Assessment of Level of Consciousness with Coma Recovery Scale among Patients with Traumatic Brain Injury

Deena S.V.[1], Rose Abraham[2], Rakhi manjooran[2]

[1]Lecturer, (Department of Medical Surgical Nursing), Amrita College Of Nursing, Amrita Viswa Vidyapeetham, Kochi-41, Kerala, India, [2]Assistant Professor, (Department of Medical Surgical Nursing), Govt. College of Nursing, Kottayam

Abstract

Traumatic brain injury (TBI) is one of the major cause of fatality and disability in paediatric age groups and young adults. TBI is usually termed to as the "silent epidemic" because the adverse effects from TBI, such as changes affecting thought process, perception, language, or emotional process, may not be readily apparent[1]. It was found that nearly 1.5 to 2 million persons are injured and 1 million directed to death every year in India. The objectives are to categorise the patients with traumatic brain injury based on the level of consciousness, to compare the domains of level of consciousness (LOC) of patients with TBI and to find out the association between the LOC and selected variables among patients with TBI at Govt. Medical college Hospital, Kottayam. A quantitatve non experimental approach was used for the study. A total of sixty patients with TBI were selected for the study by purposive sampling technique. The data were collected using socio personal-clinical data sheet and Coma Recovery Scale-Revised (CRS-R). The LOC of patients with TBI was assessed with CRS-R. The assessment of level of consciousness was assessed again by using the same scale on the sixth day to compare the domains of the LOC through the recovery process. The obtained data were categorised, compared and analysed by using descriptive and inferential statistics. The results showed that the majority of patients selected were minimally conscious and the mean scores of domains of level of consciousness (auditory, visual, motor, verbal, communication and arousal) increased from day 1 to day 6 and there is a significant association between the LOC and pupillary reaction at the time of first assessment ($p<0.05$).

Keywords: *Level of consciousness, coma recovery scale, traumatic brain injury.*

Introduction

Traumatic brain injury (TBI) still represents the leading cause of morbidity and mortality in individuals under the age of 45 years in the world[2]. Each year, traumatic brain injuries contribute to a substantial number of deaths and cases of permanent disability. In 2014, there were approximately 2.87 million TBI-related emergency department visits, hospitalizations and deaths in the United States[3]. Depending on the severity of injury, TBI can have a lasting impact on quality of life for survivors of all ages – impairing thinking, decision making and reasoning, concentration, memory, movement, and/or sensation (e.g., vision or hearing) and causing emotional problems (personality changes, impulsivity, anxiety and depression) and epilepsy[4]. Even minor head trauma in infants can lead to neurological complication like Acute arterial ischemic stroke, when adequate neurological assessment and follow up is lacking[13].

The reticular activating system (RAS) resides in the brainstem reticular formation which extends from the top of the spinal column to the rostral midbrain

Corresponding Author:
Mrs. Deena
Lecturer, Amrita College of Nursing, Amrita Vishwa Vidyapeetham, Kochi-41 Kerala, India
e-mail: dheenamarygeorge@gmail.com
Phone No.: 9400488830

with extensions into the thalamus and hypothalamus. The RAS is excited by input from surrounding sensory tracts and transmits this excitation to the cortex to induce generalized cortical and behavioral arousal. In the absence of input from the RAS, consciousness is impaired. Under the reticular hypothesis of concussion, loss of consciousness after brain trauma results from a disturbance or depression of the activity of polysynaptic pathways within the RAS[5].

In the neurologic unconscious state, responses to the external world are primitive or reflexic and may be absent altogether. After severe traumatic brain injury, emergence from a coma into vegetative state does not change the fact that the individual is still unconscious, even though the eyes may be open. Only in the somewhat higher level of function known as the minimally conscious state do we see the beginning of neurologic consciousness and higher-level behaviours indicating an awareness of the external world[7].

The priority of emergency care is to identify potentially life threatening intra-cranial injuries through the judicious application of appropriate imaging studies and neurological assessment[6]. It emphasises the need for continual, standardised assessment of neurological status by the use of neurologic scales. Passage of time is one of the most significant factors in predicting the resumption of consciousness in patients with brain injury and more accurate results are expected following the acute phase.

The fastest improvement happens in about the first six months after injury. During this time the injured person will likely show many improvements and may seem to be steadily getting better. The person continues to improve between six months and two years after injury, but this varies for different people and may not happen as fast as the first six months. Improvements slow down substantially after two years but may still occur many years after injury. Most people continue to have some problems, although they may not be as bad as they were early after injury. Rate of improvement varies from person to person.

Materials and Method

Research Approach and Design: A descriptive quantitative design was used for the study.

Research Setting: The study was conducted in Govt. medical College Hospital, Kottayam.

Population: Patients admitted under the neurosurgery department with traumatic brain injury at Govt. Medical College Hospital, Kottayam.

Sample and sampling technique: 60 patients with traumatic brain injury admitted under Neuro Surgery Department at Neuro surgery ICU, Trauma care ICU and Surgical Critical Care Unit at Govt. Medical College Hospital Kottayam, who met with inclusion and exclusion criteria were selected as samples. Non probability purposive sampling technique was used in this study.

Tools: After an extensive review of relevant literature, two tools were adopted for the study. Socio personal and clinical data sheet was developed, which was the tool 1. It consisted of socio personal data sheet and Clinical data sheet. Socio personal data sheet consists of six items, which includes age, gender, education, marital status, unhealthy habits and monthly income. Clinical data sheet consists of eight items which includes cause of head injury, duration of coma, diagnosis, pupillary reaction at the time of first assessment, pre existing co- morbidities, hyponatremia, pre-existing disabilities and previous history of neuro trauma. The tool 2 was JFK Coma Recovery Scale – revised, which is a standardised tool. The coma recovery scale measured by assessing the six domains of level of consciousness such as auditory, visual, motor, verbal, communication and arousal functions in the selected subjects. The score ranges from 0 to 23. The score was interpreted as 0-9 as vegetative stage, 10-18 as minimally conscious and 19-23 as conscious. Reliability of coma recovery scale is assessed by test retest method and the inter rater method and was found as 0.9 and 0.80 respectively. Thus the tool was found to be reliable.

Data Collection Procedure: The research study was started after obtaining ethical clearance and formal permission from the scientific review committee, principal, head of the department, institutional ethical committee and Kerala University of Health Sciences. Data collection was conducted among 60 patients with traumatic brain injury admitted under Neuro Surgery Department at Neuro surgery ICU, Trauma care ICU and Surgical Critical Care Unit at Govt. Medical College Hospital Kottayam. The duration of the study was six weeks from 31-01-2018 to 10-03-2018. In that study period, a total of 113 patients with TBI, who were admitted under Neuro Surgery department in the selected settings. Among them, 60 patients were selected for the

study, who were recorded with GCS score between 6 to 10 and who met the inclusion criteria. They were selected using non probability sampling. Purpose of the study was explained to the relatives of the participants and informed consent was obtained. Socio personal data and clinical data were collected during the initial contact with the subjects. The level of consciousness is measured by using coma recovery scale on day 1. Conventional care was given to patient group. The level of consciousness is measured with coma recovery scale on the day 6. The data obtained in day 1 and day 2 are compared and categorised. Analysis was done with inferential statistics.

Results

Sample characteristics based on socio demographic variables:

The level of consciousness gradually increased from day 1 to day 6 after the conventional trauma care.

1. **Findings related to sample characteristics:** Majority of patients with traumatic brain injury under study were males (65%) and most of them(about 45%) were having age between 49 to 55. Half of the patients were possessed primary school education. Most of the patients were married(71.7%). About 46.7% of patients reported with no unhealthy habits like alcoholism and smoking. With regard to monthly income, 61.7% of patients had monthly income upto 5000 Rs.
2. **Findings related to Clinical data:** Road traffic accidents (RTA) found as the major cause of trauma in the samples under the study (68.3%). The duration of coma was less than one week in 63.3% of patients. Most of the patients had subdural hematoma as the diagnosis. More than half of the patients (58.3%) had bilaterally reactive pupillary reaction at the time of first assessment. The total 83.3%of the patients had no pre-existing comorbidities like hypertension, diabetes mellitus, CAD renal diseases and seizure disorders. All of the patients under study had no hyponatremia, previous history of neurotrauma and pre existing sensory disabilities.
3. Categorization of the patients with traumatic brain injury based on the level of consciousness, measured with coma recovery scale.

Table 1: Categorization of the patients with traumatic brain injury based on the level of consciousness

Category	Day 1		Day 6	
	Frequency	Percentage	Frequency	Percentage
vegetative state (0-9)	8	13.3	2	3.3
Minimally conscious (10-18)	52	86.7	58	96.7
Conscious patients (19-23)	0	0	0	0

4. Comparison of the domains of level of consciousness of patients with traumatic brain injury.

Domains of level of consciousness	Day 1		Day 6	
	Mean	SD	Mean	SD
Auditory(0-4)	2.38	0.49	2.45	0.502
Visual(0-5)	2.7	0.49	2.78	0.49
Motor(0-6)	3.2	0.514	3.32	0.567
Verbal(0-3)	1.63	0.486	1.78	0.415
Communication(0-2)	0.78	0.415	0.88	0.324
Arousal (0-3)	0.78	0.454	1.02	0.469

5. **Association between level of consciousness among patients with traumatic brain injury and selected variables:** Chi square test was used to determine the association of level of consciousness of patients with traumatic brain injury with selected variables. Study result found that there was significant association between pupillary reaction at the time of first assessment and level of consciousness of patients with traumatic brain injury. Among the selected variables, all except the pupillary reaction at the time of first assessment were not having significant association with the level of consciousness among patients with traumatic brain injury.

Discussion

The findings of the study have been discussed in relation to the objectives and other similar studies.

1. **Findings related to sample characteristics:** A prospective study conducted in San Diego country on epidemiology of head injury showed that head injury rates were higher in males than in females. Majority of the studies on TBI emphasize more on male population as the incidence of TBI is more in male population. If stated, only few variables related to the female population are highlighted. In the literature the characteristics or differences unique to female patients with TBI has not been explored in great detail[8].

   In a study conducted in Taiwan, showed that mortality rate and incidence of TBI increased with age and lower monthly income which supports the current study[9].

2. **Findings related to Clinical data:** In the present study, Road traffic accidents (RTA) found as the major cause of trauma in the samples under the study (68.3%). In a study conducted in five European countries, it was shown that TBI are among the most severe injuries and are in a large part caused by RTA[10].

Most of the patients had subdural hematoma as the diagnosis. The study was supported by another study which shows the subdural hematomas are one type of focal brain injury occurring in approximately 30% of patients with TBI[11].

3. Association between level of consciousness among patients with traumatic brain injury and selected variables

The present study result found that there was significant association between pupillary reaction at the time of first assessment and level of consciousness of patients with traumatic brain injury. A cohort study conducted on TBI patients shows that one or both un-reactive pupils was significantly associated with level of consciousness and recovery. The study also recommended that Glassgow coma scale and pupil reactivity can be used for prognostic analysis of patients with traumatic brain injury[12].

Conclusion

Traumatic brain injury (TBI) is a major public health problem as evidenced by both clinicians and epidemiologist in India. Disability due to neurological illness ranks third in India; the major contributor is TBI. It results in deaths, injuries and disabilities of all age groups, especially young and productive people. The study concluded that most of the patients with TBI belonged to the age group of 49-55 years and road traffic accidents being the predominant cause for TBI.

The level of consciousness was assessed with coma recovery scale and categorized the subjects under the interpretation and domains of level of consciousness. Majority of the patients were minimally conscious and the domains of level of consciousness found to be improved with conventional care. There was association between level of consciousness of patients with TBI and pupillary reaction at the time of first assessment and. Level of consciousness had no association with other selected variables in patients with TBI. In the light of present study,

Interest of conflict: Nil

Source of Funding: Self

Ethical Clearance: Permission had taken from the Institutional Ethical Committe committee and Scientific Review Committee of Govt. College of Nursing, Kottayam. Consent was obtained from the subjects.

References

1. Faul M, Wald MM, Xu L, Coronado VG. Traumatic brain injury in the United States; emergency department visits, hospitalizations and deaths, 2002-2006.Alexander MP. Mild traumatic brain injury: pathophysiology, natural history and clinical management. Neurology. 1995 Jul.

2. Alexander MP. Mild traumatic brain injury: pathophysiology, natural history and clinical management. Neurology. 1995 Jul.
3. Peterson AB, Xu L, Daugherty J, Breiding MJ. Surveillance report of traumatic brain injury-related emergency department visits, hospitalizations and deaths, United States, 2014.
4. Baldwin G, Breiding M, Sleet D. Using the public health model to address unintentional injuries and TBI: A perspective from the Centers for Disease Control and Prevention (CDC). Neuro Rehabilitation. 2016 Jan 1;39(3):345-9.
5. Adams RD, Victor M, Ropper AH, Daroff RB. Principles of neurology.
6. Blyth BJ, Bazarian JJ. Traumatic alterations in consciousness: traumatic brain injury. Emergency Medicine Clinics. 2010 Aug 1;28(3):571-94.
7. Giacino JT, Zasler ND, Katz DI, Kelly JP, Rosenberg JH, Filley CM. Development of practice guidelines for assessment and management of the vegetative and minimally conscious states. The Journal of Head Trauma Rehabilitation. 1997 Aug 1;12(4):79-89.
8. Munivenkatappa A, Agrawal A, Shukla DP, Kumaraswamy D, Devi BI. Traumatic brain injury: Does gender influence outcomes?. International journal of critical illness and injury science. 2016 Apr;6(2):70.
9. Hsu IL, Li CY, Chu DC, Chien LC. An epidemiological analysis of head injuries in Taiwan. International journal of environmental research and public health. 2018;15(11):2457.
10. Majdan M, Mauritz W, Wilbacher I, Janciak I, Brazinova A, Rusnak M, Leitgeb J. Traumatic brain injuries caused by traffic accidents in five European countries: outcome and public health consequences. The European Journal of Public Health. 2012 Jun 9;23(4):682-7.
11. Basavaraj KG, Venkatesh HK, Rao GU. A prospective study of demography and outcome in operated head injuries. Ind J Anaesth. 2005 Jan 1;49:24-30.
12. Marmarou A, Lu J, Butcher I, McHugh GS, Murray GD, Steyerberg EW, Mushkudiani NA, Choi S, Maas AI. Prognostic value of the Glasgow Coma Scale and pupil reactivity in traumatic brain injury assessed pre-hospital and on enrollment: an IMPACT analysis. Journal of neurotrauma. 2007 Feb 1;24(2):270-80.
13. Kulikov VA, Sannikov DV, Vavilov VP. Author AA, Author BB, Author CC Title of article. Title of Journal, 2005, vol. 10, no. 2, pp. 49-53.