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ASSOCIATION BETWEEN CENTRAL NERVOUS SYSTEM–AFFECTING MEDICATIONS WITH OCCURRENCE AND SHORT-TERM MORTALITY OF TRAUMATIC BRAIN INJURY IN A TERTIARY CARE HOSPITAL PAKISTAN

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Abstract

Introduction: Traumatic brain injury (TBI) is a significant public health concern worldwide, contributing to substantial morbidity and mortality.

Objectives: The basic aim of the study is to find the association between central nervous system–affecting medications with occurrence and short-term mortality of traumatic brain injury in a tertiary care hospital Pakistan.

Methodology of the study: This cross-sectional study was conducted at Department of Neurosurgery, Shaikh Khalifa Bin Zeyyad Hospital Quetta from January 2021 June 2022.A total of 110 patients with traumatic brain injury were enrolled in the study. Demographic details such as age, gender, and place of residence were recorded. Clinical information pertaining to the TBI, including the mechanism of injury and severity of TBI based on the Glasgow Coma Scale (GCS) score, was noted.

Results: Data were collected from 110 patients according to criteria of the study.Out of the 110 patients in the study, 68 (61.8%) were male and 42 (38.2%) were female, with a mean age of 45.6 ± 18.4 years. The majority of patients were from urban areas (60%), while 40% resided in rural regions. The mechanisms of injury included road traffic accidents (55%), falls (30%), and assaults (15%). Regarding the severity of traumatic brain injury (TBI), 27.3% had mild TBI, 40.9% had moderate TBI, and 31.8% had severe TBI based on Glasgow Coma Scale (GCS) scores.Cox

proportional hazards regression analysis indicated that the use of CNS-affecting medications was associated with an increased risk of mortality ($p = 0.04$, HR = 2.15, 95% CI = 1.05-4.41).

Conclusion: It is concluded that the use of CNS-affecting medications is associated with a higher occurrence and increased short-term mortality of TBI in patients at a tertiary care hospital in Pakistan.

Introduction

Traumatic brain injury (TBI) is a significant public health concern worldwide, contributing to substantial morbidity and mortality. It is particularly prevalent in low- and middle-income countries, where the burden of road traffic accidents, falls, and violence is high. In Pakistan, TBI is a leading cause of disability and death, placing immense strain on the healthcare system. Understanding the factors that influence the occurrence and outcomes of TBI is crucial for improving patient management and outcomes [1].Medications that affect the central nervous system (CNS), such as antipsychotics, antidepressants, anticonvulsants, and sedatives, are widely used to manage various psychiatric and neurological disorders. These medications can potentially alter cognitive and motor functions, increasing the risk of accidents and injuries, including TBI [2]. Moreover, the impact of these medications on the short-term mortality of TBI patients is not well-documented, especially in the context of a tertiary care hospital in Pakistan [3].

Delivery of emergency care is especially crucial for any healthcare system in any given country. Emphasis should, therefore, be placing on improving emergency care to enhance the possibility of decrease mortality and morbidity rates [4]. For instance, the proportion of patients surviving to hospital discharge in LMICs for comparable severe injuries could be ten percentage points lower in comparison to HICs. Lack of manpower and resource in LMIC are perceived as one of the causes with such differences [5]. At the current time, there are limited number of articles that address on the quality of emergency care for managing severe trauma cases [6].

TBI's or TBI are defined as a disruption in the function of the brain, which occurs when an individual sustains an injury due to the, use of force that is sudden and unexpected. TBI is not rare and often calls for specialist attention [7]. Some data are needed to decide whether TBI's treatment is needed and accessible or not Few details are needed to decide whether TBI needs a treatment and if the treatment is available. First, these entails availability of human resources especially specialized human resources such as experienced physicians needed by TBI patients, especially those with moderate and severe TBI and material resources needed in managing such patients such as ambulances and computerized tomography (CT) scans [8]. Other factors that can easily come into play in these evaluations include the cost of TBIs. A study conducted in Australia concluded that, over the three years of their study, the average ED care cost for TBI was 40 percent more than the average for all ED patients. A Vietnamese research found that bottom line households struggled financially to pay for TBI treatments [9].

Objectives

The basic aim of the study is to find the association between central nervous system–affecting medications with occurrence and short-term mortality of traumatic brain injury in a tertiary care hospital Pakistan.

Methodology of the study

This cross-sectional study was conducted at Department of Neurosurgery, Shaikh Khalifa Bin Zeyyad Hospital Quetta from January 2021 June 2022. A total of 110 patients with traumatic brain injury were enrolled in the study.

Inclusion Criteria

- Patients diagnosed with TBI based on clinical and radiological assessments.

- Patients aged 18 years and older.
- Patients with a documented history of CNS-affecting medication use prior to the TBI.

Exclusion Criteria
- Patients with non-traumatic brain injuries.
- Patients with incomplete medical records.

Data Collection

Data collection for this study was conducted through a comprehensive approach that included patient interviews, medical record reviews, and consultations with treating physicians. Upon admission, patients diagnosed with traumatic brain injury (TBI) were identified, and their eligibility for the study was assessed based on inclusion and exclusion criteria. Demographic details such as age, gender, and place of residence were recorded. Clinical information pertaining to the TBI, including the mechanism of injury and severity of TBI based on the Glasgow Coma Scale (GCS) score, wasnoted.In addition to the clinical details, a thorough review of each patient's medical history was performed to identify the use of CNS-affecting medications prior to the injury. This included gathering information on the type of medications, their dosage, and the duration of use. The presence of any comorbid conditions was also noted to assess potential confounding factors.Short-term outcomes were tracked by monitoring the patients during their hospital stay. This included documenting their in-hospital mortality and discharge status. All collected data were systematically recorded and anonymized to ensure patient confidentiality. The combination of direct patient interviews and comprehensive medical record reviews provided a robust dataset for analysis, allowing for a detailed examination of the relationship between CNS-affecting medication use and the occurrence and short-term mortality of TBI.Data were analyzed using SPSS software (version 25.0). A p-value of <0.05 was considered statistically significant.

Results

Data were collected from 110 patients according to criteria of the study.Out of the 110 patients in the study, 68 (61.8%) were male and 42 (38.2%) were female, with a mean age of 45.6 ± 18.4 years. The majority of patients were from urban areas (60%), while 40% resided in rural regions. The mechanisms of injury included road traffic accidents (55%), falls (30%), and assaults (15%). Regarding the severity of traumatic brain injury (TBI), 27.3% had mild TBI, 40.9% had moderate TBI, and 31.8% had severe TBI based on Glasgow Coma Scale (GCS) scores.

Table 01: Demographic data of participants

Characteristic	**n (%)**
Total Patients	110
Gender	
- Male	68 (61.8%)
- Female	42 (38.2%)
Mean Age (years)	45.6 ± 18.4
Residence	
- Urban	66 (60%)
- Rural	44 (40%)
Mechanism of Injury	
- Road Traffic Accidents	61 (55%)
- Falls	33 (30%)
- Assaults	16 (15%)
Severity of TBI (GCS Score)	
- Mild (13-15)	30 (27.3%)
- Moderate (9-12)	45 (40.9%)
- Severe (≤8)	35 (31.8%)

Of the 110 patients, 45 (40.9%) were on CNS-affecting medications. Among these, 20 patients (18.2%) were on antidepressants, 12 patients (10.9%) on antipsychotics, 8 patients (7.3%) on anticonvulsants, and 5 patients (4.5%) on sedatives.

Table 02: Medication used for CNS affecting

Medication Type	**n (%)**
Patients on CNS-Affecting Medications	45 (40.9%)
- Antidepressants	20 (18.2%)
- Antipsychotics	12 (10.9%)
- Anticonvulsants	8 (7.3%)
- Sedatives	5 (4.5%)

The overall mortality rate among the 110 patients was 18.2%, with a higher mortality rate in patients on CNS-affecting medications (26.7%) compared to those not on these medications (12.3%). Complications included infections in 28 patients (25%), respiratory issues in 17 patients (15%), and seizures in 11 patients (10%). Regarding discharge status, 40 patients (36.4%) achieved full recovery, 50 patients (45.5%) had partial recovery with neurological deficits, and 20 patients (18.2%) had an unchanged or deteriorated condition.

Table 03: Outcomes and mortality

Outcome	**n (%)**
Total Mortality	20 (18.2%)
- Mortality in Patients on CNS-Affecting Medications	12 (26.7%)
- Mortality in Patients not on CNS-Affecting Medications	8 (12.3%)
Complications	
- Infections	28 (25%)
- Respiratory Issues	17 (15%)
- Seizures	11 (10%)
Discharge Status	
- Full Recovery	40 (36.4%)
- Partial Recovery with Neurological Deficits	50 (45.5%)
- Unchanged or Deteriorated Condition	20 (18.2%)

Kaplan-Meier survival analysis (Log-rank test) showed a significant difference in survival between patients on CNS-affecting medications and those not on these medications ($p = 0.03$). Cox proportional hazards regression analysis indicated that the use of CNS-affecting medications was associated with an increased risk of mortality ($p = 0.04$, HR = 2.15, 95% CI = 1.05-4.41).

Table 04: Survival analysis

Analysis Type	**p-value**	**Hazard Ratio (HR)**	**95% Confidence Interval (CI)**
Kaplan-Meier Survival Analysis (Log-rank Test)	0.03	-	-
Cox Proportional Hazards Regression	0.04	2.15	1.05-4.41

Discussion

The study revealed that 40.9% of the TBI patients were on CNS-affecting medications prior to their injury, with antidepressants being the most common. This high prevalence underscores the potential vulnerability of individuals on these medications to sustaining TBIs. CNS-affecting medications can impair cognitive and motor functions, potentially increasing the risk of accidents and injuries [10]. This finding aligns with previous research suggesting that psychiatric and neurological medications may contribute to a higher incidence of TBI due to their side effects. The mortality rate among patients on CNS-affecting medications was significantly higher (26.7%) compared to those not on

these medications (12.3%) [11]. Kaplan-Meier survival analysis and Cox proportional hazards regression both indicated that CNS-affecting medications were independent predictors of increased short-term mortality [12]. These results suggest that patients on such medications may have worse outcomes following TBI, possibly due to the compounded effects of their underlying conditions and the pharmacological impact of the medications [13]. These findings are consistent with studies showing that pre-existing health conditions and medication use can exacerbate the severity of TBI outcomes.Complications such as infections and respiratory issues were more prevalent among patients on CNS-affecting medications, though the differences were not statistically significant. However, the rate of full recovery was significantly lower in the medication group (22.2%) compared to those not on medications (46.2%), indicating poorer overall outcomes for these patients [14].

The higher incidence of partial recovery with neurological deficits and unchanged or deteriorated conditions among patients on CNS-affecting medications suggests that these individuals face greater challenges in recovering from TBI.The findings of this study have important clinical implications [15]. Healthcare providers should be aware of the increased risks associated with CNS-affecting medications in patients who are vulnerable to TBI. It may be necessary to implement additional safety measures and monitoring for these patients to prevent injuries [16]. Furthermore, tailored post-TBI management strategies are needed for patients on CNS-affecting medications to improve their recovery outcomes.

Conclusion

It is concluded that the use of CNS-affecting medications is associated with a higher occurrence and increased short-term mortality of TBI in patients at a tertiary care hospital in Pakistan. These findings underscore the need for careful consideration of medication use in individuals at risk for TBI and highlight the importance of tailored clinical management strategies to improve patient outcomes.

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