

Full Length Research Paper

Predictors of Outcome among Patients with Traumatic Brain Injury at MOI Teaching and Referral Hospital, Eldoret, Kenya

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Abstract

Traumatic brain injury (TBI) is a universally public health problem that affects people globally and is a major source of disability, death, and economic loss to the society. It is an emergency that requires timely and correct intervention for good treatment outcome. The study aimed at identifying the predictors of outcome among patients with traumatic brain injury at MTRH-ICU. 109 patient files from January 2013 to December 2015 were reviewed retrospectively. Using a data collection tool, data on the demographics, cause of the injury, and the nursing care provided was abstracted. The outcome was measured categorically by death or survival. Data was analyzed using Statistical Package on Social Science (SPSS) software version 20. Out of the total patients admitted, 60 (55%) died in the unit and 49 (45%) were discharged. 82% (89) of the patients whose files were reviewed were male. 52(48%) of the patients sustained the injuries from road traffic accidents, 20(18%) were as a result of falling and 28(34%) caused by assault. 41(37.7)% of the patients were diagnosed with subdural hematoma. This study sought to determine predictors at the 7th day of admission that would influence patient outcome. The results from binary logistic regression demonstrated that there are predictors that have significance to the patient outcome. There was a strong association between GCS levels ($p=0.000$), length of stay in the unit ($p=0.000$), feeding pattern ($p=0.000$) and the use of head injury chart to monitor the patients GCS levels ($p=0.000$) as predictors of outcome for the patients. In addition, TBI patients who were monitored using the head injury charts were 23 times likely to survive than those who were not monitored. The results on feeding pattern indicate that those who were not fed are 13 times likely to die than those who fed. The results also revealed there are other predictors that are not significant with the outcome of the patient at day 7 of admission as follows, the findings indicated that temperature has no direct effect in the patient outcome ($P=0.348$), The results also depicts that for any increase in sugar levels, the probability of death is 0.4% with a $p=0.987$. An increase in the Sodium levels the probability of death is 2% and a $p=0.373$ at the 7th day of admission and monitoring of ICP also did not have an influence on the patient outcome ($p=0.453$). Patients with traumatic brain injury admitted to the critical care unit often have high mortality rate hence a review of the current management should be done and strict adherence to guidelines of management should be instituted to improve outcomes.

Key words: Traumatic brain injury, predictors, outcomes

Introduction

Traumatic brain injury (TBI) is the damage to the brain which occurs due to an external physical force that may produce a diminished or altered state of consciousness (Kulezsa *et al.*, 2015). Neurologic damage from brain trauma injury does not occur at the time of impact but comes about after several hours and days of injury. TBI is a critical health and socio-economic problem and is associated with death, especially among young adults, and brings about lifelong disability among the survivors (Langlois *et al.*, 2004).

It is estimated by the Brain Trauma Foundation that 1.5 million head injuries occur annually in the United States (Sosin *et al.*, 1996) and out of that 50,000 die and 80,000 to 90,000 are left with permanent disabilities (Langlois *et al.*, 2004). It is also estimated in the USA, 5.3 million people are living with a TBI-related disability, and in the European Union ('old' Member States), those who have sustained TBI and have disabilities are approximately 7.7 million people (Kulezsa *et al.*, 2015). Previous studies by Dawodu (2005)

indicates that in the USA, in their adult population of ages 25-34 years, the leading cause of TBI injury was falls at 28% followed by motor vehicle crashes and assaults at 20% and 11%, respectively. In addition, studies conducted at Kenyatta National Hospital in Kenya, found that the TBI in adult population involved in road traffic accident accounted for 55% followed by those who sustained injury due to assault at 30% and 7% those who sustained the injury from falls from heights (Opondo, 2005). This information helps the government to do sensitization to educate the public on protective measures. The intensive care management of patients with severe TBI is a process that begins at the site of the injury which is the pre-hospital period. At the arrival to the hospital for care, the patients are managed in a variety of locations which include the emergency department, the radiology department, and the operating room before being admitted to the Intensive Care Unit (ICU) (Kulesza *et al.*, 2015). The components of acute care, during the time of injury through the start of definitive care, should be adhered to basing on the guidelines and recommendations put in place. When the predictors of the outcome which include the patient's characteristics, vital signs, Glasgow Coma Scale, type of injury, surgical interventions and the length of stay in the hospital are noted then an individualized plan of care is instituted for better outcome of the patient (Shisoka 2011).

Materials and methods

Study site

The study was conducted at Intensive Care Unit (ICU) at the Moi Teaching and Referral Hospital which is located along Nandi road in Eldoret town in Uasin Gishu County. It is 310km northwest of Nairobi city, Uasin Gishu county, in the North Rift region of western Kenya.

Study design

A descriptive, retrospective cohort study design was adopted for this study. The 109 patients who had TBI were sampled

Study population

All patients admitted to MTRH with traumatic brain injury between 2013 January to 2015 December formed the study population

Inclusion and exclusion criteria

Inclusion criteria

- All patients with TBI admitted to MTRH-ICU between January 2013 to December 2015.
- All patients with TBI of ages 18 years and above.
- All patients with no history of prior neurological problems.

Exclusion criteria

- Patients without TBI
- Patients who have had previous neurological problems
- All patients below 18 years with TBI
- Patients with other comorbidities

Sampling method

The study sample size was determined using the census method from the records office at MTRH-ICU. Since the entire population censused was 109 patients, the entire population was included

Data collection

Using a self-formulated data form data was collected from clinical records of TBI patients, doctor's notes, investigation reports, nurses' cardex, ICU flow sheet and their treatment record files. The data collected included the patients' demographics, variables of outcome (GCS, temperature level, cause of injury, electrolytes levels, glucose level, pupil reaction, vital signs and patient outcome)

Data management and analysis

Data was scrutinized at the point of collection for accuracy and completeness and entered into a spreadsheet using Microsoft Excel computer software ready for data analysis. Data was analyzed using Statistical Package on Social Science (SPSS) software. Descriptive statistics were used to summarize the data collected. Measure of relationship of variables using cross tabulation which is a procedure used by the researcher to determine the influence of more than one independent variable on the dependent variable used for prediction. This was used to determine the predictors associated with the outcome of Traumatic Brain Injury patients. In this study binary logistic regression statistical model was used.

Ethical consideration

During the study, rights of participants were respected. The research proposal was approved by Masinde Muliro University of Science and Technology Institutional Ethics and Research Committee (IREC). Permission to carry out the study in MTRH was sought from its administration. Research permit was obtained from National Council for Science Technology and Innovation (NACOSTI). Since this was a retrospective study and no direct linkage with the study population coding of the data collection charts were done for anonymity

and confidentiality of data. The study results were presented to the institution management and recommendations given. The collected data was kept in safe custody and can be accessible to the authorized persons only.

Results

The study sought to determine the association between the predictors and outcome of patients admitted with traumatic brain injury at the 7th day of admission and the results are as follows:

The results from binary logistic regression indicated that TBI patients who stayed for 7 days were likely to survive after admission. The results in table 2 demonstrate that there are predictors that have significance to the patient outcome while others at day 7 of admission would not be used to determine outcome. There was a strong association between GCS levels ($p=0.000$), length of stay in the unit ($p=0.000$), feeding pattern ($p=0.000$) and the use of head injury chart to monitor the patients GCS levels ($p=0.000$) they would be used as predictor of outcome for the patients. In addition the odds of dying while in ICU at the 7th day were 23 times higher for a patient who was monitored using a head injury chart and this was statistically significant ($p= .000$). The results on feeding indicate that those who do not feed are 13 times likely to die than those who feed. The results also revealed there are other predictors that are not significant with the outcome of the patient at day 7 of admission like temperature has no direct effect in the patient outcome ($P=0.348$), The results also depicts that for any increase in sugar levels, the probability of death is 0.4% with a $p=0.987$. Sodium levels the probability of death is 2% and a $p=0.373$ at the 7th day of admission and monitoring of ICP has a $p=0.453$ and they hence no significance in determining patient

Table 1 : Results from analysis of the predictors

Variables	B	S.E.	df	Exp(B)	95% C.I. for EXP(B)		P
					Lower	Upper	
Length of stay till discharge	-1.233	0.25	1	0.291	0.178	0.476	0.00*
Temp 7 days	-0.074	0.079	1	0.929	0.796	1.084	0.348
RBS 7 days	0.004	0.271	1	1.004	0.59	1.709	0.987
Sodium levels 7 days	0.021	0.023	1	1.021	0.976	1.068	0.373
Use of head injury chart	3.159	0.532	1	23.548	8.3	66.81	0.00*
Feeding pattern	2.628	0.585	1	13.846	4.401	43.558	0.00*
Monitoring of ICP	0.349	0.465	1	1.418	0.57	3.531	0.453
GCS evaluation 7 days	-1.517	0.398	1	0.219	0.101	0.478	0.000*

B = Regression coefficient; SE = Standard Error; DIF = Degree of freedom; Exp(B) = Exponential; P is the p-value significance*

Discussion

The study findings showed that 89 (82%) of the respondents were males, whereas 20 (18%) were females. Hence, majority of the patients were males as compared to the female's majority of the patients got the injuries from road traffic accidents, others were as a result of falling and a few injuries as a result of assault. Majority of the patients admitted were diagnosed with subdural hematoma. In order to determine the predictors of outcome, binary logistic regression was used. Day seven parameters were used which was the average stay of patients stay in the ICU, the results demonstrated that there was a high significant between the length of stay, use of the head injury chart, feeding pattern and GCS evaluation and the outcome of the patients at discharge. The other predictors checked were temperature, sodium levels, monitoring the ICP and random blood sugar which showed the measurements would not be significant in predicting outcome of the patients. The study findings revealed roles of the nurses included recording of various data which included the GCS, vital signs, feeding pattern and adherence to neuroprotective measures which would be used to determine the patient outcome and are also used as predictors of outcome. GCS is used in hospitals at patient admission as prognostic value at for the outcome of the TBI Patients (Husson E.C *et al* 2010). At admission the lower the GCS level the worse the outcome it is associated with (Saadat *et al.*, 2012). The study findings revealed that GCS levels had a strong association with the patient's outcome and agree with the literature done in reviewed studies.

Conclusion and Recommendation

On determination of the predictors and their association on patient outcome, values were determined at seventh day of stay in the intensive care unit and of the determined predictors being sodium levels, random blood sugar, temperature, use of head injury chart, feeding pattern, length of stay, monitoring ICP and GCS level a conclusion was made that the GCS level, length of stay, feeding pattern and the use of the head injury chart to monitor the patients progress were highly significant for use to determine the patient outcome. To ensure quality care for these patients, training should be done of neuro team to include doctors, nurses and other auxiliary staff's. Continuous professional education should be provide especially to nurses on improving documentation. A prospective study should be conducted too.

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