



Delirium in the Coronary Intensive Care Unit: Predictors and Prognostic Impact on Mortality

Koroner Yoğun Bakım Ünitesinde Deliryum: Belirleyiciler ve Mortalite Üzerindeki Prognostik Etkisi

✉ Meryem Gül TEKSİN TAŞ¹, ✉ Damla ÖZTÜRK EFE², ✉ Gülşen TEKSİN¹, ✉ Aykut DEMİRKIRAN², ✉ Özge SAHMELİKOĞLU ONUR¹, ✉ Yusuf Ziya ŞENER³

¹Tekirdağ Namık Kemal University Faculty of Medicine, Department of Psychiatry, Tekirdağ, Türkiye

²Tekirdağ Namık Kemal University Faculty of Medicine, Department of Cardiology, Tekirdağ, Türkiye

³Thoraxcenter, Department of Cardiology, Cardiovascular Institute, Erasmus University Medical Center, Rotterdam, Netherlands

ABSTRACT

Aim: Delirium is a frequent acute neuropsychiatric condition in intensive care units and is associated with increased morbidity and mortality. However, prognostic factors among cardiac patients with delirium in the coronary intensive care unit (CICU) remain insufficiently defined. This study aimed to evaluate clinical characteristics and mortality-associated factors in delirious CICU patients.

Materials and Methods: In this single-center retrospective cohort study, 62 patients diagnosed with delirium during CICU hospitalization at Tekirdağ Namık Kemal University Hospital between January and December 2024 were analyzed. Demographic, clinical, laboratory, and treatment-related variables, as well as in-hospital and 6-month mortality outcomes, were evaluated.

Results: The mean age was 76.6±10.5 years, and 58.1% were female. Prolonged mechanical ventilation (p=0.012), respiratory tract infection (p=0.038), and central venous catheter use (p=0.036) were significantly associated with adverse in-hospital outcomes. Elevated blood urea nitrogen (BUN) (p=0.034), creatinine (p=0.007), lactate (p=0.012), decreased pH (p=0.026), and prolonged CICU stay (p=0.001) were significantly associated with in-hospital mortality. Six-month mortality was significantly associated with depression history (p=0.002), nursing home residence (p=0.002), morphine use (p=0.002), central venous catheterization (p=0.011), heart failure (p=0.003), elevated BUN (p=0.003), creatinine (p=0.007), lactate (p=0.012), and mechanical ventilation duration (p=0.049).

Conclusion: Among delirious CICU patients, mortality is closely associated with organ dysfunction markers, infection burden, invasive interventions, and psychosocial vulnerability. Delirium appears to reflect systemic clinical instability, underscoring the importance of comprehensive risk assessment and multidisciplinary management.

Keywords: Delirium, coronary intensive care, mortality, retrospective study

ÖZ

Amaç: Deliryum, yoğun bakım ünitelerinde sık görülen ve mortalite ile morbidite artışıyla ilişkili akut nöropsikiyatrik bir durumdur. Ancak koroner yoğun bakım ünitesinde (KYBÜ) deliryum gelişen kardiyak hastalarda mortalite ile ilişkili prognostik faktörler yeterince tanımlanmamıştır. Bu çalışmada, KYBÜ'de deliryum gelişen hastaların klinik özellikleri ve mortalite ile ilişkili faktörlerin değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntem: Tek merkezli, retrospektif tasarlanan bu araştırmaya, Tekirdağ Namık Kemal Üniversitesi Araştırma ve Uygulama Hastanesi KYBÜ'de Ocak-Aralık 2024 arasında yatarak izlenmiş ve deliryum tanısı konmuş 62 hasta dahil edilmiştir. Sosyodemografik veriler, laboratuvar bulguları, risk faktörleri, tedavi yaklaşımları, yatış süreleri, mortalite ve advers olaylar geriye dönük olarak analiz edilmiştir.

Address for Correspondence: Asst. Prof. Meryem Gül TEKSİN TAŞ, Tekirdağ Namık Kemal University Faculty of Medicine, Department of Psychiatry, Tekirdağ, Türkiye

E-mail: mteksin@nku.edu.tr **ORCID ID:** orcid.org/0000-0001-6080-2337

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Bulgular: Hastaların ortalama yaşı $76,6 \pm 10,5$ yıl olup %58,1'i kadındı. Uzamış mekanik ventilasyon süresi ($p=0,012$), solunum yolu enfeksiyonu ($p=0,038$) ve santral venöz kateter kullanımı ($p=0,036$) hastane içi advers sonuçlarla anlamlı ilişkili bulundu. Yüksek kan üre azotu (BUN) ($p=0,034$), kreatinin ($p=0,007$), laktat ($p=0,012$), düşük pH ($p=0,026$) ve uzamış KYBÜ yatış süresi ($p=0,001$) hastane içi mortalite ile anlamlı ilişkiliydi. Altı aylık mortalite ise depresyon öyküsü ($p=0,002$), bakım evi öyküsü ($p=0,002$), morfin kullanımı ($p=0,002$), santral venöz kateterizasyon ($p=0,011$), kalp yetersizliği ($p=0,003$), yüksek BUN ($p=0,003$), kreatinin ($p=0,007$), laktat ($p=0,012$) ve mekanik ventilasyon süresi ($p=0,049$) ile ilişkili bulundu.

Sonuç: KYBÜ'de deliryum gelişen hastalarda mortalite; organ fonksiyon bozukluğu göstergeleri, enfeksiyon yükü, invaziv girişimler ve psikososyal kırılabilirlik faktörleri ile yakından ilişkilidir. Deliryum, sistemik klinik instabilitenin bir göstergesi olarak değerlendirilmelidir ve kapsamlı risk değerlendirmesi ile multidisipliner yönetim yaklaşımları önem taşımaktadır.

Anahtar Kelimeler: Deliryum, koroner yoğun bakım, mortalite, retrospektif çalışma

INTRODUCTION

Delirium is an acute mental status disorder observed in 20-50% of patients in intensive care units (ICUs)¹ and in up to 80% of those undergoing mechanical ventilation^{2,4}. In cardiac surgery ICUs, the reported incidence of delirium ranges from 11.4% to 55%, depending on the diagnostic tool and study design used^{2,5}. The association of delirium with increased mortality³, prolonged hospital stays⁶, extended mechanical ventilation duration⁷, and elevated healthcare costs⁸ underscores its critical importance in determining patient prognosis. Therefore, prevention, early detection, and effective treatment of delirium are of vital importance⁵.

For many years, the diagnosis and management of delirium in both adult and pediatric ICU patients have been inadequately addressed⁹⁻¹¹. However, in recent years, increased awareness of delirium has emerged in ICUs due to the development of more refined diagnostic criteria and the growing body of research on therapeutic interventions^{12,13}. Nevertheless, knowledge regarding the impact of delirium on acute coronary syndrome (ACS) patients—especially those in cardiac intensive care units (CICUs)—remains limited¹⁴. Recent studies emphasize that delirium is a common comorbidity among CICU patients, significantly affecting survival outcomes and healthcare resource utilization¹⁵. Similarly, in cardiac surgery patients, delirium has been associated with higher mortality rates, prolonged hospitalization, reduced functional independence, and greater healthcare costs. Moreover, it has been identified as a strong predictor of 10-year mortality¹⁶⁻¹⁸.

In this study, we aimed to retrospectively analyze the sociodemographic and clinical characteristics, contributing factors for delirium development, treatment approaches, and hospital length of stay among CICU patients who developed delirium and were consulted to the psychiatry department during their hospitalization. Additionally, by examining in-hospital, and 6-month mortality rates, this study goes beyond merely describing the prevalence and clinical features of delirium in critically ill cardiovascular patients in the CICU. It also aims to reveal the prognostic significance of delirium in this unique clinical setting. Ultimately, we seek to provide a more comprehensive insight into the impact of delirium in the context of cardiac intensive care.

MATERIALS AND METHODS

This study was conducted in the CICU of Tekirdağ Namık Kemal University Training and Research Hospital and was designed as a retrospective, descriptive, single-center study. It was approved by the Clinical Research Ethics Committee of Tekirdağ Namık Kemal University Faculty of Medicine on 31.12.2024, with the decision number 2024.326.12.09, and carried out in accordance with the ethical standards outlined in the Declaration of Helsinki.

The study included patients who were diagnosed with delirium during their CICU admission within the past year. Delirium diagnosis was established following psychiatric consultation based on clinical evaluation in accordance with the diagnostic and statistical manual of mental disorders, fifth edition criteria. Inclusion criteria were defined as the development of delirium during CICU hospitalization and the presence of complete clinical documentation in the hospital information management system.

Patients who died in the postoperative period after major cardiac surgery, individuals whose delirium diagnosis was ruled out by a psychiatrist, and those with pre-existing severe psychiatric disorders (e.g., schizophrenia, bipolar disorder, dementia) were excluded. Postoperative mortality may be driven by surgical complexity, transfusion requirements, and perioperative complications and could therefore confound the association between delirium and outcomes in non-surgical CICU patients. Severe psychiatric disorders were excluded due to diagnostic ambiguity in retrospective delirium assessment and the potential for misclassification.

The collected data included patients' demographic and clinical characteristics, laboratory parameters, cardiac risk factors (e.g., hypertension, diabetes mellitus, hyperlipidemia, smoking), predisposing and precipitating factors for delirium, medical treatments and medications administered, vital signs, invasive procedures performed, and admission diagnoses to the CICU. Additionally, CICU and total hospital length of stay, in-hospital adverse events, and in-hospital, and 6-month mortality rates were analyzed.

"In-hospital adverse events" were defined as any clinical complications that occurred during hospitalization and

negatively affected the patient's clinical course, resulting in additional treatment needs, prolonged length of stay, or increased risk of mortality—such as infections, catheter-related complications, respiratory failure, or hemodynamic instability.

Statistical Analysis

In descriptive statistics, for numerical variables, the number of observations (n), mean, standard deviation, median, interquartile range, minimum, and maximum values were calculated. For categorical variables, frequency (n) and percentage (%) distributions were reported. For continuous variables, the independent samples t-test was applied when data were normally distributed; otherwise, the Mann-Whitney U test was used.

Predictors of clinical outcomes were evaluated using univariable logistic regression analysis. Owing to the limited sample size and the low number of events, multivariable logistic regression analysis was not conducted. In the binary logistic regression models, the dependent variables were defined as in-hospital adverse events, in-hospital mortality, and 6-month mortality. Statistical significance was established at a two-sided p-value of <0.05. All statistical analyses were performed using SPSS software, version 24.0.

RESULTS

Baseline Characteristics

Data from a total of 62 patients were included in the study. Among the participants, 58.1% were female (n=36) and 41.9% were male (n=26). The mean age was 78.42 ± 10.46 years for females and 74.15 ± 10.46 years for males (p=0.114). The average length of hospital stay was 12.35 ± 8.72 days, while the mean CICU stay was 6.61 ± 4.85 days. Baseline characteristics of the study population was presented in Table 1.

Impact of Infection and Mechanical Ventilation on Length of Hospital Stay

When examining the relationship between length of stay in both the CICU and the hospital and the factors predisposing and precipitating delirium, it was found that hospital stay was significantly prolonged in cases with longer duration of mechanical ventilation and the presence of respiratory system infections (p=0.012 and p=0.038, respectively). CICU length of stay was also significantly longer in the presence of other types of infections (p=0.026) (Table 2).

Predictors of Adverse Events and Mortality

A comprehensive analysis revealed several variables that were significantly associated with adverse clinical outcomes,

Table 1. Baseline characteristics of the study population

Age, years	76.6±10.4
Sex, male, n (%)	26 (41.9)
Comorbidities, n (%)	
Hypertension	48 (77.4)
Diabetes mellitus	21 (33.9)
Coronary artery disease	39 (62.9)
Ischemic stroke	12 (19.4)
Malignancy	5 (8.1)
Cause of admission, n (%)	
Acute coronary syndrome	27 (43.5)
Arrhythmia	11 (17.7)
Heart failure	24 (38.7)
Laboratory parameters	
Hemoglobin, g/dL	11.2±1.6
Creatinine, mg/dL	1.3±0.6
ALT, U/L	220 (3-383)
ALT: Alanine aminotransferase	

including in-hospital, and 6-month mortality (Table 3). Specifically, length of ICU stay (p=0.002), presence of non-respiratory infections (p<0.001), elevated pCO₂ levels (p=0.031), history of smoking (p=0.031), and the presence of a central venous catheter (p=0.036) were significantly associated with the occurrence of adverse events and increased mortality risk.

Regarding in-hospital mortality, significant associations were observed with prolonged CICU stay (p=0.001), blood urea nitrogen (BUN)/creatinine ratio (p=0.014), inotrope administration (p=0.018), acidemia (pH level) (p=0.026), elevated BUN (p=0.034), hypertension (p=0.040), total parenteral nutrition (TPN), gastrointestinal infections, history of depression, and residence in a nursing facility (each p=0.045).

For 6-month mortality, significant associations encompassed morphine use, TPN, history of depression, and nursing home residence (each p=0.002), as well as BUN (p=0.003), heart failure (p=0.003), serum CRE (p=0.007), fever (p=0.007), diuretic use (p=0.008), central venous catheterization (p=0.011), lactate level (p=0.012), coronary insufficiency (p=0.041), mechanical ventilation duration, and cerebrovascular disease (each p=0.049).

DISCUSSION

This study identifies a strong association between delirium and mortality in patients admitted to the CICU. Hypoxia, systemic inflammation, neurotransmitter imbalances, and organ dysfunction play major roles in the pathophysiology of delirium^{1,3}. Among elderly patients in particular, the frequency and severity of delirium are critical factors that are associated with prognosis¹⁹.

Table 2. Statistically significant variables associated with predisposing and precipitating factors for delirium in relation to LOS

Factor	n0	n1	Mean LOS, days (0)	Mean LOS, days (1)	Dif. (days)	p
Mechanical ventilation duration (hospital)	50	12	10.84	18.67	+7.83	0.011*
Infection-respiratory system (hospital)	53	9	11.23	19.00	+7.77	0.038*
Infection-other (CICU)	59	3	6.14	16.00	+9.86	0.025*

*p<0.05 was considered statistically significant, (0) indicates absence of the factor; (1) indicates presence of the factor. Mean LOS values are presented in days
LOS: Length of stay, CICU: Cardiac intensive care unit

Table 3. Significant variables associated with mortality and adverse outcomes

Variable	Adverse events (p)	In-hospital mortality (p)	6-month mortality (p)
ICU length of stay	0.002*	0.001*	
Infection-other	0.003*	<0.001*	
pCO ₂	0.031*		
Smoking history	0.031*		
Central venous catheter	0.036*	0.021*	0.011*
BUN/creatinine ratio		0.014*	
Inotropes		0.018*	
pH		0.026*	
BUN		0.034*	0.003*
Hypertension		0.040*	
TPN		0.045*	0.002*
Infection-GIS		0.045*	
History of depression		0.045*	0.002*
Nursing home residency		0.045*	0.002*
Morphine			0.002*
Heart failure			0.003*
Creatinine			0.007*
Fever			0.007*
Diuretics			0.008*
Lactate			0.012*
Coronary insufficiency			0.041*
Duration of mechanical ventilation			0.049*
Cerebrovascular disease			0.049*

*p<0.05 was considered statistically significant, ICU: Intensive care unit, TPN: Total parenteral nutrition, GIS: Gastrointestinal system, BUN: Blood urea nitrogen

The study population was predominantly elderly, with a mean age of 76.6 years, which aligns with the well-established association between advanced age and increased vulnerability to delirium. In elderly cardiac patients, reduced physiological reserve, multimorbidity, and polypharmacy contribute to heightened susceptibility to acute cognitive disturbances.

No statistically significant difference in mean age was observed between female and male patients (p=0.114), indicating that age distribution was comparable between genders.

The high prevalence of hypertension, coronary artery disease, and diabetes mellitus reflects a typical elderly cardiac intensive care population. Likewise, the predominance of ACS and heart failure as admission diagnoses confirms that this cohort represents a clinically characteristic CICU setting. Therefore, the findings of the present study primarily apply to an elderly, multimorbid cardiac intensive care population.

In our study, variables such as mechanical ventilation duration, presence of infection, use of central venous catheters, and biochemical indicators of organ dysfunction (BUN, CRE, BUN/CRE ratio, pH, lactate) were significantly associated with both short- and long-term mortality. These findings are consistent with previously reported evidence demonstrating a significant association between delirium and increases mortality among CICU patients^{14,15} as well as with results from multicenter studies. For instance, one study reported that in elderly CICU patients, delirium was associated with prolonged hospital stays and increased 30-day and 6-month mortality rates²⁰.

The significant association of infections (particularly non-respiratory and gastrointestinal) and mortality underscores the clinical relevance of infection-related complications in CICU patients. Central venous catheterization was significantly associated not only with all types of mortality but also with adverse in-hospital events. The literature similarly emphasizes that central venous catheters and other invasive procedures associated with an increased risk of delirium. One study demonstrated that such interventions are independent predictors of delirium incidence²¹. These findings likely reflect both the severity of the underlying illness and the susceptibility to procedure-related complications.

The significant association of depression and nursing home residency with long-term mortality highlights the potential relevance of psychosocial factors in prognostic assessments^{17,18}. In our study, both depression and nursing home residency emerged as significant predictors of in-hospital and 6-month mortality. These findings indicate that, in addition to conventional clinical and procedural risk factors, social vulnerability and pre-existing mental health conditions may substantially influence short- and intermediate-term outcomes among patients admitted to the CICU who develop delirium.

The observed association between morphine use and increased 6-month mortality should be interpreted with caution. In the CICU setting, opioid administration often reflects greater disease severity, advanced cardiac conditions, or increased symptom burden, rather than a direct causal effect. In addition, opioids may contribute indirectly to adverse outcomes through side effects such as sedation, impaired attention, and reduced level of consciousness, which are recognized risk factors for delirium. Therefore, morphine use may represent both a marker of illness severity and a potential contributor to a more vulnerable clinical state associated with poorer long-term outcomes.

The selection of in-hospital and 6-month mortality as outcome measures was intended to reflect both early and intermediate-term prognostic associations related to delirium. In-hospital mortality is commonly used in intensive care research as an early outcome indicator associated with acute disease severity and in-hospital complications. Six-month mortality, however, provides a broader perspective on sustained clinical outcomes beyond the acute phase and has been reported to reflect longer-term prognostic patterns in critically ill and cardiac intensive care populations with delirium. These follow-up intervals are consistent with prior studies evaluating delirium-related outcomes in intensive care settings^{3,20}.

The strong association between CICU length of stay and mortality suggests that delirium may be associated with a more complicated clinical course, potentially contributing to prolonging hospitalization. Delirium has been associated with delays in treatment delivery, interruptions in diagnostic procedures, and a general slowdown in the recovery process^{6,7}. These findings are consistent with previous studies and highlight the potential value of multidisciplinary strategies focused on prevention and early recognition of delirium to reduce both mortality and morbidity^{12,14}.

Non-pharmacological interventions play a central role in delirium prevention and management, particularly in critically ill populations. Multicomponent strategies—including early mobilization, maintenance of normal sleep-wake cycles, adequate pain control, orientation protocols, and optimization of the ICU environment—have been emphasized in recent critical care guidelines as effective approaches to reduce delirium risk and support recovery¹³. In the CICU, the implementation of proactive, multidisciplinary non-pharmacological prevention protocols may contribute to improved clinical outcomes by mitigating delirium-related complications and supporting overall recovery.

Study Limitations

This study has several limitations. First, its single-center, retrospective design limits the generalizability of the findings.

Reliance on retrospective chart reviews and psychiatric consultation notes for the diagnosis of delirium, without the routine use of standardized screening instruments, may have introduced diagnostic variability and limited detection sensitivity.

Second, delirium subtypes (hypoactive vs. hyperactive) were not differentiated. Given the consultation-based sampling strategy, hypoactive delirium cases—being less clinically overt—may have been underrecognized and underrepresented.

Third, the exclusion of postoperative deaths and patients with severe pre-existing psychiatric disorders may have reduced the representativeness of the study population and potentially underestimated the overall burden of delirium in broader CICU settings. However, these exclusions were implemented to minimize diagnostic ambiguity and confounding factors related to surgical complexity and baseline psychiatric symptomatology.

Furthermore, a key limitation of our study is the relatively small sample size, particularly within certain subgroups where the number of patients was very limited, which may reduce the statistical power, increase the risk of type II error, and necessitate cautious interpretation of the observed associations and significance levels. Additionally, the relatively small sample size may have limited the statistical power of subgroup analyses, and variability in treatment approaches may further complicate interpretation of the results.

Prospective, multicenter studies with standardized delirium assessment tools and uniform treatment protocols are needed to confirm and expand upon these findings. Notably, a prospective study addressing these limitations is currently underway at our institution. Future studies with prospective, multicenter designs and standardized diagnostic and treatment protocols will be instrumental in overcoming these limitations.

CONCLUSION

Delirium represents a serious clinical concern associated with both short- and long-term mortality in CICU patients. Early diagnosis, vigilant monitoring of risk factors, and timely therapeutic interventions may reduce mortality. Close surveillance of delirium risk factors and the implementation of preventive strategies have the potential to significantly improve patient outcomes.

Ethics

Ethical Committee Approval: It was approved by the Clinical Research Ethics Committee of Tekirdağ Namik Kemal University Faculty of Medicine on 31.12.2024, with the decision number 2024.326.12.09, and carried out in accordance with the ethical standards outlined in the Declaration of Helsinki.

Informed Consent: This study was retrospective, descriptive, single-center study.

Footnotes

Authorship Contributions

Concept: Y.Z.Ş., Design: A.D., Data Collection or Processing: M.G.T.T., D.Ö.E., Analysis or Interpretation: M.G.T.T., Literature Search: G.T., Ö.S.O., Writing: M.G.T.T.

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