

# Predictor Factors for the Incident of Delirium in Sepsis at Prof. Dr. Igng Ngoerah Denpasar Period January 2022 to August 2023

I Wayan Widyantara<sup>1</sup>, Anak Agung Derisna Citra Saraswati<sup>2</sup>

Department of Neurology, Faculty of Medicine, Universitas Udayana, Prof Dr IGNG Ngoerah General Hospital, Denpasar, Indonesia

**Abstract:** ***Background:** Delirium are disturbances in the function of consciousness, attention, perception, thinking, memory, psychomotor, emotions, and sleep - wake patterns. The mechanisms and predictor factors underlying delirium in sepsis are currently still unclear, but based on neurological clinical observations in patients with chronic sepsis, delirium in sepsis is a combination of neuroinflammation, impaired cerebral perfusion, impaired blood - brain barrier and neurotransmission. The aim of this study was to determine predictor factors in patients with delirium in sepsis at Prof. Dr. IGNG Ngoerah Denpasar for the period January 2022 to August 2023. **Methods:** An observational study on relationship of several clinical parameters and the severity all patients with sepsis, both with delirium and without delirium, who are treated in the room by the Neurology department in collaboration with the Psychiatry department at Prof. IGNG Ngoerah General Hospital Denpasar for the period January 2022 to August 2023. Delirium was defined by the Memorial Delirium Assessment Scale (MDAS) and predicting mortality use Chalon Age Comorbidity Index (CCI) scores. **Results:** Over 18 months, there were 62 patients with sepsis, both with and without delirium, who were treated in the room by the Neurology department in collaboration with the Psychiatry department at Prof. Dr. IGNG Ngoerah General Hospital Denpasar for the period January 2022 to August 2023. Overall, 35 (56.45%) patients were male and 27 (43.55%) patients were female. Where 49 (79.03%) patients had delirium and 13 (20.97%) patients without delirium. Overall, 35 (56.0%) patients had pneumonia, 16 (25.8%) patients had UTI, and 11 (17.7%) patients had other infections, and 49 of 62 (79%) patients had sepsis. In this study, there were no significant differences in MDAS scores between male and female patients and among different types of infections, but patients with sepsis had significantly higher MDAS scores compared with patients without sepsis ( $19.48 \pm 3.72$  vs  $15.88 \pm 2.82$ ;  $P < .001$ ). This study revealed that of several clinical variables, only BUN ( $R = 0.230$ ;  $P = 0.040$ ) and CCI ( $R = 0.533$ ;  $P < 0.001$ ) correlated with MDAS score significantly in Table 3. By multiple linear regression test, CCI and sepsis had a significant role, while BUN had no role in delirium severity. **Conclusions:** the CCI score and sepsis has a strong relationship with the severity of delirium, only BUN levels have a weak role in the severity of delirium.*

**Keywords:** Delirium, sepsis, predictor factors

## 1. Introduction

Delirium is an organic cerebral syndrome with non - specific causes.<sup>3</sup> The characteristics of delirium are disturbances in the function of consciousness, attention, perception, thinking, memory, psychomotor, emotions, and sleep - wake patterns.<sup>3</sup> Delirium can be characterized by changes in mental status, consciousness, and also concerns that are acute and fluctuating.<sup>1,2</sup> Delirium has a high incidence in patients with critical illnesses.<sup>1,2</sup> Delirium is a serious disorder associated with prolonged length of stay in intensive care/hospital care, higher costs, slow recovery functional, and increased morbidity and mortality.<sup>1,2</sup> In general, delirium often occurs in adult patients in general.<sup>1,2,3</sup> In a systematic review carried out in 2020, the overall presentation of delirium was 23% in acute onset adult patients during inpatient treatment. A longitudinal observational study reported that the incidence of delirium was rare in the acute phase in patients under 65 years of age, but its prevalence increased 10 - fold in patients over 75 years of age. Risk factors for delirium include dementia, older age, multiple comorbidities, use of psychoactive medications, sleep disorders, dehydration, immobility, pain, sensory disturbances, and length of hospital stay. In frail elderly patients, delirium can be triggered by many medical and surgical problems, such as infections (urinary tract infections, pneumonia), metabolic disorders (hyponatremia, hypoglycemia, hypoxemia), structural (cerebral hemorrhage), urinary retention, drug intoxication, and environment (hospital care).<sup>1,2,3</sup> It is known that systemic inflammation can induce a spectrum of changes in the function of the central

nervous system through the induction of stimulators of pathogen - related molecular patterns by pro - inflammatory cytokines.<sup>4,5</sup> These changes can be described as behavioral responses (behavior) and metabolic response to an infection, to minimize the spread of infection and save the body's energy.<sup>4,5</sup>

The mechanisms and predictor factors underlying delirium in sepsis are currently still unclear, but based on neurological clinical observations in patients with chronic sepsis, delirium in sepsis is a combination of neuroinflammation, impaired cerebral perfusion, impaired blood - brain barrier and neurotransmission. Sepsis itself is a dangerous complication resulting from the body's response to infection. Neuroinflammation persists for days to months after the onset of sepsis and can cause delirium in sepsis, which often results in cognitive deficiencies, decreased mental status and neurological deficits even after recovery from sepsis.

Based on the description above, researchers want to know the predictor factors for the incidence of delirium in sepsis at Prof. Dr. IGNG Ngoerah General Hospital Denpasar for the period January 2022 to August 2023.

### Research Purposes

The aim of this study was to determine predictor factors in patients with delirium in sepsis at Prof. Dr. IGNG Ngoerah General Hospital Denpasar for the period January 2022 to August 2023.

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**Research Methods**

This research is a descriptive studying all patients with sepsis, both with delirium and without delirium, who are treated in the room by the Neurology department in collaboration with the Psychiatry department at Prof. Dr. IGNG Ngoerah General Hospital Denpasar for the period January 2022 to August 2023.

All patients were assessed within 24 hours of hospital admission. The presence of delirium was defined by the *Memorial Delirium Assessment Scale* (MDAS) <sup>6</sup>, and suspected infection on admission was defined by clinical findings and confirmed by laboratory examination after admission. Data collected included age, gender, sepsis, complete blood count (hemoglobin, leukocyte, thrombocyte levels), liver function, renal function, sodium levels, and the *Charlson Comorbidity Index* (CCI).

*Charlson Comorbidity Index* (CCI) is a method for predicting mortality by classifying various comorbid conditions and has been widely used to measure the burden of disease. The diagnosis of sepsis is determined by the finding of SIRS (*Systemic Inflammatory Response Syndrome*) which requires 2 or more of the following signs: Temperature > 38°C or <36°C, heart rate >90 times/minute, respiratory rate >20 times/minute or PaCO<sub>2</sub> <32 mmHg and leukocyte count > 12, 000/mm<sup>3</sup> or < 4000/mm<sup>3</sup> or neutrophil presentation increased > 10%. To assess the degree of delirium using the MDAS (*Memorial Delirium Assessment Scale*) instrument. The collected data was then processed using IBM SPSS (*Statistical Package for Social Sciences Statistics*) version 22 software. Patient characteristics were presented descriptively. Independent t tests and 1 - way analysis of variance were used to differentiate MDAS (delirium) rates between gender, infection type, and with or without sepsis. One - sided Pearson correlation test and Spearman correlation test (only for CCI variables due to non - normal distribution). Significance values were confirmed at p < 0.5.

**2. Research Result**

**Table 1:** Characteristics of Research Subjects and Incidents of Delirium in Sepsis (n= 62)

Characteristics	Frequency or Mean ± SD
Delirium	49 (79.03%)
Not Delirium	13 (20.97%)
Gender	
- Man	35 (56.45%)
- Woman	27 (43.55%)
<i>Charlson Comorbidity Index</i> (CCI)	225 ± 2.32
Leukocytes	737.78 ± 9.94
Hemoglobin	564.42 ± 2.61
Thrombocytes	13320.7 ± 154.03
SGOT	2353.6 ± 48.40
SGPT	2736.9 ± 98.94
Blood urea nitrogen	1377.7 ± 22.01
Serum creatinine	70.8 ± 1.22
Sodium	6692 ± 7.81
MDAS scores	
- Mild delirium	8 (12.9%)
- Moderate delirium	23 (37.06%)
- Severe delirium	18 (29.03%)

**Table 2:** MDAS score based on gender, type of infection and sepsis

Parameter	MDAS score (Mean ± SD)	P value
Gender		
- Man	18.39 ± 3.76	0, 682
- Woman	18.76 ± 4.00	
Infection Type		
- Pneumonia	19.12 ± 3.89	0, 292
- UTI	17.88 ± 3.86	0, 292
- Other	17.64 ± 3.67	0, 292
Sepsis		
- Yes	19.48 ± 3.72	< 0.001
- No	15.88 ± 2.82	

**Table 3:** Correlation of clinical parameters and MDAS score

Parameter	R	P value
Age, y	- 0.103	0.218
CCI	0.533	<0.001
Leukocytes	0.916	0.070
Hemoglobin	- 0.090	0.251
Thrombocytes	- 0.719	0.090
SGOT	0.063	0.326
SGPT	0.025	0.429
Blood urea nitrogen	0.230	0.40
Serum creatinine	0.116	0.191
Sodium	0.042	0.375

Over 18 months, there were 62 patients with sepsis, both with and without delirium, who were treated in the room by the Neurology department in collaboration with the Psychiatry department at RSUP Prof. Dr. IGNG Ngoerah General Hospital Denpasar for the period January 2022 to August 2023. Overall, 35 (56.45%) patients were male and 27 (43.55%) patients were female. Where 49 (79.03%) patients had delirium and 13 (20.97%) patients without delirium. Overall, 35 (56.0%) patients had pneumonia, 16 (25.8%) patients had UTI, and 11 (17.7%) patients had other infections, and 49 of 62 (79%) patients had sepsis. Patient characteristics are presented in Table 1.

In this study, there were no significant differences in MDAS scores between male and female patients and among different types of infections, but patients with sepsis had significantly higher MDAS scores compared with patients without sepsis (19.48± 3.72 vs 15.88±2.82; P<.001) in Table 2.

This study revealed that of several clinical variables, only BUN (R= 0.230; P=0.040) and CCI (R= 0.533; P<0.001) correlated with MDAS score significantly in Table 3. By multiple linear regression test, CCI and sepsis had a significant role, while BUN had no role in delirium severity.

**3. Discussion**

Based on the MDAS score, we found that the frequency of patients with moderate delirium was higher compared with mild and severe delirium. Infection is an important risk factor for delirium in patients, especially elderly patients. In this study, gender and type of infection were not associated with the severity of delirium. However, patients with sepsis had more severe delirium than patients without sepsis (Table 2).

In some literature, as stated by Mariz J, et al, delirium itself is related or associated with the presence of SIRS criteria.

Delirium is also a predictor of in - hospital mortality in patients with community - acquired pneumonia. A study conducted by Balogun and Philbrick found that there was a relationship between UTI and delirium in elderly patients. This research revealed that the relationship between different types of infections and the severity of delirium did not differ significantly, as suggested by previous research studies carried out by Tuty Kuswardhani and Yosef Samon. With the bivariate correlation test between clinical parameters and MDAS scores, only CCI and BUN levels had a significant correlation with MDAS scores (Table 3).

Comorbidity (CCI) is one of the predictors of delirium<sup>9, 10, 11</sup>. In patients, especially elderly patients admitted acutely, cognitive and physical impairment and high serum urea nitrogen (BUN) concentrations are independent risk factors for delirium. In this study, the severity of delirium was associated with BUN levels but was not correlated with SC, hemoglobin and sodium levels. Decreased renal function is weakly associated with the occurrence and severity of delirium.

A limitation of this study is that we did not calculate the sample size due to limited study time and instead enrolled all eligible patients during the observation period.

#### 4. Conclusion

Research shows that predictor factors of infection are important causes of delirium in patients, especially in elderly patients. In patients, especially elderly patients, the CCI score, sepsis has a strong relationship with the severity of delirium, where only BUN levels have a weak role in the severity of delirium.

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