ORIGINAL ARTICLE

Factors associated with Outcome in Patients Admitted with Traumatic Brain Injury at the University Teaching Hospital, Lusaka, Zambia

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ABSTRACT

Objectives: This study was undertaken to determine the in-hospital outcomes of Traumatic Brain Injury (TBI) patients admitted to the University Teaching Hospital (UTH) Lusaka and their associated factors over a period of one year (December 2012 to November 2013).

Study design*:* This was a prospective clinical cohort study using convenient sampling method were 211 TBI patients admitted to the UTH Department of Surgery were enrolled at admission to hospital and followed up during their hospital stay until discharged or death.

Methods: A structured questionnaire was used to collect the primary and secondary variables from the patient's hospital record cards to answer the objectives of the study. The end point of the study was the Glasgow Outcome Score (GOS), which was assessed at discharge or death of the patient.

Results: The study showed majority of TBI patients were males at 87.7% while females made up 12.3% only. Brain contusion was the most common radiological finding at 12.3% out of the 89 who had Computed Tomography (CT) scan of the brain done. Mortality was associated with increase in age, abnormal blood pressure of greater than 150/90 mmHg or less than 90/60 mmHg, fixed and dilated pupil/s at the time of admission to UTH and admission to the Main Intensive Care Unit (MICU) and/or a low GCS of below 9/15. The study found a case fatality rate of 25.6%. Among those discharged, 42% had a favourable GOS.

Conclusion: The study showed a case fatality of 25.6%, 6 percentage points lower than an earlier study done at UTH. Although, this finding is still much higher than in developed nations where medical infrastructure is much more developed. Majority of the patients presenting with TBI belong to the productive age group of the society. TBI is still a major contributor to morbidity and mortality like in other study found elsewhere. Most of the discharged TBI patients (42%) went home with a favourable GOS out of the total 73.46% discharged.

INTRODUCTION

Traumatic Brain Injury(TBI) is defined as an alteration or disruption of normal function that manifests as confusion, altered level of consciousness, seizure, coma, or focal sensory or motor neurological deficit resulting from blunt or penetrating trauma or injury to the head. In mild TBI cases, subtle behavioural and neuropsychological changes may be the only symptom(s). [6,7]

Worldwide, TBI cases are on the increase due to the increased number of motor vehicles on the roads and the resulting increase in Motor Vehicle Crushes (MVCs). [1, 2,3] Zambia is not excluded from such preventable trauma cases, which have both short and long-term morbidity and mortality among those involved. [4, 5] Most of these persons are within the productive age group who contribute to the country's much needed economical growth.

Clinical evaluation of TBI patients is done using the Glasgow Coma Scale (GCS) to give a minimum score of 3 and maximum score of 15. [6,7]

TBI can be classified in the following ways:

1. Morphology of injury; this include skull fractures, intracranial haemorrhage, diffuse, brain oedema, diffuse neuronal and axonal injury
2. Mechanism of injury; this depend on whether its Penetrating (open) injuries including fracture base of skull and non-penetrating injuries (closed) injuries including acceleration and deceleration injuries.
3. Severity of injury; this is determined by use of the GCS and categorising the injury as mild, moderate and severe TBI.[8,9]

Patients with both clinical and radiological features of TBI have been associated with various degrees of morbidity and mortality that could be short or long term. [4, 5] This helps in important in planning and implementing preventive and clinical management for these patients in order to improve their outcomes. As such determination of outcomes in terms of condition at discharge using GOS and death for such patients at UTH, Lusaka, was undertaken.

METHODS

This was an observational prospective clinical cohort study. The population enrolled comprised of TBI patients aged 7 years and above admitted to Casualty Department of the Department of Surgery at the UTH, in Lusaka, Zambia. The sample size was 320 patients based on expected mortality of 25% and 95% confidence interval using the prevalence formula. Two hundred and twenty (220) TBI patients were enrolled over a one-year period from December 2012 to December 2013 with 211 patients' data analysed. A convenient sampling method was used to recruit patients. A structured questionnaire was used to collect data from the enrolled patients' clinical record cards from admission to discharge or death, these being the primary variables.

Data analysis

Data collected using a structured questionnaire and entered onto Epidata spreadsheet database version 3.1. This was later exported to STATA version 11 for analysis after data cleaning. Chi square was used to test associations for categorical variables while t-test was used for continuous variables were p value < 0.05 was considered statistically significant. Multivariate logistic regression analysis was used to adjust for confounders for the significant variables at 95% confidence level.

RESULTS

The males made up the majority of the enrolled TBI patients at 87.7% shown in Table 1.The mean age of the studied population was 29.1 years with age ranging from 7 to 71 years. RTA was the most common cause of trauma at 56.9% followed by assault at 34.6% (Table 2). Clinical TBI using GCS was distributed as 42.7% for mild, 24.1% moderate and 33.2% severe TBI. The commonest radiological findings using CT scan was brain contusion at 12.3% (Table 3)**.** The case fatality rate was 25.6%. Of the patients who were discharged, 39.7% (90) had a favourable GOS (Table 4). Abnormal blood pressure, admission to main intensive care unit, advanced age and non-responsive dilated pupil or pupils were associated with mortality after correcting for confounders **(**Table 5).

Table 1**:** showing age and sex distribution of TBI patients

Age Category (years)	Frequency		Total Percentage (%)
	Male	Female	
7-21	29	11	18.5
22-45	149	15	77.7
46-55	5	0	2.4
Above 55	3	0	1.4

Table 2**:** Showing causes of trauma among TBI patients

Cause of TBI	**Frequency**	**Percentage %**
RTA	120	56.9
Assault	73	34.6
Fall from Height	14	6.6
Others (Object falling on patient)	1	0.5
Not indicated	3	1.4
Total	211	100

Table 3: Summary of types of TBI as shown by brain

Brain CT scan Findings	Frequency	Percentage	Cumulative
Brain Contusion	26	12.3	12.3
Subdural Haemorrhage	20	9.5	21.8
Intracerebral Haemorrhage	12	5.7	27.5
Depressed Skull fracture	8	3.8	31.3
Brain Oedema	5	2.4	33.7
Epidural Haemorrhage	4	1.9	35.6
Intraventricular Haemorrhage	3	1.4	37.0
Linear Fracture	3	1.4	38.4
CT scan results unavailable	8	3.8	39.8
CT scan not requested	122	57.8	100
Total	**211**	**100**	

Table 4: Showing GCS distribution of TBI patients

Glasgow Coma Score for TBI patients recruited	Freq.	Percent	Cum.
3	10	4.74	4.74
4	10	4.74	9.48
5	9	4.27	13.74
6	9	4.27	18.01
7	11	5.21	23.22
8	20	9.48	32.70
9	13	6.16	38.86
10	18	8.53	47.39
11	8	3.79	51.18
12	13	6.16	57.35
13	15	7.11	64.45
14	23	10.90	75.36
15	52	24.64	100.00
Total	211	100.00	

Table 5: Showing death by MICU and severity of TBI

Type of TBI	MICU admission (%)	Alive (%)	Died (%)	Subtotal
Mild TBI	3 of 90	87 (94.4)	3 (5.6)	90 (100)
Moderate TBI	12 of 51	39	12	51 (100)
Severe TBI	46 of 70	31	39	70 (100)
Total	61 of 211	157	54 (25.6)	211 (100)

Table 6: Multivariate logistic regression analysis for determinants of mortality in TBI patients.

Outcome death	Odds Ratio	z	p>|z|	95% confidence interval	
Age	1.057	2.11	0.034	1.004	1.113
Assault	.392	-0.84	0.401	.044	3.489
Road traffic accident	1.737	0.55	0.582	.243	12.384
Abnormal blood pressure >150/90 mmHg or < 90/60 mmHg	.309	-2.18	0.029	.108	888
Dilated pupil/s	7.737	2.35	0.019	1.405	43.284
Mild GCS	2.651	1.30	0.193	.610	11.509
Severe GCS	.897	-0.16	0.873	.236	3.412
Additional body injuries	.994	-0.05	0.958	.785	1.258
Contusion on CT scan	1.926	1.00	0.319	.530	6.993
Fluid administration	.853	-0.14	0.891	.089	8.181
Brain CT scan done	.757	-0.43	0.670	.210	2.731
Oxygen administration	.468	-0.79	0.428	.072	3.062
Blood administration	2.658	1.08	0.278	.454	15.568
Mannitol administration	1.001	0.01	0.990	.305	3.323
Neurosurgical review	.529	-0.74	0.460	.097	2.865
ICU ward admission	47.760	3.99	<0.001	7.136	319.66
Abnormal CT findings	2.104	1.04	0.300	.515	8.598

DISCUSSION

This study done at UTH looking at TBI has shown that most of the patients admitted with TBI were males at 87.7% and young with median age of 29.1 years. About half of TBIs were caused by RTAs at 56.9% and followed by assault at 34.6%. Although the study analysed 211 patients, only 89 (42.2%) had CT scan done which showed brain contusion as the predominant finding followed by SDH. These findings confirm what has been found and documented in South Africa, Rwanda and Europe.[8,10,11,12,13,14]

Majority of the patients who sustain TBI were males who belonged to the reproductive age group of society. This has severe consequences on the social and economical status of the nation and its future prospect. In this study RTAs contributed much to the aetiology of TBI represented by 56.9%, which is similar to other studies. [2,15] What the study did not determine is the kind of victims the enrolled patients were in terms of whether they were pedestrian or vehicle occupant at the time of the injury.[10,16]

Clinical and radiology findings showed that closed TBI accounted for 145patients (68.7%) while 65 (30.8%) had open TBI. The majority of the patients, 90(42.7%), had mild TBI, with moderate TBI at 52(24.6%) and severe TBI at 69(32.7%). There was a statistical difference in terms of outcome between severe TBI and Mild TBI at p <0.001 (38 died out of 70 with severe TBI). In an Indian study, intracranial haematoma were found at a much lower incidence of 8.9%. [19] Other findings in our study included depressed skull fractures in 9.9%(8), brain oedema in 6.2%(5), EDH in 4.9%(4), IVH in 3.7%(3) and linear fracture in 3.7%(3). Analysis using chi square showed that having CT scan done was associated with death at p value 0.016 (34 died out of 54 died). This could result from the fact that most patients with low GCS will almost always have a CT scan done for them to evaluate the type of injury sustained. Unfortunately the study did not analyze the combination of CT scan findings in relation to outcomes, death or the various GOS.

The acquisition of the CT scan machine at UTH which was thought to improve outcomes in TBI patients as Chikoya suggested in his study of missed opportunity, has been validated by this study as there has been a 6.0-percentage point drop in case fatality. In his study the case fatality rate stood at 31.6% while this study case fatality rate stood at 25.6% .[5] This rate is still higher than shown elsewhere among TBI patients which stood around 13%. [18]

Although GOS used in this study has never been used at the time of discharge in TBI patients at UTH, those who had it done before discharge showed good recovery and moderate disability at 58 (27.49) and 32(15.17%) from TBI. Hence 42% of those who sustained TBI could go back into the community, integrate well and live independent or near independent lives in society.

The study's case fatality rate of 26.54% is still among the highest when compared to the findings in the region that average 13%. Age, abnormal Blood Pressure of greater 150/90 mmHg and below 90/60 mmHg, non-responsive dilated pupil/s and admission to MICU and /or low GCS of below 9/15 were associated with mortality after multivariate regression analysis, although the CHIP and TARN study showed that parenchymal damage, undergoing craniotomy, and huge intracranial haemorrhage were associated with mortality. In another study, combining midline shift and 48hr GCS was a more accurate predictor of outcome. [19,20,21,22,23]

Those admitted to MICU had a 72.1 %(44 out of 61) as compared to the total 25.6% (54 out of 211) from the study. Majority of patients admitted to MICU had severe TBI whose mortality is higher as has been shown even in other studies. [24] In this study there has been a notable reduction in case fatality rate in general from the previous value. A few of the patients with Mild 3.3% (3 out of 90) and Moderate 23% (12 out of 51) TBI patients where sent to MICU post operatively and with multiple trauma for Intensive Care management.

CONCLUSION

Traumatic Brain injury patients at UTH have a high case fatality rate of 25.6%, although lower than earlier found. Most of the discharged TBI patients, 42%, went home with a favourable GOS out of the total 73.46% discharged. Abnormal blood pressure, non-reactive pupils whether unilateral or bilateral, increase in age and MICU admissions and or low GCS of less than 9/15 were associated with a risk of dying or unfavourable GOS. These findings are consistent with findings in other similar studies elsewhere. GOS is a good and simple tool to assess patient with TBI. It can be easily be implemented in resource limited setting.

LIMITATIONS

The study was unable to recruit the required sample size due to specified duration of the study of one year in which only 220 TBI patients where recruited and 221 analysed. About a third of the patients at 28.9% (61) had no GOS done at the time of discharge thus limiting the conclusion on one of the study objectives. The study did not include follow up of patients after discharge which could have added more information in terms of GOS and mortalities in the community thereby highlighting valuable

information on how post TBI patient integrate into the community in the intermediate and long term follow up.

RECOMMENDATIONS

Computed Tomography scan and neurosurgical specialist services should be expanded, improved and sustained to help in furthering the reduction of mortality among TBI patients. These services should also be provided in other 3rd level health institutions to reduce distance covered by TBI patients in order to get this specialised service.

Vital clinical information should be documented in patient's clinical record cards and GOS adopted as a tool to as state of outcome of TBI patients at the UTH. Increase in staffing in MICU should be considered to improve patient care.

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