WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Uncovering Mortality Risks in Traumatic Brain Injury: Insights from a 2019-2020 Retrospective Analysis at Mbale Regional Referral Hospital

[1]Opolot Aaron Okanya, [2]Abingwa John Patrick, [3]Benon Wanume

[123]Dr

[12]Department of Surgery [3]Department of Public Health

[123]Busitema University, Mbale, Uganda

DOI : https://doi.org/10.55248/gengpi.5.1224.250124

ABSTRACT

Background:

Traumatic brain injury (TBI) is a leading cause of mortality, disability, and economic burden worldwide, with especially severe outcomes in low-resource settings. This study investigates factors influencing mortality among TBI patients admitted to Mbale Regional Referral Hospital during 2019-2020, with the aim of identifying key insights to improve patient outcomes.

Methods:

A retrospective review was conducted on 199 patient files from 2019-2020. Data collected included patient demographics, injury mechanisms (e.g., road traffic accidents, falls), hospital stay duration, transportation mode, discharge status (alive or deceased), Glasgow Coma Scale (GCS) at discharge, and neurosurgical imaging and interventions performed.

Results:

A total of 199 TBI patients were reviewed, with an average age of 34.6 years (SD 15.8), and 70.9% were male. Severe head injury (GCS <8) was observed in 20.9% of cases. The overall mortality rate was 20.6%, with a death rate of 27.4 per 1,000 person-days. No deaths occurred among patients with mild head injuries, while 47.7% of those with moderate to severe injuries (GCS ≤12) died. Patients with a GCS <8 had a 7.21 times higher mortality risk (ARR 7.21; 95% CI 3.84–13.53; p<0.001). Additionally, alcohol consumption at admission was associated with a doubled mortality risk (ARR 2.13; 95% CI 1.18–3.85; p=0.012).

Conclusion:

While overall mortality was relatively low, the high death rate among patients with moderate to severe TBI highlights the urgent need for improved emergency response and specialized care. Strengthening healthcare staff training to deliver timely, targeted interventions could significantly reduce mortality and long-term disability. Investments in these areas are crucial to improving outcomes for TBI patients and offering better hope for affected individuals and families.

Keywords: Traumatic brain injury, Mortality risk, Risk factors, Mbale Regional Referral Hospital, Specialized care.

Introduction

Traumatic brain injury (TBI) is a major global health issue, contributing to significant morbidity and mortality, particularly in low-resource settings. In Uganda, where timely medical care can be limited, understanding the factors that influence TBI outcomes is critical. This study aims to evaluate the mortality rates among TBI patients admitted to Mbale Regional Referral Hospital between 2019 and 2020. By examining variables such as injury severity (measured by the Glasgow Coma Scale), mechanisms of injury, and the impact of alcohol consumption, the study seeks to identify key risk factors and inform strategies for improving emergency response and patient management, ultimately enhancing outcomes for individuals affected by TBI.

Methods and Materials

Study Design:

This study utilized a retrospective cohort design, which was appropriate for analyzing existing patient data.

Justification for the Study Design:

Data Availability: The study relied on historical patient records from Mbale Regional Referral Hospital, making the retrospective design ideal for examining data from 2019 and 2020.

Study Objective: The primary objective was to assess mortality rates and identify risk factors associated with TBI. A cohort design allowed for a comparison of different patient groups based on injury severity (e.g., mild, moderate, severe) and other risk factors like alcohol consumption.

Analysis of Outcomes: This design facilitated an analysis of mortality outcomes in relation to various exposures (risk factors) within a defined patient population over a set time period.

Efficiency: Retrospective studies are generally more time- and cost-effective compared to prospective studies, which made it feasible to analyse historical patient data.

Data Collection:

Data were collected through a retrospective review of patient files at Mbale Regional Referral Hospital. The process included the following steps:

1. **Patient Selection**: Medical records of patients admitted with TBI between 2019 and 2020 were reviewed. A total of 199 patient files were included in the analysis.

2. **Data Abstraction Tool**: A standardized tool was used to systematically extract relevant information from each patient's medical record, ensuring consistency and accuracy.

3. **Variables Collected:** The following data were extracted:

Demographics: Age, sex, and other relevant patient characteristics.

Mechanism of Injury: Categorized into road traffic injuries, falls, and other causes.

Length of Hospital Stay: Duration of admission recorded in days.

Transportation Method: Mode of transport used to reach the hospital.

Discharge Status: Recorded as either alive or deceased at the time of discharge.

Glasgow Coma Scale (GCS): GCS scores were categorized into mild (13 or more), moderate (9-12), and severe (8 or below) at the time of discharge.

Neurosurgical Imaging: Documentation of any imaging studies conducted.

Neurosurgical Interventions: Information on any surgical procedures performed.

Data Management

Data were compiled into a secure database for analysis, ensuring proper handling and confidentiality of patient information throughout the process.

Data Analysis

The analysis was performed using statistical software to assess mortality rates and identify risk factors in patients with traumatic brain injury (TBI). The steps involved in the analysis were as follows:

1. Descriptive Statistics:

Patient demographics (e.g., age and sex) were summarized using means and standard deviations for continuous variables (e.g., age) and frequencies and percentages for categorical variables (e.g., sex, injury mechanism). Length of hospital stay and GCS scores at discharge were also summarized descriptively.

2. Mortality Analysis:

The overall mortality rate was calculated by dividing the number of deaths by the total number of patients admitted, expressed as a percentage. Additionally, the death rate was analysed per 1,000 person-days for a more detailed understanding of mortality risk.

3. Categorization of Injury Severity:

Patients were categorized based on their GCS scores at discharge into mild (13 or more), moderate (9–12), and severe (8 or below) groups, facilitating comparisons across severity levels.

4. Risk Factor Assessment:

The association between various risk factors (e.g., GCS score, alcohol history) and mortality was assessed using adjusted risk ratios (ARRs). Logistic regression was employed to analyse the effect of GCS scores at admission and alcohol history on the likelihood of death, providing adjusted risk ratios with confidence intervals (CIs) and p-values to evaluate statistical significance.

5. Statistical Significance:

A significance level of $p < 0.05$ was used to determine statistical significance. Confidence intervals (95% CI) for risk ratios were also calculated to assess the precision of the estimates.

6. Interpretation of Results:

Results were interpreted in the context of clinical relevance, focusing on the implications of identified risk factors for improving emergency response and specialized care for TBI patients.

This systematic approach to data analysis enabled a comprehensive evaluation of mortality rates and their associated risk factors, offering valuable insights to inform clinical practice and enhance outcomes in the management of traumatic brain injury (TBI).

The study involved a retrospective chart review of patient records from Mbale Regional Referral Hospital, adhering to strict ethical guidelines to protect patient rights and ensure the integrity of the research. The following ethical considerations were observed:

Approval from Mbale Regional Referral Hospital IRB:

The study received approval from the Institutional Review Board (IRB) of Mbale Regional Referral Hospital before data collection, ensuring compliance with ethical standards and regulations for human subjects research.

Patient Confidentiality:

To protect patient identities, all personal identifiers were removed from the data abstraction tool, ensuring the anonymization of patient data and preventing the tracing of information back to individual subjects.

Informed Consent:

Since the study used existing medical records, direct informed consent from patients was not required. However, it was conducted in line with Mbale Regional Referral Hospital IRB guidelines, which allow the use of archival data with minimal risk to patients.

Data Security:

Data were stored securely, with access restricted to authorized research personnel. Electronic records were protected by password encryption, and physical records were kept secure to safeguard patient information.

Minimization of Harm:

The study design minimized potential harm by focusing exclusively on the analysis of existing data, without direct involvement of patients. The potential benefits, including improved understanding of TBI outcomes, were highlighted.

Transparency and Integrity:

The research maintained transparency by fully disclosing methodologies, findings, and any potential conflicts of interest. The results were reported honestly and without selective omission to preserve the integrity of the study.

Beneficence:

The research aimed to contribute to advancing knowledge on TBI and improving clinical practices, ultimately benefiting future patients by identifying key risk factors to guide better emergency response and specialized care.

By addressing these ethical considerations, the study upheld rigorous ethical standards while providing valuable insights into TBI management at Mbale Regional Referral Hospital.

Results

Summary of Patient Data

A total of 199 patients with traumatic brain injury were reviewed from January 2019 to December 2020.

Gender: The majority of participants were male (141, 70.9%).

Age:

Mean age: 34.6 years (SD 15.8).

Median age: 35 years (IQR 23 to 44).

Age range: Less than 10 years to 80 years.

Alcohol Influence: 29.6% of patients were under the influence of alcohol at the time of admission.

Mode of Transportation:

Most patients (105, 52.8%) were transported to the hospital by motorcycle.

Road Traffic Accidents: 160 patients (80.4%) were involved in road traffic accidents, with 106 (66.3%) using motorcycles as their mode of transport.

This summary provides an overview of the demographic and incident-related characteristics of the patients included in the study.

Key Risk Factors for Mortality

Low Glasgow Coma Scale (GCS): Patients with a GCS below 9 were 7.21 times more likely to die compared to those with higher GCS scores ($p < 0.001$).

A GCS below 9 significantly increased the likelihood of mortality, with an Adjusted Hazard Ratio of 5.63 (95% CI [2.74 to 11.56]).

Alcohol Influence:

Patients under the influence of alcohol at the time of the accident had a 2.13-fold increased risk of mortality ($p = 0.012$).

These findings underscore the significant role of initial GCS scores and alcohol consumption in determining survival outcomes for head trauma patients.

Summary of Survival Among Patients with Head Injury

Low GCS:

Survival probability significantly decreased over time for patients with a GCS below 9, with an increased risk of death (Adjusted Hazard Ratio: 5.63; 95% CI [2.74 to 11.56]).

Alcohol Influence:

Survival was notably poorer for patients under the influence of alcohol, who had a 2.13-fold higher risk of mortality ($p = 0.012$).

Ethical Considerations

This study involved a retrospective chart review of patient records from Mbale Regional Referral Hospital and followed strict ethical guidelines to protect patient rights and ensure research integrity. The key ethical considerations were as follows:

1. Approval from Mbale Regional Referral Hospital IRB:

The study received approval from the Institutional Review Board (IRB) of Mbale Regional Referral Hospital before data collection, ensuring compliance with ethical standards and regulations governing human subjects research.

2. Patient Confidentiality:

Patient data were anonymized to protect individual identities. Personal identifiers were removed from the data abstraction tool to maintain confidentiality and prevent tracing patient information back to any individual.

3**. Informed Consent**:

Since the study used existing medical records, direct informed consent was not required. The research adhered to guidelines established by the Mbale Regional Referral Hospital IRB, which permits the use of archival data without consent, given that the study posed minimal risk to patients.

4. Data Security:

All collected data were stored securely, with access limited to authorized research personnel only. This included password protection and encryption for electronic files, as well as physical security measures for paper records.

The study reviewed 199 patient files for individuals admitted to the casualty ward with traumatic brain injury from January 2019 to December 2020. The demographic details are as follows:

Gender: 141 male patients (70.9%).

Age:

- Mean age: 34.6 years (SD 15.8).

- Median age: 35 years (IQR 23–44).

Age range: Less than 10 years to 80 years.

Alcohol Influence: 29.6% of patients confirmed being under the influence of alcohol at the time of admission.

Mode of Transportation:

105 patients (52.8%) were transported by motorcycle.

160 patients (80.4%) were involved in road traffic accidents, and of those, 106 (66.3%) were using motorcycles as their mode of transport.

Descriptive Statistics Table

A table summarizing key demographics and characteristics of the participants. This table should include the following:

Characteristic	Value
Total Participants	199
Gender Distribution	Male: 141 (70.9%) Female: 58 (29.1%)
Mean Age	34.6 years (SD 15.8)
Median Age	35 years (IQR 23 to 44)
Age Range	<10 to 80 years
Alcohol Influence	29.6% confirmed
Mode of Transportation	Motorcycle: 105 (52.8%)
Road Traffic Accidents	160 (80.4%)
Motorcycles in Traffic Accidents	106 (66.3%) of 160

Discussion

This study highlights the concerning mortality rates among patients with traumatic brain injury (TBI) at Mbale Regional Referral Hospital, providing critical insights into the factors influencing survival. The findings emphasize the urgent need for enhanced interventions and management strategies to reduce the risks associated with head trauma, particularly in resource-limited settings.

The observed mortality rate of 20.6% among TBI patients is alarming, especially considering that nearly half of those with moderate to severe head injuries did not survive. These statistics not only reflect the severity of head trauma but also underscore the broader public health implications, as TBI remains a leading cause of disability and death globally. Notably, low Glasgow Coma Scale (GCS) scores and alcohol influence emerged as significant risk factors for mortality in this cohort.

Impact of Glasgow Coma Scale (GCS)

The GCS is a crucial tool for assessing consciousness and neurological status in head injury patients. Our findings show that patients with a GCS below 9 were more than five times as likely to die, emphasizing the importance of prompt and effective evaluation upon admission. This underlines the need for healthcare professionals to prioritize rapid interventions for patients with low GCS scores. Improving trauma assessment training and establishing standardized care protocols could significantly improve outcomes for these high-risk patients.

Role of Alcohol Influence

The study also highlights the significant relationship between alcohol consumption and increased mortality risk in TBI patients. Patients who were under the influence of alcohol at the time of their injury were more likely to succumb to their trauma. This finding underscores the need for targeted public health initiatives to reduce alcohol-related incidents, particularly those contributing to road traffic accidents. Educating the public on the dangers of impaired driving and promoting responsible alcohol consumption may help reduce the incidence of head injuries and associated mortality.

Call for Enhanced Emergency Response

Given the critical nature of TBI and its impact on patient survival, there is an urgent need to improve emergency response systems. Enhancing pre-hospital care and transport systems can improve the chances of survival for TBI patients. Collaboration between emergency medical services, trauma centers, and rehabilitation facilities is essential to ensure comprehensive care and better outcomes for patients throughout their recovery.

Conclusion

In conclusion, this study underscores the pressing need to address factors influencing mortality among TBI patients at Mbale Regional Referral Hospital. Key areas for improvement include early assessment using the GCS, addressing the impact of alcohol consumption, and strengthening emergency response systems. By focusing on these factors, healthcare outcomes for TBI patients can be improved. Future research should explore further interventions and strategies to mitigate these risks, ultimately reducing the burden of traumatic brain injury in our communities.

To reduce mortality and improve outcomes, comprehensive interventions are needed both at the healthcare and community levels. In healthcare settings, investing in training for TBI assessment and management, improving neurosurgical and radiological resources, and developing standardized care protocols could lead to significant improvements. At the community level, public education on alcohol consumption and road safety is essential to prevent TBI-related incidents and deaths.

Recommendations

Enhance Trauma Assessment and Training: Provide targeted training for healthcare providers in rapid assessment and management of TBI, with emphasis on using the Glasgow Coma Scale (GCS) for early triage and intervention.

Strengthen Pre-Hospital Care: Develop or improve structured pre-hospital care and emergency response systems, including trained paramedics and better-equipped transport options, to reduce delays and stabilize TBI patients en route to the hospital.

Implement Alcohol Prevention Programs: Introduce hospital-based brief interventions for alcohol use and promote public awareness campaigns on the dangers of alcohol consumption, particularly in relation to road traffic accidents and injury severity.

Expand Access to Neurosurgical and Radiological Resources: Invest in hospital resources, such as neurosurgical support and advanced imaging capabilities, to improve diagnostic accuracy and treatment options for TBI patients.

Promote Road Safety Initiatives: Partner with local authorities to strengthen road safety regulations, focusing on reducing motorcycle-related injuries, which are prevalent in this patient population.

References

1. Ghajar J. Traumatic brain injury. The Lancet. 2000 Sep 9;356(9233):923-9.
2. Risdall JE, Menon DK. Traumatic brain injury. Philosophical Transactions of the Royal Society B: Biological Sciences. 2011 Jan 27;366(1562):241-50.
3. Risdall JE, Menon DK. Traumatic brain injury. Philosophical Transactions of the Royal Society B: Biological Sciences. 2011 Jan 27;366(1562):241-50.
4. Sloan S, Snow P. Traumatic brain injury. Psychology Press; 2012.
5. Werner C, Engelhard K. Pathophysiology of traumatic brain injury. British journal of anaesthesia. 2007 Jul 1;99(1):4-9.
6. Werner C, Engelhard K. Pathophysiology of traumatic brain injury. British journal of anaesthesia. 2007 Jul 1;99(1):4-9.
7. Faul M, Coronado V. Epidemiology of traumatic brain injury. Handbook of clinical neurology. 2015 Jan 1;127:3-13.
8. Roozenbeek B, Maas AI, Menon DK. Changing patterns in the epidemiology of traumatic brain injury. Nature Reviews Neurology. 2013 Apr;9(4):231-6.
9. Georges A. Traumatic brain injury.
10. McGinn MJ, Povlishock JT. Pathophysiology of traumatic brain injury. Neurosurgery Clinics. 2016 Oct 1;27(4):397-407.
11. Gardner AJ, Zafonte R. Neuroepidemiology of traumatic brain injury. Handbook of clinical neurology. 2016 Jan 1;138:207-23.
12. Johnson WD, Griswold DP. Traumatic brain injury: a global challenge. The Lancet Neurology. 2017 Dec 1;16(12):949-50.
13. Jiang JY, Gao GY, Feng JF, Mao Q, Chen LG, Yang XF, Liu JF, Wang YH, Qiu BH, Huang XJ. Traumatic brain injury in China. The Lancet Neurology. 2019 Mar 1;18(3):286-95.
14. Galgano M, Toshkezi G, Qiu X, Russell T, Chin L, Zhao LR. Traumatic brain injury: current treatment strategies and future endeavors. Cell transplantation. 2017 Jul;26(7):1118-30.

15. Peeters W, van den Brande R, Polinder S, Brazinova A, Steyerberg EW, Lingsma HF, Maas AI. Epidemiology of traumatic brain injury in Europe. Acta neurochirurgica. 2015 Oct;157:1683-96.

16. Prins M, Greco T, Alexander D, Giza CC. The pathophysiology of traumatic brain injury at a glance. Disease models & mechanisms. 2013 Nov 1;6(6):1307-15.

17. Xiong Y, Mahmood A, Chopp M. Animal models of traumatic brain injury. Nature Reviews Neuroscience. 2013 Feb;14(2):128-42.

18. Vella MA, Crandall ML, Patel MB. Acute management of traumatic brain injury. Surgical Clinics. 2017 Oct 1;97(5):1015-30.

19. McAllister TW. Neurobiological consequences of traumatic brain injury. Dialogues in clinical neuroscience. 2011 Sep 30;13(3):287-300.

20. Saatman KE, Duhaime AC, Bullock R, Maas AI, Valadka A, Manley GT. Classification of traumatic brain injury for targeted therapies. Journal of neurotrauma. 2008 Jul 1;25(7):719-38.