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

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ABSTRACT

INTRODUCTION

Delirium in mechanically ventilated patients is associated with a poor outcome. Delirium in mechanically ventilated patients is associated with a poor outcome, including increased length of stay, frequent medical complications, increased cost of care, and mortality.

MATERIAL AND METHODS

This prospective study was done in 67 patients of age ≥18 years who underwent mechanical ventilation for more than 24 hours in a level three intensive care unit of tertiary care hospital for one year. The ethical approval from the Institutional Review Committee was obtained before enrolment in this study The whole sampling method was used in our study. The Confusion Assessment Method-ICU and Richmond Agitation Sedation Scale were used to diagnose and motor subtype delirium, 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. The risk factors were analyzed using binary logistic regression.

RESULTS

Of the 67 ICU admissions, 34 (38.4%) developed delirium. Mixed delirium was the most common motor subtype 36 (53.73%). The mean duration of delirium was 5.41±4.62 days. Hypoxemia, acute respiratory failure, and history of alcohol intake were identified as risk factors for delirium. Delirious patients had a longer length of stay in the ICU (11.8 ±8.1 vs 7.4±7.7 days) and duration of mechanical ventilation (5.1±2.0 vs 2.5±1.6), with no impact on mortality, reintubation and unplanned extubation.

CONCLUSION

Hypoxemia, acute respiratory failure, and history of alcohol intake were identified as the risk factor for mortality in mechanically ventilated delirious patients that should be identified early to prevent complications such as longer length of stay and duration of mechanical ventilation in the semi-closed intensive care unit.

KEYWORDS

Delirium, Intensive Care Units, Ventilation, Mortality

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INTRODUCTION

The requirement of mechanical ventilation is a common reason for admission in the intensive care unit. Delirium occurs more in mechanically ventilated patients than other patients. Delirium in mechanically ventilated patients is associated with a poor outcome, including increased length of stay (LOS), frequent medical complications, increased cost of care, and mortality.

Delirium is an acute brain dysfunction and studies have shown that an incidence of delirium in a mechanically ventilated patient isbetween 55.5% to 81.7%[1-3] depending upon the severity of the illness, primary diagnosis, co-morbidities, and the diagnostic method used. There are limited studies about delirium in mechanically ventilated patients from developing countries including Nepal. Understanding the risk factor can help in early management and preventing complications.This study was conducted to know clinical profile, and outcome of delirium in mechanically ventilated patients in semi-closed intensive care unit in a developing country.

MATERIAL AND METHODS

It was a descriptive cross-sectional study in a level three intensive care unit of National Medical College, Birgunj, Nepal between January1, 2024 to December 31, 2024. The ethical approval from the Institutional Review Committee was obtained before enrolment in this study. The ethical approval number was F-NMC/638/079-080. Written informed consent explaining the type of research, and has no impact on his treatment was obtained from the patients or surrogate decision-makers.

Patients ≥18 years admitted to the mixed intensive care unit of a tertiary care hospital and underwent mechanical ventilation 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, neurological disorder,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.This above group of patients were excluded because these patients affects the sensorium of patients.

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 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, exposure to a sedative, analgesic, and other drugs, including Lorazepam, M°idazolam, Quietapine Haloperidol 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 rating of +1 to +4during 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, 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 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 1 year were 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 for continuous data according to their distribution. Chi-square test and Fisher's exact

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probability test were used to detect the difference between groups in the univariate analysis, as appropriate.

The risk factors 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 $p<0.05$.

RESULTS

There were 542 admitted to the ICU during the study period. Out of 542 patients, 30 patients were below 18 years, 21 patients had surrogate decision makers did not give consent, 15 patients did not give consent, 94 patients had a duration of stay in the ICU for less than 24 hours, 24 patients underwent cardiopulmonary resuscitation with no return of spontaneous circulation, 102 patients had a neurological disorder and 184 patients did not undergo mechanical ventilation. Therefore 67 patients were included in this study.

Table 1. Baseline characteristics of patients with and without delirium

Characteristics	Delirious patients (n=36)	Non-delirious patients (n=31)	p-value
Age (Years), Mean±SD	47.2±18.8	51.9±20.4	0.33
Sex (Male/ Female),n	22/14	17/14	0.604
APACHE II, Mean±SD	21.1±8.1	14.4±8.0	0.0.001*
SOFA, Mean±SD	12.1±3.5	5.4±3.2	0.021*
Injury Severity Score, Mean±SD	17.8±7.8	24.0±13.1	0.37
COPD, n(%)	3 (8.3)	3(9.7)	1
Chronic renal failure, n (%)	3 (8.3)	0(0.0)	0.243
Hypertension, n (%)	9 (25.0)	7(22.6)	0.817
Diabetes mellitus, n (%)	2 (5.6)	3(9.7)	0.862
Alcohol. n (%)	32 (88.8)	12(38.3)	0.001
Trauma, n (%)	5 (13.9)	7(22.6)	0.355
Emergency surgery, n (%)	5 (13.9)	8(25.8)	0.219
Abdominal surgery, n (%)	2 (5.6)	7(22.6)	0.093
Chest surgery, n (%)	1 (2.8)	1(3.2)	1
Ortho surgery, n (%)	2 (5.6)	1(3.2)	1
Reason for ICU admission			
Acute respiratory failure, n (%)	15 (41.7)	4(12.9)	0.009*
Septic shock, n (%)	18 (50.0)	5(16.1)	0.012*
Other, n (%)	16 (44.4)	13(41.9)	0.836
Specialty			
Medicine, n (%)	26 (72.2)	18(58.1)	0.224
Surgery, n (%)	5 (13.9)	9(29.0)	0.128
Orthopedics, n (%)	3 (8.3)	6(19.4)	0.337

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 36 (53.73%). Delirium was mixed in 15 (41.6%), hyperactive 11 (30.5%), and hypoactive 10 (27.7%). The mean duration of delirium was 5.41±4.62 days. Delirious patients had higher APACHE II, SOFA score, had a history of alcohol, acute respiratory failure, and septic shock.

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

Characteristics	Delirious patients (n=36) n (%)	Non-delirious patients (n=31) n (%)	p-value
Anemia	19 (52.8)	16(51.6)	0.924
Raised Urea	14(38.9)	9(29.0)	0.397
Raised Creatinine	11(30.6)	9(29.0)	0.892
Raised AST/ ALT	21(58.3)	17(54.8)	0.773
Hyperbilirubinemia	14(38.6)	14(45.2)	0.604
Hypoalbuminemia	25(69.4)	12(38.7)	0.002
Metabolic disorder			
Hypoglycemia	2(5.6)	2(6.5)	1
Hyponatremia	5(13.9)	9(29.0)	0.928
Hyperkalemia	2(5.6)	2(6.5)	1
Hypocalcemia	13(36.1)	12(38.7)	0.826
Hypomagnesemia	6(16.7)	3(9.7)	0.633
Hypoxemia	26(72.2)	13(41.9)	0.012
Hypercarbia	6(16.7)	5(16.1)	0.809
Metabolic acidosis	27(75.0)	22(71.0)	0.71
Respiratory acidosis	4(11.1)	5(16.1)	0.809
Blood Transfusion	11(30.6)	9(29.0)	0.892
Analgesic	32(880.2)	15(48.3)	0.512
Vasopressor	18(50.0)	15(16.0)	0.024

AST/ALT: Aspartate aminotransferase/Alanine aminotransferase , 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.

Table 2 shows the univariate analysis of metabolic risk factors in delirious and non-delirious patients. Metabolic disorders like hypoxemia, hypoalbunemia, is were higher in delirium patients. The use of vasopressor l was higher in delirious patients.

Table 3. Multivariate analysis of risk factors related to mortality

Characteristics	OR	OR (95% CI)	p-value
Alcohol	1.094	3.352-1.357	0.045*
Acute respiratory failure	4.622	18.244-1.171	0.029*
Hypoxemia	3.306	10.686-1.023	0.046*

CI: Confidence interval, OR: Odds ratio

Table 3 shows the multivariate analysis of risk factors related to mortality.

Table 4. Clinical outcomes, complications and mortality

Characteristics	Delirious patients (n=36)	Non-delirious patients (n=31)	p-value
Duration of MV, Mean±SD, days	5.1 ± 2.0	2.5±1.6	0.041*
ICU LOS, days, Mean±SD	11.8 ±8.1	7.4±7.7	0.045*
Mortality n (%)	11(30.6)	8(25.8)	0.667
Complications			
Unplanned extubation, n (%)	3(8.3)	1(3.2)	0.717
Reintubation, n (%)	4(11.1)	0	0.118

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 and duration of MV in the ICU. Mortality was similar between the two groups.

Table 5. Dose and duration of drugs used to treat delirium in the intensive care unit

		N	Minimum	Maximum	Mean	Std. Deviation
Lorazepam	Dose, mg	22	3	400	51.09	84.16
	Duration, days	22	1	40	6.68	8.66
Midazolam	Dose, mg	6	10	40	21.67	9.832
	Duration, days	6	2	5	3.17	0.983
Quietapine	Dose, mg	14	6	400	57.29	102.927
	Duration, days	14	1	40	6.36	9.811
Haloperidol	Dose, mg	3	10	40	23.33	15.275
	Duration, days	3	2	5	3	1.732

Table 5 shows the dose and duration of drugs to treat delirium in the intensive care unit. Lorazepam and Quietapine were the most common drugs used to treat delirium in the intensive care unit.

DISCUSSION

The incidence of delirium in mechanically ventilated patients in our study was 36 (53.73%) while in other studies the percentage varied from 55.5% to 81.7%.[1-3] This difference may be due to differences in definitions, type of ICU population, the severity of illness, diagnosis tool used, models of ICU, and the protocol for ventilator management.

Mixed subtype constituted 39 (41.6%) of the cases of delirium in our study which is similar to the other studies.[4-6] Studies[7-12] have also shown that hypoactive delirium is the common delirium in the ICU. This difference may be due to differences in the type of ICU population, diagnosis tool used, models of ICU, and protocol for different procedures and drug administration in the ICU.

High APACHE II, raised SOFA score, hypoxemia and hypoalbuminemiawere statistically significant in univariate analysis but in multivariate analysis, it was not statistically significant. It is because it was a non-randomized and cross-sectional study.Three risk factors for delirium in mechanically ventilated patients were identified in our study. Acute respiratory failure, history of alcohol intake, and hypoxemia. Alcohol was an important risk factor for delirium in our study which is similar to the study by a Stewart et al[13] and Sarkar et al.[14] It is because alcohol causes the change in the brain neurotransmitters, physiological and metabolic changes that predisposes patients to delirium.The alcoholic patient undergoing mechanical ventilation develops alcohol withdrawal and requiresto prolong sedation that increases the incidence of delirium in alcoholic patients.

Hypoxemia was a risk factor for delirium which is similar to the study by a Jayaswal et al[11] and Li et al.[15] Hypoxemia is one of the common indications for the requirement of mechanical ventilation in the intensive care unit. Hypoxemia predisposes to anaerobic metabolism that causes delirium.

Acute respiratory failure was identified as a risk factor for delirium in mechanically ventilated patient in this study. Acute respiratory failure is one of the common reasons for mechanical ventilation in the ICU. Acute respiratory failure causes increases in carbon dioxide, and changes in neurotransmitter levels.

This study showed that the length of stay in the ICU was higher in delirious patients that is similar to other studies.[1-3] The requirement of sedative and analgesic drugs is more in MV patients than other patients which may increase LOS in the ICU.

The duration of mechanical ventilation was more in delirious patients in our study which is similar to other studies.[1-3] The duration of MV depends upon the primary disease, the requirement of sedative and analgesic drugs. complications during management, ventilator management protocol.

The mortality was similar in delirious non-delirious patients in our study which is similar to the study byTilouche et al.[12] This is different in the literature with higher mortality in mechanically ventilated delirious patients.[1-3] This may be due to the management of the patient by full-time intensivist in our study. Reintubationand unplanned extubation were similar in both groups of patients in our study.

Lorazepam was the most common drug used to treat delirium in the intensive care unit in our study because 88.8% of patient in our study were alcoholic and benzodiazepiens in a dose is a drug of choice to treat delirium in alcoholic patient.and non-benzodiazepiens in non-alcoholic patients which were used in our study.

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

CONCLUSION

Hypoxemia, acute respiratory failure, and history of alcohol intake were identified as the risk factor for delirium in mechanically ventilated patients that should be identified early to prevent complications such as longer length of stay and duration of mechanical ventilation in the intensive care unit.

CONFLICT OF INTEREST

None

REFERENCES

1. Lochanie PAN, Ranawaka NMD. Assessment of incidence and risk factors for intensive care acquired delirium in mechanically ventilated patients in surgical intensive care unit National Hospital of Sri Lanka. Sri Lankan Journal of Anaesthesiology 2018;26(2):131-6.

2. Ely EW, Shintani A, Truman B,Speroff T, Gordon SM, Harrell FE et al. Delirium as a predictor of mortality in mechanically ventilated patients in the intensive care unit. JAMA 2004;291(14):1753-62.

3. Kwizera A, Nakibuuka J, Ssemogerere L, Sendikadiwa C, Obua D, Kizito S et al. Incidence and Risk factors for delirium among mechanically ventilated patients in an African intensive care setting: An observational multicenter study. Crit Care Res Pract 2015:2015;491780.

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4. Pipanmekaporn T, Chittawatanarat K, Chaiwat O, Thawitsri T, Wacharasint P, Kongsayreepong S et al.Incidence and risk factor of delirium in multi-center Thai surgical intensive care units: a prospective cohort study. J Intensive Care 2015;3:53.

5. Peterson JF, Pun BT, Dittus RS, Thomason JW, Jackson JC, Shintani AK et al. Delirium and its motor subtypes: a study of 614 critically ill patients. J Am GeriatrSoc 2006;54(3):479-84.

6. Meagher DJ, O' Hanlon D, O' Mahony E, Casey PR, Trzepacz PT. Relationship between symptoms and motoric subtype of delirium. J Neuropsychiatry ClinNeurosci 2000; 12(1):51-6.

7. Krewulak KD, Steflfox HT, Leigh JP, Ely EW, Fiest KM. Incidence and prevalence of delirium subtypes in an adult ICU.: A systemic review and meta-analysis, CritCare Med 2018;46(12):2029-35.

8. Sharma A, Malhotra S, Grover S, Jindal SK. Incidence, prevalence, risk factor and outcome of delirium in intensive care unit: A study from India. Gen Hosp Psychiatry 2012;34(6):639-46.

9. Lahariya S, Grover S, Bagga S, Sharma A. Delirium in patients admitted to a cardiac intensive care unit with cardiac emergencies in a developing country: Incidence, prevalence, risk factor and outcome. Gen Hosp Psychiatry 2014;36(2):156-64.

10. Bamalwa M, Mahmood SN, Praharaj SK. Delirium in cardiac ICU patients. Ann Clin Psychiatry 2016;28(1):51-5.

11. Jayaswal AK, Sampath H, Soohinda G, Dutta S. Delirium in medical intensive care units: Incidence, subtypes, risk factors, and outcome. Indian J Psychiatry 2019;61(4):352-8.

12. Tilouche N, Hassen MF, Ali HBS, Jaoued O, Ghaberi R, EI Atrous SS. Delirium in the Intensive Care Unit: Incidence, Risk Factors, and Impact on Outcome. Indian J Crit Care Med 2018;22(3):144-9.

13. Stewart D, Kinsella J, McPeake J, Quasim T, Puxty A. The influence of alcohol abuse on agitation, delirium and sedative requirements of patients admitted to a general intensive care unit. J Intensive Care Soc 2019;20(3):208-15.

14. Sarkar S, Choudhary S, Ezhumalai G, Konthoujam J. Risk factor for the development of delirium in alcohol dependence syndrome: clinical and neurobiological implications. Indian J Psychiatry 2017;59(3):300-5.

15. Li Y, Yuan D, Li X, Wang S. Risk factors for delirium in intensive care unit and its duration. Zhonghua Wei Zhong Bing Ji Jiu Yi Xue 2020;32(1):62-6.