Quest Journals
Journal of Medical and Dental Science Research
Volume 8~ Issue 5 (2021) pp: 28-34
ISSN(Online) : 2394-076X ISSN (Print):2394-0751
www.questjournals.org

Research Paper

Determinants of Early Outcome in Severe Head Injury in Abubakar Tafawa Balewa University Teaching Hospital(ATBUTH) Bauchi, North-Eastern Nigeria

Ogunleye Olabisi O[1]., Ibrahim Shaphat S[1]., Rabiu Muhammed B[2]

1. *Department of Surgery, Abubakar Tafawa Balewa University Teaching Hospital, Bauchi. Bauchi State. Nigeria*
2. *Department of Anaesthesia, Abubakar Tafawa Balewa University Teaching Hospital, Bauchi. Bauchi State. Nigeria*

***Corresponding Author**: Dr Ogunleye Olabisi O. Department of Surgery, Abubakar Tafawa Balewa University Teaching Hospital, Bauchi. Bauchi State. Nigeria.*

ABSTRACT

***BACKGROUND**: Head injury is one of the leading causes of traumatic death worldwide. Severe head injury is the most dreaded among all forms of head injury and its outcomes has been a major concern to all. Identifications of factors that determine outcomes of head injury is crucial in giving appropriate counselling to patient's relatives and use of limited resources. Our aim was to identify factors that define the early outcomes among patients with severe head injury.*

***MATERIALS AND METHOD:** A prospective study where data from patients with severe head injury, as defined by Glasgow Coma Score (GCS) ≤ 8 were obtained. All patients had standard neurosurgical care based on individual pathology. They were followed up for three months' post injury and the outcomes were measured using Extended Glasgow Outcome Score (GOSE). Data were collected using structured profoma and were analyzed using SPSS version 20.0 software. Demographic, clinical and radiological details were correlated with outcomes measured after three months of injury using statistical test.*

***RESULTS:** Sixty-one severe traumatic brain injured patients were studied. The Mean ± SD of age was 35 ±7.2. More than half of the study population (60%) were below 5th decade of life with male preponderance of 4 :1. The correlation of age, time of presentation, hypotension, pupillary response, Glasgow coma score (GCS), Glasgow coma score-motor response (GCS-BMR), brain midline-shift and basal cistern with Glasgow outcome score (GOSE) were statistically significant (p=.000). Only gender that was not statistically significant when correlated with outcomes.*

***CONCLUSION:** Primary and secondary brain injuries are the main drivers of severity and outcomes of brain injury. However, predictors like, age, time of presentation, hypotension, pupillary response, Glasgow coma score (GCS), Glasgow coma score-motor response (GCS-BMR), brain midline shift and basal cistern have been proven to be determinants of early outcome in severe head injured patients.*

***KEYWORDS:** Severe, head injury, determinants, outcome*

Received 26 April, 2021; Revised: 08 May, 2021; Accepted 10 May, 2021
Published with open access at www.questjournals.org

I. INTRODUCTION

Head injury is the major cause of morbidity and mortality in young people and continues to be one of the most common clinical problems treated by neurosurgeons[1]. It has been reported to affect millions of people throughout the world each year. Severe Traumatic Brain Injury(TBI) results in considerable health care cost and for many survivors, permanent disability may occurs[2]**.** Mortality following head injury has been reported to be in the range of 39-51%[3,4].

The analysis of prognostic factors in comas resulting from severe head injury is crucial to the specialized care teams involved in their management. In addition to being helpful in making therapeutic decisions and developing protocol, such analysis provides a basis for objective responses to the legitimate questions asked by patient's families.

Various research groups have demonstrated the prognostic features of patients with severe head injury[5,6,7,8]. However most of these studies have been conducted in countries where the patients were managed under a well-developed trauma care system and facilities.

This study will help to identify patients with severe head injury who have the potential for a good or favourable outcome, who would greatly benefit from limited resources. In addition to being helpful in making therapeutic decisions by the Clinicians, such determinants provide a basis for objective responses to the legitimate questions asked by the patient's families.

The purpose of this study was to determine which of the prospective collected variables; clinical and radiological criteria evident on admission were predictive of morbidity and mortality in severe head injury.

II. METHODOLOGY

A prospective study with which consecutive patients presented to the Trauma Centre and/or Accident & Emergency department of our facility with severe head injury following trauma as defined as Glasgow Coma Score (GCS) of ≤ 8 at or within 48hrs of injury. The duration of the study was between August 2019 and August 2020. Ethical approval was obtained from Research and Ethic Committee (ATBUTH/REC/0025/2019).

The variable included demographic data, Glasgow coma score (GCS), Motor component of GCS, aetiological factors, hypotension, pupillary response, brain computerized scan findings (midline-shift and basal cistern) and Glasgow outcome score at three months' post injury. Data were entered into the SPSS Version 20 software for analysis. Descriptive statistics were obtained (mean SD, frequencies, percentages). Statistical tests, chi-squared test was applied to measure the significant difference among the variables. P-value less than or equal to 0.05 was considered statistically significant.

III. RESULTS

Sixty-one severe traumatic brain injured patients were studied. The Mean ± SD of age was 35 ±7.2. More than half of the study population (60%) were below 5th decade of life as shown by Figure1.

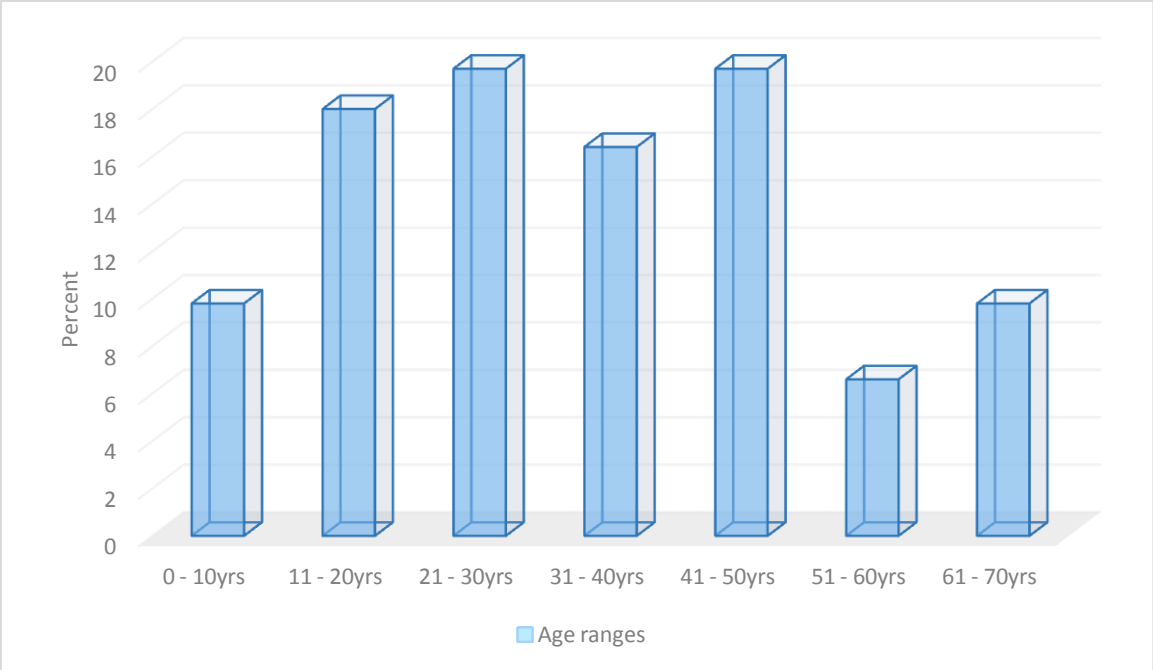

Figure 1: Age distribution of the study population

There was male preponderance with male to female ratio of 4:1. The mode of transportation of the patients to our facility and time of presentation is shown in Table 1. Figure 2 shows the majority of the study population had GCS-8 (34%) while patients with GCS-4 and GCS-5 accounted for 7% each.

Table 2 shows the correlation between pre-admission variables (age, sex, time of presentation) and the patient outcomes, while the age (p=0.000) and time of presentation (p=0.021) were statistically significance among the variables. Aetiological factors have also shown to have strong association with patient's outcomes, p=0.00 (Table 3).

Hypotension and patient's pupillary responses were shown to be statistically significant factors defining their treatment outcomes, p=0.00 and p=0.00 respectively (Table 4). In the same vein as in Table 5, the

severity of the injury (GCS) and the motor components of the Glasgow coma score (GCS-BMR) showed a strong relation to determining the outcomes (p=0.000).
Brain computerized tomographic findings showed in Table 6 have strong association (p=0.00) with the patient's outcomes, thereby constitute a defining factor for outcomes

Table 1: Demography of the study population

Variables	**N (%)**
Gender	
Male	49 (80.3)
Female	12 (19.7)
Mode of presentation	
Referral	14 (23.0)
Primary	47 (77.0)
Mode of transportation	
Car	49(80.3)
Ambulance	10 (16.4)
Bus	2 (3.3)
Time of presentation	
< 12hrs	14 (23)
>12 – 24hrs	36 (59)
>24hrs	11 (18)

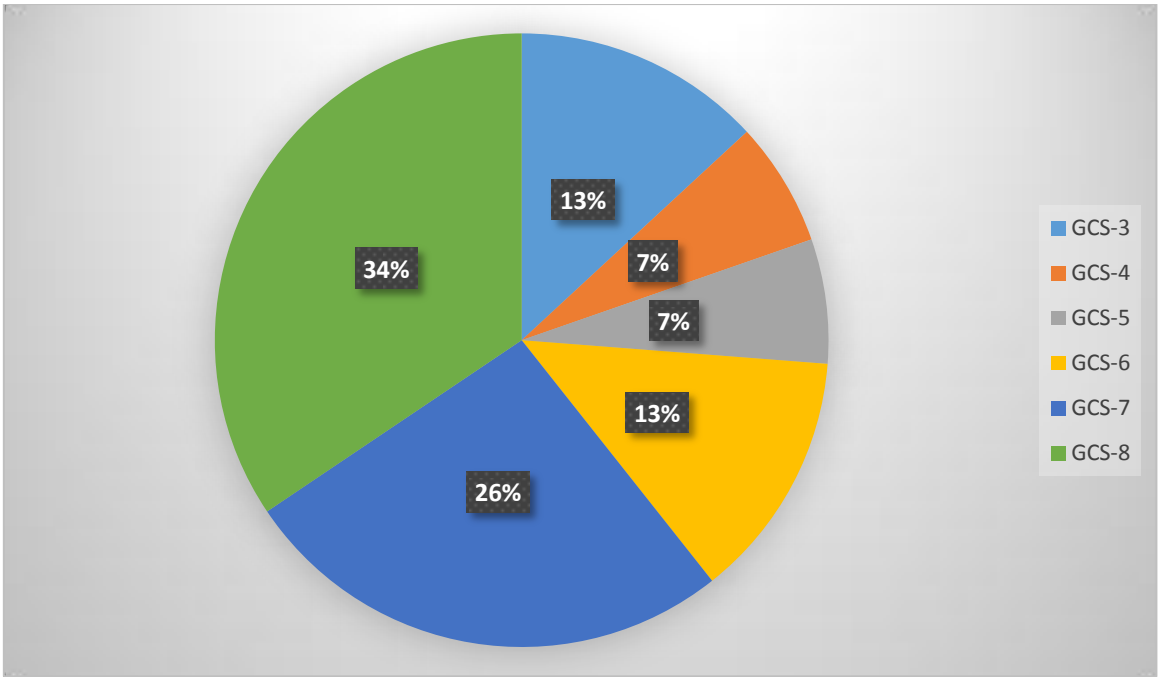

Figure 2: Categorization of severe head injury

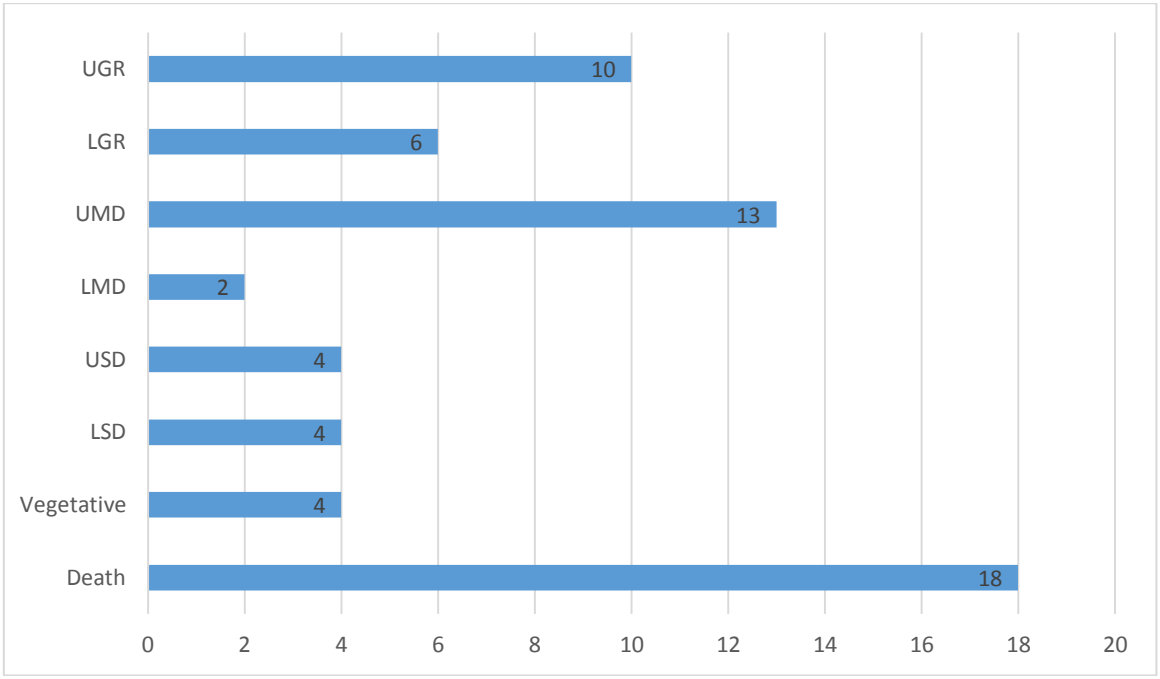

Figure 3: Pattern of Glasgow Outcome Score

Table 2: Association between pre-admission variables and outcomes

	Glasgow Outcome Score(Extended)									Statistical Analysis
	Death	Veg	LSD	USD	LMD	UMD	LGR	UGR	Total	
Age range										
0- 10yrs	-	-	-	-	-	2	-	4	6	
11-20yrs	-	-	-	-	-	5	6	-	11	X^2=118.190[a]
21-30yrs	2	2	2	2	-	4	-	-	12	
31-40yrs	4	0	2	-	-	-	-	4	10	df= 42
41-50yrs	6	-	-	2	-	2	-	2	12	
51-60yrs	2	-	-	-	2	-	-	-	4	
61-70yrs	4	2	-	-	-	-	-	-	6	p=.000
Total	18	4	4	4	2	13	6	10	**61**	
Sex										
Male	16	4	2	2	2	11	6	6	49	X^2=11.196[a]
Female	2	0	2	2	-	2	-	4	12	df=7
Total	18	4	4	4	2	13	6	10	**61**	p=.130
Time of presentation										
< 24hrs	4	2	2	-	-	2	-	4	14	X^2=26.720[a]
12 – 24hrs	8	2	2	4	-	8	6	6	36	df=14
> 24hrs	6	-	-	-	2	3	-	-	11	p=.021
Total	18	4	4	4	2	13	6	10	**61**	

Table 3: Association between aetiology and outcome

	Glasgow Outcome Score(Extended)									Statistical Analysis
	Death	Veg	LSD	USD	#LMD	UMD	LGR	UGR	Total	
Aetiology										
RTA	16	2	4	4	0	6	2	8	42	X^2=120.790[a]
Fall from height	-	-	-	-	-	-	4	-	4	
Fall into depth	-	-	-	-	-	2	-	2	4	df= 28
Assault	2	2	-	-	-	5	-	-	9	
Gun Shot	-	-	-	-	2	-	-	-	2	p=.000
Total	18	4	4	4	2	13	6	10	**61**	

Table 4: In-hospital variables and outcomes

	Glasgow Outcome Score(Extended)									Statistical Analysis
	Death	Veg	LSD	USD	LMD	UMD	LGR	UGR	Total	
HYPOTENSION										
Yes	12	4	3	4	2	10	5	7	47	X^2=115.087[a]
No	6	0	1	0	0	3	1	3	14	df= 20
Total	18	4	4	4	2	13	6	10	**61**	p=.000
PUPILLARY REACTIONS										
Bilateral reactive	3	1	1	0	1	8	6	8	28	X^2=209.016[a]
Unilateral reactive	5	0	1	1	1	4	0	2	14	df=10
Bilateral unreactive	10	3	2	3	0	1	0	0	19	p=.000
Total	18	4	4	4	2	13	6	10	**61**	

Table 5: Comparisons between GCS and Outcomes

	Glasgow Outcome Score(Extended)									Statistical Analysis
	Death	Veg	LSD	USD	LMD	UMD	LGR	UGR	Total	
GCS Score										
3	4	2	-	2	-	-	-	-	8	X^2=73.031[a]
4	4	-	-	-	-	-	-	-	4	df= 25
5	2	-	2	-	-	-	-	-	2	p=.000
6	2	2	-	2	-	-	-	2	8	
7	4	-	-	-	-	4	2	6	18	
8	2	-	2	-	2	9	4	2	21	
Total	18	4	4	4	2	13	6	10	**61**	
GCS-BMR										
1	11	0	0	4	0	0	0	0	15	
2	3	0	0	0	2	5	0	0	10	
3	2	0	1	0	0	0	0	0	3	X^2=73.956[a]
4	1	2	0	0	0	7	0	1	11	df=28
5	1	0	1	0	0	1	0	1	4	p=.000
6	0	2	2	0	0	0	6	8	18	
Total	18	4	4	4	2	13	6	10	**61**	

Table 6: Comparisons between CT findings and Outcome

	Glasgow Outcome Score(Extended)									Statistical Analysis
	Death	Veg	LSD	USD	LMD	UMD	LGR	UGR	Total	
CT LESIONS										
Contusions	2	0	0	2	2	9	5	6	26	X^2=182.381[a]
Depressed skull #	0	0	0	1	0	1	0	1	3	
EDH	3	3	2	1	0	2	0	2	13	df= 30
SDH	2	1	1	0	0	1	0	1	6	
EDH&SDH	6	0	0	0	0	0	1	0	7	p=.000
ICH	2	0	1	0	0	0	0	0	3	
IVH	3	0	0	0	0	0	0	0	3	
Total	18	4	4	4	2	13	6	10	**61**	
MIDLINE SHIFT										
No	2	0	1	3	1	11	6	10	34	X^2=38.583[a]
Yes	16	4	3	1	1	2	0	0	27	df=10
Total	18	4	4	4	2	13	6	10	**61**	p=.000
CISTERNS										
Normal	3	2	0	4	1	9	5	8	32	X^2=188.462[a]
Compressed	5	0	3	0	1	4	1	2	16	df=10
Absent	10	2	1	0	0	0	0	0	13	p=.000
Total	18	4	4	4	2	13	6	10	**61**	

IV. DISCUSSION

The outcome measurement is fundamental to the effective evaluation of clinical management of any illness. In a disease process such as severe head injury which is influenced by countless variables, objective measures of outcomes are critical in the assessment of treatment regimen.

This study demonstrated male preponderance with 4:1. The study revealed a prominent gender bias with males outnumbering females in as far as incidence of head injury is concerned and this is understandable, since most of the cases are due to vehicular accidents, and there is male dominance as far as driving is concerned. This finding was in consistent with other studies among Asian population by Ng et al (9) and also

among US population with male to female ratio of 4 ratio1(`10). Youth have been the most affected group in trauma, with mean age of 35yrs in our study. Benedict Selladurai et al (11) in the study done in Malaysia reported mean age of 28 years while the mean age of the patient was 44 years by Annoni et al (12).

The causes of severe head injury in this study were; road traffic accident (RTA), fall from height, fall into depth, assault and gun shot, with RTA accounted for 69%, which is similar to 74.2% from Odebode study (13) and 74.8% from Colantino et al study (10).

The analysis of prognosis from severe head injury is crucial to the specialized care teams involved in their management. Favourable outcome of 51% in this study was comparable with 55% seen in Fearnside et al (14). However, studies by Selladura et al (11) and Martin et al (15) reported unfavourable outcome of 67% and 78% respectively.

Determinants of Outcomes

Age of the patients was demonstrated by our study to be one of the the most important predictive determinant of outcome, this finding has also been convincingly demonstrated that older adult can typically expect a poorer outcome as compared to younger adults (16,17,18). Younger patients have a higher percentage of good outcome and a significant lower mortality rate than the elderly population.

There was no statistical evidence to suggest gender is a determinant of outcomes in severe head injury among our study population this is in accordance with Coimbra et al (19) and Farin et al (20) which affirmed that there were no differences in outcome between male and females. Though some studies have demonstrated a tendency to a poorer outcome and higher mortality in females (9, 21). However, Grosswater et al study concluded that females had a better predicted outcome than males (22).

Glasgow Coma Score (GCS) has been shown by our study to have a significant correlation with outcome following severe head injury, this is similar to findings by Choil et al where the patients with low GCS has poor outcome. In the same vein, motor components of the GCS of our study population has shown a strong relation with the observed outcomes and this is consonance with previous studies by Choi et al and Beca et al (23, 24).

Patients with bilateral reactive pupillary response in our study had good outcomes GOSE-5, 6,7, 8) while those with bilateral unreactive pupils had poor prognosis. This is similar to reports from Jenett et al (7), Beca et al (24) and Narayan et al (25).

The occurrence of one or more episodes of hypotension during the period of injury through the resuscitation was associated with a doubling of mortality and a marked increase in morbidity (26). Likewise, our study showed a strong correlation between hypotension and outcomes. Mortality of 67% among those with hypotension in our study is higher compare to Fearnside et al which showed mortality of 42% among hypotensive patients and 27% mortality among those without hypotension (14).

Computerized tomography of the brain following head trauma has been consistently related to the outcome. Marshall et al (27) reported 62% favourable outcome in patients with normal CT scan on admission, while Narayan et al (25) reported a higher favourable outcome of 76%. The outcomes in our study showed a strong association with basal cistern findings. Complete obliteration of basal cistern doubles unfavourable outcome (11), While Eisenberg et al (28) study showed that abnormal cisterns indicate a threefold increase in mortality.

V. CONCLUSSION

Prediction of outcomes following severe head injury may be difficult especially at and or within the first few days after the trauma. Pre-hospital care, quality of resuscitation, severity of injury, other clinical and radiological parameters have enormous bearing on the nature of outcomes. Statistically, the age, time of presentation, aetiological factor, hypotension, GCS, pupillary response, midline shift and basal cistern are determinants of outcomes in our study. It is therefore recommended that the outcome in severe head injury can be improved by enforcing traffic laws on the roads, improving pre-hospital care, early access to neurosurgical evaluation and care. These outlined determinants can be safely used to counsel patient' relatives and for patient's stratification for utilization of limited resources.

FUNDING: The research was funded by the authors
CONFLICT OF INTEREST: The authors declared no conflict of interest

REFERENCES

[1]. Iacoangel M, Rosell R, Poumpuci A, Scesrati M. Acute Management of head injury; Part 1: medical management. Contemp Neurosurg 2000; 22(11):1-8.
[2]. Flaada JT, Leibson CL, Mandrekar JN, Diehl N, and Perkins PK, Brown AW et al. Relative risk of mortality after traumatic brain injury: a population study of the role of age and injury severity. J Neurotrauma 2007; 24:435-45[PubMed: 17402850].
[3]. Lannoo E, Van Rietvelde F, Colardyn F, *et al* . Early predictors of mortality and morbidity after severe closed head injury.*J Neurotrauma* 2000; 17:403-14.

[4]. Bulger EM, Nathens AB, Rivara FP, Moore M, Mackenzie EJ, Jurkovich GJ. Brain Trauma Foundation: Management of severe head injury: Institutional variations in care and effect on outcome. Crit Care Med 2002; 30:1870-6.
[5]. Brain Trauma Foundation. The American Association of Neurological Surgeons. The joint Session on Neurotrauma and Critical Care. Management and prognosis of severe traumatic brain injury: Part 2: Early indicators of prognosis in severe traumatic brain injury. J Neurotrauma 2000; 17(67): 559-627.
[6]. Combes P, Farage B, Colonna M, Passagia JG, Chirossel JP, Jacquot C. Severe head injuries: an outcome prediction and survival analysis. Intens care Med 1996; 22:1391 – 5.
[7]. Jenett B, Teasdale GM, Braakman R, Minderhood J, Knill Jones R. Prediction outcome in individual patients after severe head injury. Lancet 1976; I – 4.
[8]. Lannoo E, Van Rietvelde F, Colaardyn, Lemmering M, Vanderkerchhove T, James C, De Soete G. Early predictors of mortality and morbidity after severe closed head injury. J Neurotrauma 2000; 17(5): 403 – 14.
[9]. Ng I, K-K Lee, Lim JHG, Wong HB, Yan XY. Investigating gender differences in outcome following severe traumatic brain injury in a predominantly Asian Population. British Journal of Neurosurg, April 2006; 20(2): 73 – 78.
[10]. Colantonio A, Ratchiff G, Chase S, Kelsey S et al. Long term outcome after moderate to severe traumatic brain injury. Disability and Rehabilitation 2004; 26(5): 253 – 261.
[11]. Benedict M. Selladurai, Ramasamy Jayakumar, Yan Y. T, Heng C-Low. Outcome prediction in early management of severe head injury: an experience in Malaysia. British Journal of Neurosurg, 1992; 6: 549 – 557.
[12]. Annoni JM, Beer S, Kesselring J. Severe traumatic brain injury- epidemiology and outcome after 3 years. Disability and Rehabilitation 1992; 14(1) 23 – 26.
[13]. Odebode TO. Age Related Pattern and Outcome of head injury in indigenous African. Nigerian Journal of Clinical Practice 2008; 11(3): 265 – 269.
[14]. Fearnside MR, Cook RJ, McDougall P et al. The Westmead Head Injury Project; Outcome in severe head injury. A comparative analysis of pre- hospital, Clinical and CT variables. Br J Neurosurg 1993; 7(3): 267 – 79.
[15]. Martin AS, Noriaki A, Bradford GS, Robert B. determinants of Mortality in Patients with Severe Blunt Head Injury. Arch. Surg 2002; 137: 285 – 290.
[16]. Choi S, Ward D, Beeker P. Chart for outcome prediction in severe head injury. J Neurosurg 1983; 52:294 – 297.
[17]. Levin HS, Gary HE Jr, Eisenberg HM et al. Neurobehavioral outcome one year after severe head injury: experience of the Traumatic Coma Data Bank. Journal of Neurosurg, 1990; 73: 699 – 709.
[18]. Vollmer DG, Torner JC, Jane JA et al. Age and outcome following traumatic coma: why do older patients fare worse? Journal of Neurosurgery, 1991; 75: 537 – 549.
[19]. Coimbra R, Hoyt DB, Potenza BM et al. Does sexual dimorphism influence outcome of traumatic brain injury Patients? The answer is no! J Trauma, 2003; 54: 689 – 700.
[20]. Farin A, Deutsch R, Biegon A et al. Sex-related differences in patients with severe head injury: greater susceptibility to brain swelling in female patients 50 years of age and younger. J Neurosurgery 2003; 98; 32 – 6.
[21]. Kirkness CJ, Burr RL, Mitchell PH et al. Is there a sex difference in the course following traumatic brain injury? Biolog Res Nursing, 2004; 5: 299 – 310.
[22]. Grosswasser Z, Cohen M, Keren O. Female TBI patients recover better than males. Brain Injury, 1998; 12: 805 – 808.
[23]. Choi SC, Narayan RK, Anderson RL et al. Enhanced specificity of prognosis in severe head injury. J Neurosurgery 1988; 69: 38–385.
[24]. Beca J, Cox PN, Taylor MJ et al. Somatosensory evoked potentials for prediction of outcome in acute severe brain injury. J Paed 1995; 126: 44-49.
[25]. Narayan RK, Greenberg RP, Miller MD et al. Improved confidence of outcome prediction in severe head injury. A comparative analysis of the clinical examination, multimodality evoked potentials, CT scanning and intracranial pressure. J Neurosurgery 1981; 54: 751–762.
[26]. Chestnut RM, Marshall LF, Klauber MR et al. Division of Neurological survey UMC. The role of secondary brain injury in determining outcome from severe head injury. J Trauma 1993; 34(2): 216 – 22.
[27]. Marshall LF, Klauber GT, Eisenberg HM et al. The outcome of severe closed head injury. J Neurosurg 1991; 75 (suppl) S28 – S36.
[28]. Eisenberg HM, Garry HE, Aldrich EF. Initial CT findings in 753 patients with severe head injury. A report from the NIH Traumatic Coma Data Bank. J Neurosurgery 1990; 73: 688-698.