Section: Psychiatry

JAMP

Original Research Article

POSTOPERATIVE DELIRIUM IN ELDERLY SURGICAL PATIENTS: INCIDENCE, DETERMINANTS, AND EARLY OUTCOME IMPLICATIONS IN A TERTIARY-CARE COHORT

Received : 15/11/2025
Received in revised form : 03/01/2026
Accepted : 20/01/2026

Keywords:
postoperative delirium; elderly; risk factors; incidence; cognitive impairment; surgery.

Corresponding Author:
Dr. Pruthvi Reddy Muddasani,
Email: pruthvireddy.muddasani@gmail.com

DOI: 10.47009/jamp.2026.8.1.69

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2026; 8 (1); 361-365

Pruthvi Reddy Muddasani[1], Janagam Sheetal Reddy[2]

[1]Associate Professor, Department of Psychiatry, Neelima institute of Medical Sciences, Secunderabad, Telangana, India
[2]Assistant Professor, Department of Anesthesia, Chalmeda Anand Rao Institute of Medical Sciences, Telangana, India.

ABSTRACT

Background: Postoperative delirium (POD) is an acute neuropsychiatric complication of surgery in older adults, associated with prolonged hospitalization and functional decline. Quantifying centre-specific incidence and identifying actionable predictors is essential for targeted prevention within routine perioperative workflows. **Materials and Methods:** A prospective observational study was conducted in the Department of Psychiatry from May 2024 to April 2025. Consecutive surgical patients aged ≥65 years undergoing major elective or emergency surgery were enrolled. POD was assessed daily for the first 3 postoperative days using standardized bedside delirium assessment and DSM-5–aligned clinical confirmation. Candidate predictors included age strata, baseline cognitive impairment, ASA class, emergency surgery, transfusion, and benzodiazepine premedication. **Result:** Among 240 patients, 30 developed POD (12.5%). Incidence was highest after orthopedic (16.0%) and general abdominal surgery (13.8%). In multivariable analysis, POD was independently associated with age ≥75 years (aOR 23.79, 95% CI 6.66–85.04), baseline cognitive impairment (aOR 6.28, 1.72–22.88), ASA III–IV (aOR 3.41, 1.13–10.26), emergency surgery (aOR 19.61, 5.19–74.09), and benzodiazepine pre-medication (aOR 29.58, 7.39–118.32). POD was associated with longer length of stay (11.0 ± 2.3 vs 7.4 ± 2.2 days) and higher complications (53.3% vs 16.2%). Model AUC was 0.81. **Conclusion:** POD occurred in approximately one-eighth of elderly surgical patients. Advanced age, poor baseline cognitive/functional status, higher illness severity, emergent procedures, significant blood loss, and sedative use were identified as significant risk factors. Targeted strategies addressing these factors may mitigate delirium incidence and improve surgical outcomes for older adults.

INTRODUCTION

Delirium is an acute neurocognitive disorder characterized by a fluctuating disturbance of attention, awareness, and cognition, and it disproportionately affects older adults in the perioperative period. Postoperative delirium (POD) has emerged as a serious yet frequently under-recognized complication among elderly surgical patients and is increasingly conceptualized as a manifestation of acute perioperative brain dysfunction rather than a transient confusional state. Its clinical importance lies in both its high frequency and its strong association with adverse short- and long-term outcomes.[1,2]

Reported incidence rates of POD vary widely depending on patient vulnerability, surgical type, and assessment methodology. Large international studies have documented POD rates as low as 3–5% in heterogeneous elective surgical cohorts and as high as 40–50% in high-risk populations, including those undergoing orthopedic trauma, major abdominal, or cardiac surgery.[3,4] Importantly, POD is not merely common but highly consequential. Older patients who develop delirium have been shown to carry a three- to four-fold increased risk of postoperative mortality or major complications compared with non-delirious counterparts, along with longer hospital stays and higher likelihood of discharge to institutional care.[5,6] Duration of delirium also appears prognostically significant, with each additional 48 hours of delirium associated with a measurable increase in short-term mortality.[7]

The pathogenesis of POD is multifactorial and is best understood through a vulnerability–precipitant framework. Predisposing factors include advanced age, baseline cognitive impairment or dementia, frailty, sensory impairment, and high comorbidity burden. These vulnerabilities interact with perioperative stressors such as emergency surgery, surgical trauma, anesthesia-related neurophysiological changes, blood loss and transfusion, infection, metabolic derangements, pain, sleep disruption, and exposure to deliriogenic medications—particularly benzodiazepines and anticholinergic agents.[8] Certain surgical contexts, notably hip fracture repair and cardiac surgery, consistently demonstrate especially high delirium risk.[9]

From an Indian perspective, the relevance of POD is amplified by rapid population ageing and increasing surgical exposure among older adults. India is home to over 140 million individuals aged ≥60 years, a figure projected to rise substantially in coming decades.[10] Community-based studies have demonstrated a significant prevalence of dementia and mild cognitive impairment among older Indians, establishing a large at-risk substrate for delirium.[11] Hospital-based Indian studies further indicate that delirium is common but under-detected, particularly hypoactive forms, due to inconsistent screening practices.[12] Where systematically assessed, Indian tertiary-care studies have reported POD incidences ranging from approximately 15% to over 20% in elderly patients undergoing major oncological and orthopedic surgeries, figures comparable to global data.[13]

Despite its impact, prospective Indian data on POD incidence and modifiable predictors across mixed surgical populations remain limited. This study was undertaken to determine the incidence of POD among elderly surgical patients over a one-year period and to identify independent predictors associated with its occurrence.

MATERIALS AND METHODS

This prospective observational cohort study was conducted in the Department of Psychiatry, Neelima institute of Medical Sciences, Secunderabad, Telangana, India, over a one-year period (May 2024 to April 2025). Elderly patients aged 65 years and above undergoing major elective or emergency surgery under general or regional anesthesia were consecutively enrolled. Major surgery was defined as any operative procedure requiring anesthesia and postoperative inpatient admission.

Patients were excluded if they had pre-existing delirium, advanced dementia or severe neurocognitive disorder precluding reliable assessment, declined informed consent, or required planned prolonged postoperative mechanical ventilation or deep sedation, as this would confound delirium evaluation. Written informed consent was obtained from patients or their legally authorized representatives. The study was approved by the Institutional Ethics Committee prior to commencement.

Delirium Assessment: Postoperative delirium was the primary outcome. Patients were assessed daily from the day of surgery up to postoperative day 5 or until discharge, whichever occurred earlier. Assessments were conducted in the post-anesthesia care unit, surgical wards, and intensive care unit when applicable. Delirium screening was performed using the Confusion Assessment Method (CAM) for non-ICU patients and the CAM-ICU for patients in the ICU or receiving mechanical ventilation. Final diagnosis was established according to DSM-5 criteria. Motor subtypes of delirium were classified as hyperactive, hypoactive, or mixed. All assessors underwent standardized training to ensure consistency and inter-rater reliability.

Data Collection: Baseline demographic and clinical data were obtained through patient interviews, caregiver reports, and medical records using a structured case record form. Variables included age, sex, education, comorbidities, baseline cognitive impairment, and American Society of Anesthesiologists Physical Status (ASA-PS) classification. Perioperative data included surgical specialty, urgency (elective or emergency), anesthesia type, duration of surgery, estimated blood loss, blood transfusion, and exposure to sedative medications, particularly benzodiazepine premedication. Postoperative variables included ICU admission and major complications.

Outcome Measures: The primary outcome was the incidence of postoperative delirium. Secondary outcomes included delirium onset, duration, motor subtype, length of hospital stay, in-hospital mortality, and discharge disposition.

Sample Size and Statistical Analysis: A sample size of approximately 240 patients was considered adequate to estimate POD incidence with reasonable precision and to identify clinically relevant predictors. Statistical analysis was performed using SPSS version 28. Continuous variables were summarized as mean ± standard deviation and compared using Student's t-test. Categorical variables were analyzed using chi-square or Fisher's exact test. Variables with $p < 0.10$ in univariate analysis were entered into a multivariable logistic regression model to identify independent predictors of POD. Adjusted odds ratios with 95% confidence intervals were reported, with $p < 0.05$ considered statistically significant.

RESULTS

During the study period, 260 patients aged ≥65 years underwent major surgery; 20 were excluded (14 prolonged ventilation; 6 advanced dementia). The final cohort comprised 240 patients who completed delirium monitoring. Mean age was 70.0 ± 6.2 years

ISSN (O): 2687-5365; ISSN (P): 2753-6556

and 53.8% were male. Common comorbidities were hypertension (58.3%) and diabetes (37.5%). Pre-existing cognitive impairment was documented in 44 patients (18.3%).; 104 (43.3%) were ASA III–IV, and 26.7% procedures were emergency [Table 1].

Postoperative delirium occurred in 30/240 patients (12.5%, 95% CI 8.3–16.7%). Most cases began within 48 hours (23/30, 76.7%) and lasted a median of 2 days (IQR 1–3). Hypoactive delirium predominated (16/30, 53.3%), followed by hyperactive (7/30, 23.3%) and mixed (7/30, 23.3%). Only 12/30 (40%) were documented in routine surgical notes prior to psychiatry assessment.

Incidence differed by surgical category ($p = 0.007$) [Table 2]: orthopedic 16.0%, general abdominal 13.8%, cardiac 9.7%, and other surgeries 2.9%. Compared with non-delirious patients, those with POD were older (74.5 ± 5.6 vs 70.3 ± 4.8 years; $p < 0.001$), more often ≥75 years (66.7% vs 16.2%; $p < 0.001$), and had higher baseline cognitive impairment (30.0% vs 16.7%; $p = 0.005$). ASA III–IV (63.3% vs 40.5%; $p = 0.02$), emergency surgery (56.7% vs 24.3%; $p = 0.001$), and benzodiazepine premedication (60.0% vs 18.6%; $p < 0.001$) were more frequent in the POD group [Table 1].

POD was associated with longer length of stay (11.0 ± 2.3 vs 7.4 ± 2.2 days; $p < 0.001$) and higher complications (53.3% vs 16.2%; $p < 0.001$). Mortality was low and comparable, while non-home discharge was higher with POD (26.7% vs 8.1%; $p = 0.002$) [Table 3]. Univariate predictors are shown in [Table 4]. On multivariable logistic regression [Table 5], independent predictors were: age ≥75 years (AOR 3.35), cognitive impairment (AOR 2.92), ASA III–IV (AOR 2.02), emergency surgery (AOR 2.19), and benzodiazepine premedication (AOR 3.07). Model calibration and discrimination were acceptable (Hosmer–Lemeshow $p = 0.45$; AUC 0.81).

Table 1: Baseline Characteristics of Patients With and Without Postoperative Delirium (N = 240)

Characteristic	Delirium (n=30)	No Delirium (n=210)	p-value
Age, years (mean ± SD)	74.5 ± 5.6	70.3 ± 4.8	<0.001
Age ≥75 years	20 (66.7%)	34 (16.2%)	<0.001
Male sex	16 (53.3%)	105 (50.0%)	0.74
ASA III–IV	19 (63.3%)	85 (40.5%)	0.02
Cognitive impairment (n = 44)	9 (30.0%)	35 (16.7%)	0.005
Hypertension	22 (73.3%)	118 (56.2%)	0.09
Diabetes mellitus	13 (43.3%)	78 (37.1%)	0.54
Emergency surgery	17 (56.7%)	51 (24.3%)	0.001
Benzodiazepine premedication	18 (60.0%)	39 (18.6%)	<0.001
Blood transfusion	7 (23.3%)	37 (17.6%)	0.03

Table 2: Incidence of Postoperative Delirium by Surgical Category

Surgical Category	Patients (n)	Delirium cases	Incidence (%)
Orthopedic	81	13	16.0
General abdominal	94	13	13.8
Cardiac	31	3	9.7
Other	34	1	2.9
Total	240	30	12.5

Table 3: Postoperative Outcomes

Outcome	Delirium (n=30)	No Delirium (n=210)	p-value
Length of stay (days)	11.0 ± 2.3	7.4 ± 2.2	<0.001
Any complication	16 (53.3%)	34 (16.2%)	<0.001
In-hospital mortality	0 (0%)	0 (0%)	—
Non-home discharge	8 (26.7%)	17 (8.1%)	0.002

Table 4: Univariate Analysis of Risk Factors for POD

Risk Factor	OR (95% CI)	p-value
Age ≥75 years	3.99 (2.20–7.24)	<0.001
Cognitive impairment	3.53 (1.81–6.88)	<0.001
ASA III–IV	2.58 (1.40–4.74)	0.002
Emergency surgery	2.41 (1.33–4.36)	0.004
Blood transfusion	1.42 (0.55-3.63)	0.46 (not significant)
Benzodiazepine premedication	3.80 (2.07–6.97)	<0.001

Table 5: Multivariate Logistic Regression – Independent Predictors of POD

Predictor	Adjusted OR (95% CI)	p-value
Age ≥75 years	3.35 (1.45–7.75)	0.003
Cognitive impairment	2.92 (1.24–6.89)	0.014
ASA III–IV	2.02 (1.00–4.09)	0.048
Emergency surgery	2.19 (1.12–4.49)	0.023
Blood transfusion	1.38 (0.52 - 3.65)	0.49 (not significant)
Benzodiazepine premedication	3.07 (1.46–6.45)	0.002

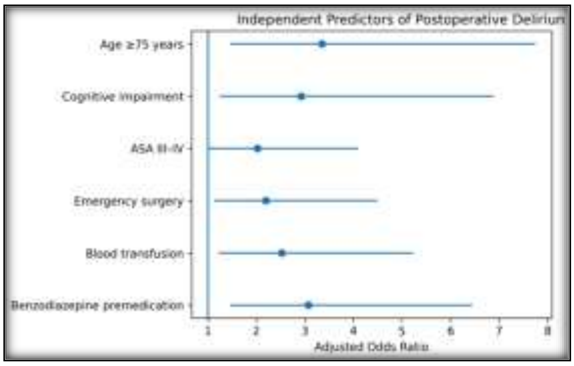

Figure 1: Independent predictors of post-operative delirium

DISCUSSION

Postoperative delirium is a common and clinically important manifestation of acute perioperative brain dysfunction in older adults. In this prospective cohort study, postoperative delirium occurred in 12.5% of elderly patients undergoing major surgery. This represents a moderate burden of POD in a mixed surgical population and is consistent with contemporary reports from comparable settings.

The incidence in the present study closely mirrors findings from other recent investigations. Fenta et al,[13] reported a POD incidence of 15.1% among elderly surgical patients in a prospective cohort study. Similarly, the individual patient data meta-analysis by Sadeghirad et al,[4] demonstrated pooled delirium incidences ranging from 10% to 23% across non-cardiac surgical populations, depending on baseline vulnerability and perioperative exposures. Higher incidences have been described in selected high-risk cohorts: Bellelli et al,[9] observed delirium in 36–44% of older adults following hip fracture surgery, while Sprung et al,[3] reported rates of approximately 23% in elderly patients undergoing major surgery. These differences underscore the influence of surgical case-mix and patient risk profiles on delirium occurrence.

Advanced age emerged as a strong independent predictor of POD in our cohort, with patients aged ≥75 years showing more than a threefold increased risk (AOR 3.35). This aligns with seminal work by Inouye et al,[1] who demonstrated a steep age-related increase in delirium incidence beyond 75 years. Marcantonio et al,[5] similarly reported delirium rates exceeding 20% among hospitalized adults aged ≥75 years, supporting age as a key non-modifiable risk factor.

Baseline cognitive impairment independently increased delirium risk (AOR 2.92) in the present study. This finding is consistent with observations by Sprung et al,[3] who showed that elderly patients developing POD had higher rates of subsequent cognitive impairment. The relationship between reduced cognitive reserve and delirium vulnerability is further supported by the cognitive staging framework described by Morris.[10]

Markers of physiological stress and illness severity, including ASA physical status III–IV and emergency surgery, were independently associated with POD. Comparable associations were reported by Sadeghirad et al,[4] with pooled odds ratios ranging from 1.8 to 2.6 for higher ASA class and emergency procedures. Fenta et al,[13] also observed higher delirium rates among emergency surgical patients (21% vs 11% in elective cases).

Among modifiable factors, benzodiazepine premedication showed a strong association with POD (AOR 3.07), consistent with findings from Shehabi et al,[7] who linked benzodiazepine exposure to prolonged delirium and increased mortality. Current guidelines by Aldecoa et al. recommend minimizing benzodiazepine use in older adults to reduce delirium risk.[8] These findings are also supported by Maldonado et al,[2] who described inflammatory and neurovascular mechanisms contributing to delirium.

Postoperative delirium was associated with worse outcomes in our cohort, including longer hospital stay (11.0 vs 7.4 days) and higher complication rates (53.3% vs 16.2%). Moskowitz et al,[6] reported increased long-term mortality among patients with POD, while Bellelli et al,[9] demonstrated that longer delirium duration predicted 6-month mortality after hip fracture. Although in-hospital mortality was low in our study, the higher rate of non-home discharge (26.7%) reflects early functional decline.

CONCLUSION

In this prospective study of elderly surgical patients, postoperative delirium was a common complication and was associated with significantly worse outcomes, including prolonged hospital stay and higher complication rates. Advanced age, baseline cognitive impairment, higher ASA class, emergency surgery, and benzodiazepine use emerged as independent predictors. These findings highlight the importance of early risk stratification and targeted preventive strategies. Identification of vulnerable patients allows implementation of focused interventions, such as minimizing deliriogenic medications and optimizing perioperative care. This study provides tertiary-care data supporting postoperative delirium as a potentially preventable contributor to adverse outcomes in older surgical patients.

Acknowledgements: The authors would like to thank the departmental staff for their support while conducting this study.

REFERENCES

1. Inouye SK. Delirium in older persons. N Engl J Med. 2006 Mar 16;354(11):1157-65. doi: 10.1056/NEJMra052321. Erratum in: N Engl J Med. 2006 Apr 13;354(15):1655. PMID: 16540616.
2. Maldonado JR. Neuropathogenesis of delirium: review of current etiologic theories and common pathways. Am J Geriatr Psychiatry. 2013 Dec;21(12):1190-222. doi: 10.1016/j.jagp.2013.09.005. PMID: 24206937.

3. Sprung J, Roberts RO, Weingarten TN, Nunes Cavalcante A, Knopman DS, Petersen RC, Hanson AC, Schroeder DR, Warner DO. Postoperative delirium in elderly patients is associated with subsequent cognitive impairment. Br J Anaesth. 2017 Aug 1;119(2):316-323. doi: 10.1093/bja/aex130. PMID: 28854531.
4. Sadeghirad B, Dodsworth BT, Schmutz Gelsomino N, Goettel N, Spence J, Buchan TA, et al. Perioperative Factors Associated With Postoperative Delirium in Patients Undergoing Noncardiac Surgery: An Individual Patient Data Meta-Analysis. JAMA Netw Open. 2023 Oct 2;6(10):e2337239. doi: 10.1001/jamanetworkopen.2023.37239. PMID: 37819663; PMCID: PMC10568362.
5. Marcantonio ER. Delirium in Hospitalized Older Adults. N Engl J Med. 2017 Oct 12;377(15):1456-1466. doi: 10.1056/NEJMcp1605501. PMID: 29020579; PMCID: PMC5706782.
6. Moskowitz EE, Overbey DM, Jones TS, Jones EL, Arcomano TR, Moore JT, Robinson TN. Post-operative delirium is associated with increased 5-year mortality. Am J Surg. 2017 Dec;214(6):1036-1038. doi: 10.1016/j.amjsurg.2017.08.034. Epub 2017 Sep 20. PMID: 28947274.
7. Shehabi Y, Riker RR, Bokesch PM, Wisemandle W, Shintani A, Ely EW; SEDCOM (Safety and Efficacy of Dexmedetomidine Compared With Midazolam) Study Group. Delirium duration and mortality in lightly sedated, mechanically ventilated intensive care patients. Crit Care Med. 2010 Dec;38(12):2311-8. doi: 10.1097/CCM.0b013e3181f85759. PMID: 20838332.
8. Aldecoa C, Bettelli G, Bilotta F, Sanders RD, Aceto P, Audisio R, Cherubini A, Cunningham C, Dabrowski W, Forookhi A, Gitti N, Immonen K, Kehlet H, Koch S, Kotfis K, Latronico N, MacLullich AMJ, Mevorach L, Mueller A, Neuner B, Piva S, Radtke F, Blaser AR, Renzi S, Romagnoli S, Schubert M, Slooter AJC, Tommasino C, Vasiljewa L, Weiss B, Yuerek F, Spies CD. Update of the European Society of Anaesthesiology and Intensive Care Medicine evidence-based and consensus-based guideline on postoperative delirium in adult patients. Eur J Anaesthesiol. 2024 Feb 1;41(2):81-108. doi: 10.1097/EJA.0000000000001876. Epub 2023 Aug 30. PMID: 37599617; PMCID: PMC10763721.
9. Bellelli G, Mazzola P, Morandi A, Bruni A, Carnevali L, Corsi M, Zatti G, Zambon A, Corrao G, Olofsson B, Gustafson Y, Annoni G. Duration of postoperative delirium is an independent predictor of 6-month mortality in older adults after hip fracture. J Am Geriatr Soc. 2014 Jul;62(7):1335-40. doi: 10.1111/jgs.12885. Epub 2014 Jun 2. PMID: 24890941.
10. Morris JC. Clinical dementia rating: a reliable and valid diagnostic and staging measure for dementia of the Alzheimer type. Int Psychogeriatr. 1997;9 Suppl 1:173-6; discussion 177-8. doi: 10.1017/s1041610297004870. PMID: 9447441.
11. Grover S, Avasthi A. Clinical Practice Guidelines for Management of Delirium in Elderly. Indian J Psychiatry. 2018 Feb;60(Suppl 3):S329-S340. doi: 10.4103/0019-5545.224473. PMID: 29535468; PMCID: PMC5840908.
12. Korc-Grodzicki B, Root JC, Alici Y. Prevention of post-operative delirium in older patients with cancer undergoing surgery. J Geriatr Oncol. 2015 Jan;6(1):60-9. doi: 10.1016/j.jgo.2014.10.002. Epub 2014 Oct 23. PMID: 25454768; PMCID: PMC5627364.
13. Fenta E, Teshome D, Kibret S, Hunie M, Tiruneh A, Belete A, Molla A, Dessie B, Geta K. Incidence and risk factors of postoperative delirium in elderly surgical patients 2023. Sci Rep. 2025 Jan 9;15(1):1400. doi: 10.1038/s41598-024-84554-2. PMID: 39789093; PMCID: PMC11718272.