariate analysis of metabolic risk factors in delirious and non-delirious patient

Characteristics	Delirious patients (n=28) n(%)	Non-delirious patients (n=54) n(%)	p-value
Anaemia	20 (71.4)	28(51.9)	0.228
Raised Urea	0	4(7.4)	0.539
Raised Creatinine	2(7.1)	8(14.8)	0.835
Raised AST/ ALT	16(57.1)	30(55.6)	0.923
Hyperbilirubinemia	8(28.6)	18(33.3)	0.756
Hypoalbuminemia	4(14.3)	20(37.0)	0.129
Mechanical ventilation	10(35.7)	16(29.6)	0.691
Metabolic disorder			
Hypoglycaemia	4(14.3)	2(3.7)	0.031
Hyponatremia	0	4(7.4)	0.539
Hypocalcaemia	10(35.7)	26(48.1)	0.447

Hypomagnesemia	8(28.6)	12(22.2)	0.653
Hypoxemia	12(42.9)	20(37.0)	0.717
Hypercarbia	2(7.1)	6(11.1)	1
Metabolic acidosis	8(28.6)	24(44.4)	0.323
Respiratory acidosis	4(14.3)	4(7.4)	0.042
Blood Transfusion	18(64.3)	20(37.0)	0.097
Analgesic	20(71.4)	50(92.5)	0.061
Vasopressor	20(71.4)	28(51.85)	0.121

AST/ALT: Aspartate aminotransferase/Alanine aminotransferase, Anaemia: Haemoglobin <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, Hypoglycaemia: Blood sugar<60 mg/dl. Hyponatremia: Serum sodium<135 mEq/L, Hyperkalaemia: Serum potassium>5.5 mEq/L, Hypocalcaemia: Serum calcium <8.8 mg/dl, Hypomagnesemia: Serum magnesium<1.7 mg/dl.

Table 2 shows the univariate analysis of metabolic risk factors in delirious and non-delirious patients. Metabolic disorders like hypoglycaemia and respiratory acidosis were higher in delirium patients.

Table 3: Multivariate analysis of risk factors related to mortality

Characteristics	OR	OR(95% CI)	P Value
Hypertension	5.172	27.568-5.124	0.041
Alcohol	1.095	5.474-1.219	0.032

CI: Confidence interval, OR: Odds ratio.

Table 3 shows the multivariate analysis of risk factors related to mortality. Hypertension and alcohol were associated with delirium in surgical patients.

Table 4: Clinical outcomes, complications and mortality

Characteristics	Delirious patients (n=28)	Non-delirious patients (n= 54)	P Value
Duration of MV, Mean ± SD, days	3.6 ± 3.1	2.2±1.1	0.224
ICU LOS, days, Mean ± SD	10.1 ±12.7	5.1 ±4.2	0.047
Mortality n(%)	1(7.1)	3(11.1)	1
Complications			
Unplanned extubation, n(%)	0	1(3.7)	1
Reintubation, n(%)	1(7.1)	0	0.341

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 significantly longer length of stay in the ICU. Duration of mechanical ventilation, mortality, unplanned extubation, and reintubation were similar between the two groups.

DISCUSSION

The incidence of delirium in our study was 28(34.1%). The incidence of delirium in the other studies ranges from 3.6 to 73%. This difference may be due to differences in definitions, the severity of illness, models of ICU, pre-existing co-morbid condition, and nature of surgery performed. Delirium is underdiagnosed because it is missed and can be used with other acute dysfunction brain syndromes.

Hyperactive subtype constituted 12(42.8%) of the cases of delirium in our study. Studies have shown that hypoactive delirium is a common subtype in the surgical patients.[2,3,9] This difference may be due to small number of patients in our study. Delirium is often missed because health care teams are more attuned to noticing the patient with hyperactive delirium, with positive symptomology like agitation, than the hypoactive delirium, manifesting negative symptomology like inattention and depressed level of consciousness

Hypoglycaemia, respiratory acidosis, acute respiratory failure 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. Hypoglycaemia can lead to psychiatric symptoms ranging from delirium and confusional states to psychosis. Intensive glycaemic control therapy in patients with diabetes can lead to neuroglycopenia and precipitate psychosis. Acute respiratory acidosis causes multiple neurological symptoms. It can cause restlessness, anxiety, somnolence, and delirium. Two risk factors for delirium were identified in our study hypertension and alcohol.

Hypertension was identified as a risk factor in our study which is similar to the study by a Kim et al.[10] Hypertension can be associated with a decline in cognitive performance. The vascular damage exposes hypertensive patients to cerebral hypoperfusion and cerebral hypoxia and makes them at higher risk for delirium when admitted in the ICU.

Alcohol was an important risk factor for delirium in our study which is similar to the study by a Talikoti et al[11]. It is because alcohol causes the change in the brain neurotransmitters, physiological and metabolic changes that predisposes patients to delirium.

This study showed that the length of stay in the ICU was higher in delirious patients that is similar to other studies.[4,5,9,10] Length of stay causes more economic burden to patients and family members can cause more hospital-acquired infections and psycho-social problems.

The mortality was similar in delirious non-delirious patients in our study. This is different in the literature with higher mortality in delirious patients.[8-10] This may be due to small sample size in our study. Mortality is higher in delirious patients because a delirious patient has more chance of developing an infection, procedure related complications, and have chronic health problems.

The duration of mechanical ventilation was similar in delirious and non-delirious patients while other studies have shown that duration of MV is higher in delirious patients.[8-11] This may be due to small sample size, management of patients by the full-time intensivist in our study. Duration of mechanical ventilation is more in delirious patient because these patients develop more health- care associated infections, drug- related complication and ventilator- associated complications.

Reintubation was similar in delirious and non-delirious patients this may be due to small sample size in our study. Reintubation is more common in delirious patients because of inadequate sedation, difficulty to cure the primary disease. Reintubated patient has more chance of mortality than non-delirious patient.

Lorazepam was a most common drug used to treat delirium in the intensive care unit in our study because 64.28% 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. Benzodiazepines are prone to cause delirium than non-benzodiazepines. Non-Benzodiazepines like propofol, quetiapine and preferred drugs.

CONCLUSIONS

Early recognition of risk factors for delirium in surgical patients can decrease the mortality and morbidity of surgical patients. Our study has limitations like it was a single-centre small sample size, non-randomized study.

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