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The Relationship Between the Severity of Head Injury and Acute Non-Epileptic Seizures in Head Injury Patients at Umar Wirahadikusumah Regional General Hospital

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ABSTRACT

Background & Objective: Head injury is a serious health problem that can cause neurological complications, including acute non-epileptic seizures. This study aimed to determine the relationship between the severity of head injury and the occurrence of acute non-epileptic seizures in patients with head injury at Umar Wirahadikusumah Regional General Hospital. **Method:** This study applied a quantitative cross-sectional retrospective design. The population included all head injury patients recorded in medical records from 2024 to 2025. A total 159 samples were selected using purposive sampling techniques from patients with mild, moderate, or severe head injury without a previous history of epilepsy. The research instrument was a medical record review sheet. Head injury severity assessed using the Glasgow coma scale score served as the independent variable, while acute non-epileptic seizures were the dependent variable. Data were presented descriptively and analyzed using the Spearman's correlation test. **Result:** The results showed a statistically significant relationship between the severity of head injury and the occurrence of acute non-epileptic seizures, with a probability value less than 0.001 and a correlation coefficient of 0.477, indicating a positive relationship with moderate strength. **Conclusion:** The severity of head injury is significantly associated with the occurrence of acute non-epileptic seizures, highlighting the importance of early neurological assessment and increased clinical vigilance in patients with head injury, particularly in emergency care settings.

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Introduction

Head injury is a serious medical condition because it can cause complex disorders in both physical and mental functions (Marbun et al., 2020). Head trauma is one of the leading causes of death in young adults and also contributes significantly to disability in all age groups in many countries. The heaviest burden of this condition

is generally felt by low- to middle-income countries (Maas et al., 2022). Patients with head trauma are at high risk of brain tissue damage, which can be caused by bleeding or swelling of the brain in response to injury. This condition can then increase pressure in the cranial cavity (Marbun et al., 2020). Increased intracranial pressure can inhibit blood flow to the brain and risk causing structural changes in the brain, including herniation. If not treated promptly and appropriately, head injuries can lead to various complications, such as epilepsy, aphasia (speech disorder), apraxia (movement disorder), agnosia (recognition disorder), amnesia (memory impairment), carotid-cavernous fistula, diabetes insipidus, post-traumatic seizures, cerebrospinal fluid leakage, brain edema, and other neurological and psychological deficits that significantly impact the patient's quality of life (Izzah et al., 2023).

Research by Rauchman et al. (2023) states that one of the complications that can arise from head trauma is seizures. This condition, known as post-traumatic seizures, has long been identified as one of the significant complications of head injuries. Globally, the prevalence of post-traumatic seizures reaches approximately 19.4% (Pingue et al., 2021). Head trauma triggers various symptoms as a result of the injury, and seizures are one of the most commonly found clinical manifestations . Within a period of 30 years, the risk of post-traumatic seizures ranges from 2.1% in mild injuries to 16.7% in severe injuries. Based on the time of onset, post-traumatic seizures are classified into two types: early seizures, which occur within the first seven days after injury, and late seizures, which occur after that period. About 80% of post-traumatic seizure cases are classified as late seizures (Rauchman et al., 2023). If seizures occur more than seven days after trauma and only occur once, they are referred to as late post-traumatic seizures. However, if seizures recur after that time, they are categorized as Post-Traumatic Epilepsy (PTE) (Wangidjaja & Wreksoatmodjo, 2022). Several risk factors that contribute to seizures after head trauma include acute intracerebral hematoma, acute subdural hematoma, young age, severity of injury, and long-term alcohol consumption (Rauchman et al., 2023).

Head trauma in various countries is generally caused by traffic accidents, falls, and violence, with the productive age group being the most affected population. The WHO notes that every year around 96 million people worldwide experience head trauma due to traffic accidents, making it the third most common type of trauma globally (*World Health Organization*, 2020). In Indonesia, data on the prevalence of head trauma is still limited. Based on the 2018 Riskesdas report by the Indonesian Ministry of Health, the national incidence of head trauma reached 11.9%, or around 92,976 cases. In West Java Province, this figure is slightly higher at 12.3%, which means that the burden of cases in this province is quite significant compared to the national average. West Java, as the province with the largest population in Indonesia, although it does not have the highest percentage of cases, likely contributes to the largest absolute number of head trauma cases. This is reinforced by the weighted number of respondents from West Java totaling 186,809 people, the highest compared to other provinces (Health Research and Development Agency, 2019).

In Sumedang Regency, Umar Wirahadikusumah Regional General Hospital is the main referral hospital for head trauma cases. Data shows an increasing trend in the number of cases from year to year. In 2024, there were 191 cases of head trauma, with the majority occurring in adults. The most common head injuries were superficial injuries of the head (90 cases) and open wounds of the head (67 cases). From January to May 2025, there were 86 cases, with the diagnosis still dominated by these two types

of injuries. This data confirms that head trauma is a significant health issue at this hospital and can lead to serious complications, including acute non-epileptic seizures, which require appropriate medical intervention.

Various studies have attempted to identify the relationship between head trauma and seizures, both epileptic and non-epileptic. Laing et al. (2022) revealed that certain types of injuries, such as cerebral hematoma and subarachnoid hemorrhage, are significantly correlated with an increased risk of seizures. The level of consciousness measured by *the Glasgow Coma Scale* (GCS) is also an important indicator, with low scores indicating a greater risk of neurological complications. This study mentions that severe head trauma increases the risk of seizures by up to 47% compared to mild trauma. Borland et al. (2022) showed that in children with head trauma and a GCS score ≤13, the risk of seizures increased by 9.7 times compared to children with a GCS of 15. In addition, seizures can also occur as a result of injuries from falls from a height of 1–3 meters or from *non-accidental* violence. On the other hand, Alanazi et al. (2023) examined the relationship between the severity of head trauma and the frequency of seizures in epilepsy patients and found that there was no significant difference based on the severity of the injury, although severe trauma was still associated with higher neurological complications. These findings imply that Mild trauma does not always cause an increase in seizure frequency. Schneider et al. (2022) found that people with a history of head trauma are 1.88 times more likely to experience *Late Onset Epilepsy* (LOE) than those who have never experienced head trauma. This risk is greater if the trauma occurs more than once, is more severe, and occurs in old age. Wangidjaja and Wreksoatmodjo (2022) stated that post-traumatic epilepsy is generally associated with moderate to severe injuries, especially those affecting the temporal lobe. The severity of the trauma greatly determines the likelihood of delayed seizures, with a risk of about 2% for mild trauma, 4% for moderate trauma, and more than 15% for severe trauma.

Although there have been many studies examining post-traumatic seizures, there is still a gap in information, particularly in the context of acute non-epileptic seizures and their relationship to the severity of injury, especially in emergency services in Indonesia. The majority of studies emphasize severe trauma, while the clinical implications of mild trauma on mortality rates have not been widely discussed. In addition, the risk of death from head trauma is also greatly influenced by age and cause of trauma and can change over time (Maas et al., 2022). The relationship between head trauma and long-term neurological diseases is also not fully understood due to methodological limitations in previous studies, such as retrospective nature, narrow coverage, and small sample size (Maas et al., 2022).

Head trauma is the most common case encountered in hospital emergency rooms (Siahaya et al., 2020). Prompt and appropriate treatment is crucial for patient outcomes, especially in critical conditions such as head trauma, *stroke*, or *cardiac arrest*. *The golden period* after injury is crucial to avoid complications that could worsen the condition. Therefore, the clinical competence and rapid decision-making of medical personnel in the emergency department are vital.

Therefore, a deep understanding of the relationship between the severity of head injury and the occurrence of acute non-epileptic seizures is very important in supporting rapid diagnosis, appropriate clinical decision-making, and improving patient safety. Delays in recognizing or treating seizures can cause further brain damage and even death. This study aims to examine the relationship between the

severity of head trauma and the occurrence of acute non-epileptic seizures, which is expected to strengthen the role of nurses in the early detection of neurological complications while improving the quality of service in the ER. Based on this phenomenon, the researchers were interested in exploring whether there was a relationship between the severity of head injury and the occurrence of acute non-epileptic seizures in head injury patients at Umar Wirahadikusumah Regional General Hospital.

Objective

The general objective of this study is to determine the relationship between the severity of head injury and the occurrence of acute non-epileptic seizures in patients with head injury, the distribution of head injury severity among head injury patients in the emergency department of Umar Wirahadikusumah Hospital, and the incidence of acute non-epileptic seizures in head injury patients in the emergency department or inpatient ward of Umar Wirahadikusumah Hospital.

Method

This study employed a quantitative research method using a cross-sectional design with a retrospective approach. Quantitative research is appropriate for examining relationships between variables through numerical data analysis (Notoatmodjo, 2022). A cross-sectional design allows the measurement of independent and dependent variables at the same time to identify associations between variables (Hidayat, 2024). The retrospective approach was used because the data were obtained from existing medical records (Polit & Beck, 2021). The study was conducted at Umar Wirahadikusumah Regional General Hospital, Sumedang Regency, West Java. Data collection was carried out from August 2025 to January 2026 using medical records of patients treated during the period of 2024–2025, totaling 1,629 patients. The sample was selected using a purposive sampling technique. Purposive sampling is a non-probability sampling method in which samples are selected based on specific inclusion and exclusion criteria relevant to the research objectives (Yaniwati & Indrawan, 2024). The inclusion criteria were patients diagnosed with mild, moderate, or severe head injury; patients without a previous history of epilepsy; patients who experienced head injury during the 2024–2025 period; and patients with complete medical record data, including Glasgow Coma Scale scores and seizure documentation. The exclusion criteria were patients with a documented history of epilepsy prior to head injury, patients with incomplete or missing medical record data, and patients who experienced seizures due to causes other than head injury. Based on these criteria, 159 patients were included as research samples. Data collection was conducted retrospectively using a structured medical record review checklist as the research instrument. Medical record review is commonly used in retrospective clinical research to obtain secondary data systematically and consistently (Polit & Beck, 2021). The checklist included demographic characteristics, Glasgow Coma Scale scores, head injury severity, medical diagnosis, and records of acute non-epileptic seizures. Data were presented descriptively in the form of frequency and percentage distribution tables (Notoatmodjo, 2022). Data analysis consisted of univariate analysis to describe each variable and bivariate analysis to examine the relationship between head injury severity and the occurrence of acute non-epileptic seizures (Dahlan, 2022). Because the

variables were ordinal, the Spearman's rank correlation test was used to analyze the relationship between the two variables (Hidayat, 2024). Statistical analysis was performed using Jeffreys's Amazing Statistics Program.

Results

A total of 159 patients with head injury who met the inclusion criteria were included in this study. Based on demographic characteristics, the majority of patients were adults aged 18 to 59 years, accounting for 77 patients (48.4%), followed by elderly patients over 60 years with 29 patients (18.2%), adolescents aged 10 to 18 years with 27 patients (17.0%), children aged 5 to 9 years with 15 patients (9.4%), and infants under 5 years with 11 patients (6.9%). Male patients predominated, with 101 patients (63.5%), while female patients accounted for 58 patients (36.5%). Regarding medical diagnoses, skull vault fracture was the most frequent diagnosis, observed in 23 patients (14.7%), followed by epidural hemorrhage, traumatic subdural hemorrhage, and focal brain injury, each affecting 15 patients (9.6%).

TABLE 1. Respondent Demographics

Variabel	N	%
Age		
Infants (<5 years)	11	6.9
Children (5-9 years)	15	9.4
Teenagers (10-18 years old)	27	17.0
Adults (18-59 years old)	77	48.4
Elderly (>60 years old)	29	18.2
Gender		
Female	58	36.5
Male	101	63.5
Medical Diagnosis		
Skull vault fracture	23	14.7
Epidural Haemorrhage	15	9.6
Traumatic subdural haemorrhage	15	9.6
Focal brain injury	15	9.6
Concussion	14	9.0
Diffuse traumatic brain injury	14	9.0
Traumatic subarachnoid haemorrhage	13	8.3
Skull base fracture	12	7.7
Traumatic cerebral edema	3	1.9
Other diagnoses	36	23.1

Univariate analysis of head injury severity showed that most patients had mild head injury, with 84 patients (52.8%), followed by moderate head injury in 63 patients (39.6%), and severe head injury in 12 patients (7.5%). Analysis of acute non-epileptic seizures revealed that 55 patients (34.6%) experienced acute non-epileptic seizures, while 104 patients (65.4%) did not.

TABLE 2. Distribution of Head Injury Severity and Acute Non-epileptic Seizures

Variable	N	%
Degree of Head Injury		
Mild	84	52.0
Moderate	63	39.6
Severe	23	7.5
Seizure Occurrence		
None	104	65.4
Yes	55	34.6

Based on the results of univariate analysis, it was found that 23 people (7.5%) suffered severe injuries and the results of univariate analysis of seizure occurrence showed that 55 people (34.6%) experienced acute non-epileptic seizures after head injury.

TABLE 3. Relationship Between the Severity of Head Injury and the Occurrence of Acute Non-epileptic Seizures

Variable	p-value	Correlation Coefficient
Degree of Head Injury	<0.001	0.477
Seizure Occurance		

Bivariate analysis using the Spearman's rank correlation test demonstrated a statistically significant relationship between the severity of head injury and the occurrence of acute non-epileptic seizures, with a probability value <0.001. The correlation coefficient was 0.477, indicating a moderate positive relationship, where increasing severity of head injury was associated with a higher occurrence of acute non-epileptic seizures.

Discussion

This study provides a comprehensive overview of the demographic characteristics, head injury severity, and the occurrence of acute non-epileptic seizures among patients with head injury, as well as the relationship between injury severity and seizure occurrence. The findings offer important clinical and nursing implications, particularly in emergency and inpatient care settings.

The demographic distribution showed that most head injury patients were adults and elderly individuals. This finding indicates that head injury is not limited to younger populations but also affects individuals in productive and older age groups. Adults tend to have higher mobility and activity levels, which increases their exposure to traffic accidents and occupational hazards, while elderly individuals experience age-related declines in balance, protective reflexes, and physiological function, increasing their risk of falls and the severity of injury outcomes (Masturoh & Anggita, 2018). These conditions contribute to an increased risk of neurological complications, including acute post-traumatic seizures (Laing et al., 2022). Previous studies support these findings, as Laing et al. (2022) reported that adults with moderate to severe head injuries have a significant risk of early post-traumatic seizures, and Schneider et al. (2022) found that head injury in adulthood is associated with a higher risk of seizure disorders later in life.

Male patients predominated in this study, reflecting gender differences in the incidence of head injury. Men are more frequently involved in physically demanding

activities, outdoor work, and motor vehicle use, which increases their risk of head trauma (Tubi et al., 2019). Behavioral and social role factors further contribute to this pattern (Wasif et al., 2023). Consistent with these results, previous research has shown that most patients with moderate to severe head injuries who experience post-traumatic seizures are male (Laing et al., 2022), and that gender differences influence seizure frequency in traumatic brain injury patients (Wasif et al., 2023).

Regarding medical diagnoses, skull vault fractures and intracranial hemorrhages were the most common findings. Diagnoses involving skull fractures and bleeding indicate more severe trauma and structural brain involvement (Masturoh & Anggita, 2018). These conditions can increase intracranial pressure, disrupt cerebral perfusion, and irritate cortical tissue, thereby triggering acute non-epileptic seizures (Laing et al., 2022). This is consistent with studies reporting that temporal lobe trauma and structural brain injury are strong predictors of post-traumatic seizures (Borland et al., 2022).

In terms of injury severity, most patients experienced mild head injuries, followed by moderate and severe injuries. This distribution aligns with epidemiological data indicating that the majority of head injury cases presenting to healthcare facilities are mild (Siahaya et al., 2020). Mild head injuries are often associated with relatively preserved neurological function and are commonly caused by minor trauma, prompting hospital visits for observation and education regarding danger signs (Rahma & Sari, 2024). However, the substantial proportion of moderate head injuries highlights the ongoing risk of neurological deterioration, as patients with moderate injury are vulnerable to acute complications and require close monitoring (Mardliyah et al., 2022). Although severe head injuries were less frequent, they remain clinically significant due to their strong association with extensive brain damage and acute non-epileptic seizures (Maas et al., 2022).

The occurrence of acute non-epileptic seizures was observed in more than one-third of patients, indicating that seizures are a relatively common but not universal complication of head injury. This finding supports the concept that post-traumatic seizures are selective complications influenced by injury severity and other clinical factors (Temkin, 2021). Pathophysiologically, trauma-induced neuronal damage, cerebral edema, intracranial hemorrhage, and neurochemical imbalance contribute to increased neuronal excitability and seizure susceptibility (Akhyar et al., 2023). Patients with mild head injuries generally have a lower risk of seizures, whereas moderate to severe injuries are more often accompanied by conditions that facilitate abnormal electrical activity in the brain (Rahma & Sari, 2024).

The bivariate analysis demonstrated a statistically significant moderate positive relationship between head injury severity and the occurrence of acute non-epileptic seizures. This indicates that increasing injury severity is associated with a higher likelihood of seizures. The moderate strength of the relationship suggests the influence of additional factors such as lesion location, intracranial hemorrhage type, metabolic disturbances, hypoxia, and individual neurobiological responses to trauma (Mauritz et al., 2022). Severe head injuries result in more extensive tissue damage, increased intracranial pressure, cerebral perfusion impairment, and neuroinflammatory responses, all of which contribute to seizure pathogenesis (Goldberg & Coulter, 2022). These findings are consistent with previous studies reporting higher seizure risk in patients with lower Glasgow Coma Scale scores and more severe traumatic brain injuries (Kohlhase et al., 2025).

One strength of this study is the use of a relatively large sample size derived from hospital medical records, providing a realistic representation of clinical conditions. The use of standardized assessment tools, such as the Glasgow Coma Scale, enhances the reliability of injury severity classification. However, this study has several limitations. The retrospective design relies on the completeness and accuracy of medical records, which may lead to information bias. Additionally, other potential risk factors for seizures were not analyzed, and the single-center setting may limit generalizability.

Conclusion

This study demonstrates a significant positive relationship between the severity of head injury and the incidence of acute seizures ($p<0.001$), characterized by a moderate correlation coefficient ($r=0.477$). The findings reveal that patients with moderate to severe injuries carry a substantially higher risk compared to those with mild injuries, emphasizing the need for head injury severity to be used as a primary clinical indicator for risk stratification. To build upon these results, future research should adopt prospective designs and incorporate a broader range of clinical variables, such as the specific location and type of intracranial lesions, the administration of anticonvulsant medications, and patients' prior neurological or systemic comorbidities. By addressing these multifaceted factors, subsequent studies can provide a more comprehensive understanding of the complex mechanisms underlying acute seizures in head injury patients, ultimately refining preventive strategies and improving long-term clinical outcomes.

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