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CORRELATION OF GCS AND CT-SCAN SCORE IN PREDICTING THE MORTALITY AND ICU STAY IN MODERATE TO SEVERE TBI ADULT VICTIMS IN ED

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Abstract

***Background**: Traumatic brain injury is burning health issue in patients with trauma. RTAs (59%), Fall down (25%) and Violence (10%) are major aetiology of head injury [1,4]. In 2011, 4.97 lakhs RTA out of that around 1.42 lakhs deaths. On an average RTA every 1 min and death every 3.5 minutes. Economical loss of 3.7% in national GDP [3]. At the global level, annual incidence and mortality from TBIs is 200 and 20 per 1 lakh per year, respectively [1]. GC Scale and Rotterdam CT scan score can predict in-hospital mortality in TBI victims. **Materials and method**: The observational, descriptive study was conducted on 50 adult (age≥18 years) TBI patients with GCS <13 presented in ED. Non-ionic contrast CT (NCCT) scan brain as a part of radiological investigation in trauma patients after resuscitation and Rotterdam scoring applied. Data was collected from iHis and analysed in Stata 13.0 and Epi (version 7.3.2.1) CDC software. P <0.05 was considered statistically significant. **Results**: The mean Rotterdam CT score and GCS was 3 and 10 respectively for ICU stay, mean age was 39.24±18.33, sex ratio 3.9:1, RTAs was the most common mode of injury in 70% TBIs victims, mortality 24% and mean ICU stay 8.64±14.81 days. Mean GCS of 8.25±2.60 and 10.95±1.71 for the un-favourable and favourable outcomes respectively. Mean Rotterdam CT score was 4±1.52 for predicting mortality and outcome.*

***Keywords**: TBI, GCS, Rotterdam CT score*

INTRODUCTION

TBIs are major non-communicable and modern epidemiological public health problem in India resulting in injuries, disabilities and deaths in young and reproductive population of our society [1]. RTAs are among top 5 cause of morbidity and mortality. In 2013, Tamilnadu (22.8%), Haryana (17.2%) and Andhra Pradesh (16.9%) faced 50% higher fatality risk than all India (11.2%). Gujarat is at 8th position in fatality rate[2]. RTAs occurs predominantly in age group of 15-40 years, among them males are 75-80% victims. Falls having bimodal age distribution in females < 5years (27%) and >60 years (19%) [1]. In year 1974, a new score was coined by Graham Teasdale and Bryan J. Jennet, professor of neurosurgery at university of Glasgow, Scotland to measure the consciousness is Glasgow coma scale [5,6,7]. In 2005, CT scan score was introduced to add prognostic values of Marshall CT score classification in 1991. Then onwards it became the integral part of IMPACT outcome model for TBI patients.

AIMS AND OBJECTIVES

To predict ICU, stay and mortality in moderate to severe TBI patients based on GCS and Rotterdam CT scan score.

MATERIAL AND METHODS

A prospective, observational study conducted during period of March 2019 to August 2019 at S.V.P.I.M.S.R hospital, Ahmedabad-06 Emergency Room of Level-I Trauma centre. Patients with head injury presented in ER on admission are classified according to GCS into mild (13-15), moderate (9-12) and severe (3-8) category. Simultaneously patient also resuscitated according to latest ATLS protocol. Non-ionic contrast CT (NCCT) scan brain as a part of radiological investigation in trauma patients after resuscitation and Rotterdam scoring applied. All data was collected from ER

registry and iHiS record. Data was analysed in Stata 13.0 and Epi (version 7.3.2.1) CDC software. P <0.05 was considered statistically significant.

Inclusion criteria:

- Age ≥ 18 years and willing for part of study
- Moderate to severe TBI patients on the basis of GCS
- Trauma within 12 hours and reach to definitive care within 12 hours
- TBIs victims who require ICU admission

Exclusion criteria:

- Age <18 years and not willing for part of study
- Mild TBI patients
- Patients with poly-trauma (especially abdominal and pelvic injury)
- Patients who took DAMA/ LAMA

OBSERVATION AND RESULTS

1) Comparison of age and gender (figure I and II):
In our study, out of 50 patients 39 (78%) males, 10 (20%) females and 1 (2%) other population. Mean age of males and females were 38.54±18.62 and 43.5±17.80 respectively. Mean age of population was 39.20±18.33. Sex ratio was 3.9:1. Majority of population 78% was <50years of age. Sex ratio of 4:1 to 5:1 in Gururaj G et al. [1] and Sanjay Kumar Singh et al. [2]. 80.7 % (30.8 ± 16.5) were males and 19.3% (29.8 ± 19.9) mean ± SD were females. Mean age of 30.6 ± 17.2 in Gururaj G et al. [1]. 30-44 years, is the most prone to road accident fatality in India in Gururaj G et al. [1].

2) Comparison of Mode of injury (figure III):
Present study shows, most common mode of injury was RTA followed by fall down and violence 70%, 28% and 2% respectively. Gururaj G et al. [1] showing 62.2% RTIs followed by falls 22.2%, violence 12.2% and others 3.4%. Nair S.S. et al. [4] showing 78.30% RTAs followed by fall down 14.5% and assault 5.8%.

3) Comparison of GCS and Rotterdam CT score with ICU stay (figure V and VI):
In our study, A linear regression analysis showing statistical significance at 95% CI with p<0.01 with mean GCS and Rotterdam score cut of value at 10.0 and 3.0 respectively, with each point of decrease in GCS and Rotterdam score will prolong mean ICU stay by 5 days. Mean ICU stay was 8.64±14.81. Minimum duration is 1 day and maximum duration is 95 days of ICU stay. TBI patients with GCS scores ranging from 3 to 8 had a longer average hospital LOS than did those with a GCS of 13–15 (18.2 vs. 9.2 days, p < 0.01) Ahmed Saiyad Okasha et. al[8]. The mean duration of ICU stay was 10 (5–21) days J. Leitgeb et. al[9]. Mean LOS of 8.9 days (SD: 11.9 days, M: 4 days, IQR25–75: 1–13 days) in the intensive care unit Maegele M et. al[10]. Rotterdam CT scan score showed a statistical significant correlation with ICU length of stay (r = 0.586; p < 0.001). The mean ICU LOS of 14.4 ± 7.8 days and Survivors median of 11 days. The Rotterdam score showed significant statistical correlation than the Marshall score (0.59 vs. 0.48) Tamer Abdullah Helmy et al [11].

4) GCS and ROTTERDAM with Mortality outcome (figure IV, Table I): In present study, mean GCS of 8.25±2.60 and 10.95±1.71 for the un-favourable and favourable outcomes respectively. GCS of 9-12 having good sensitivity of 89.5% but, poorer specificity with positive likelihood ratio of (LR^+) 1.19 ($LR^+ > LR^-$) and significant p value of 0.003 (p <0.05). The mean Rotterdam CT score was 4±1.52 for predicting mortality and outcome with statistically significant p value <0.05. Rotterdam score and GCS both were highly correlating with each other in linear regression at 95% CI. Decreasing the 2 points of GCS will simultaneously drops Rotterdam score by 2 points. There was no patients with Rotterdam score of 1 with un-favourable outcome. Also, there was no patients with favourable outcome with Rotterdam score of 6 in our study. Rotterdam score of 3 caring 38% of favourable and 8% un-favourable outcomes. Overall mortality with irrespective of score was 24% in present study. GCS score caring (OR 0.62; 95 % CI 0.46–0.84; p = 0.002) in prediction of mortality Ahmed Said Okasha et. al[8]. Rotterdam CT Score has a significant correlation (p<0.05) with the outcome in TBIs patients and also a good correlation between the changes in CT Scans with the shift of GCS. The mortality in patients with Rotterdam score 1 and 2 is 0%, for score 3 is 6%, for score 4 is 35%, for score 5 is 53.65% and for score 6 is 58.33%. Thus, higher Rotterdam score in patients with TBI has higher risk of mortality. This shows positive correlation between increasing Rotterdam score and the respective mortality in patients with traumatic brain injury [11].

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5) Other findings:

- Only 8% (4) patients were having cervical spine injury associated with TBIs.
- 58% of TBIs victims had associated facial bone injuries, while 56% had other body injuries except abdominal and pelvic bone injuries.
- 18 (36%) patients out of 50 were required immediate intubation and 8 (16%) required tracheostomy during course of treatment in ICU.

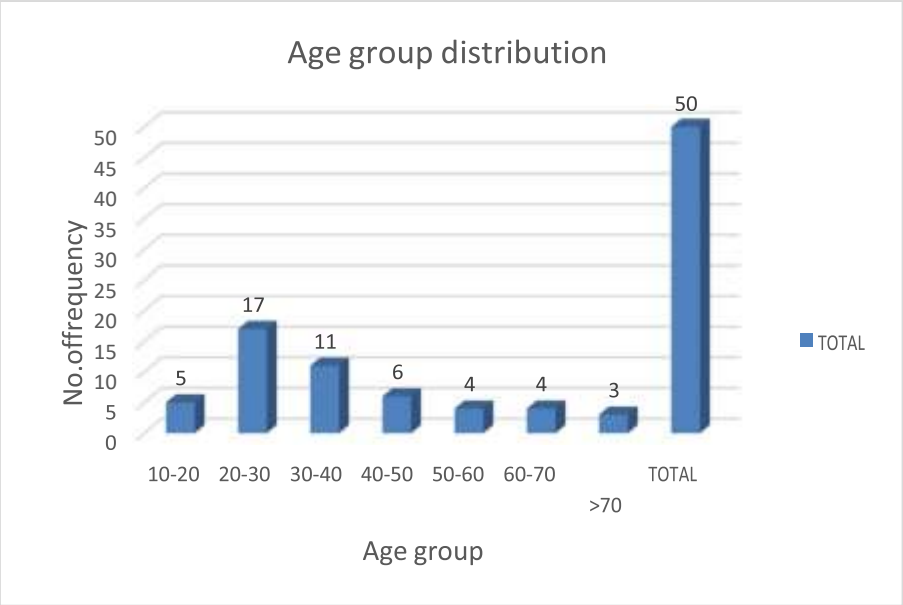

Figure I) Age group distribution:

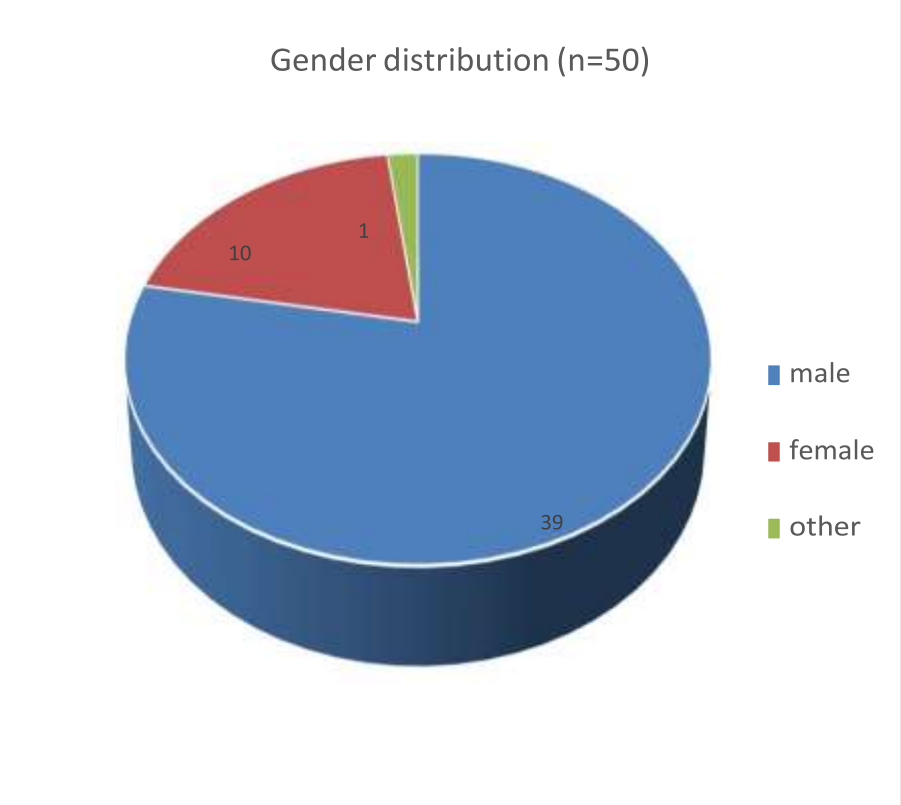

Figure II) Gender distribution:

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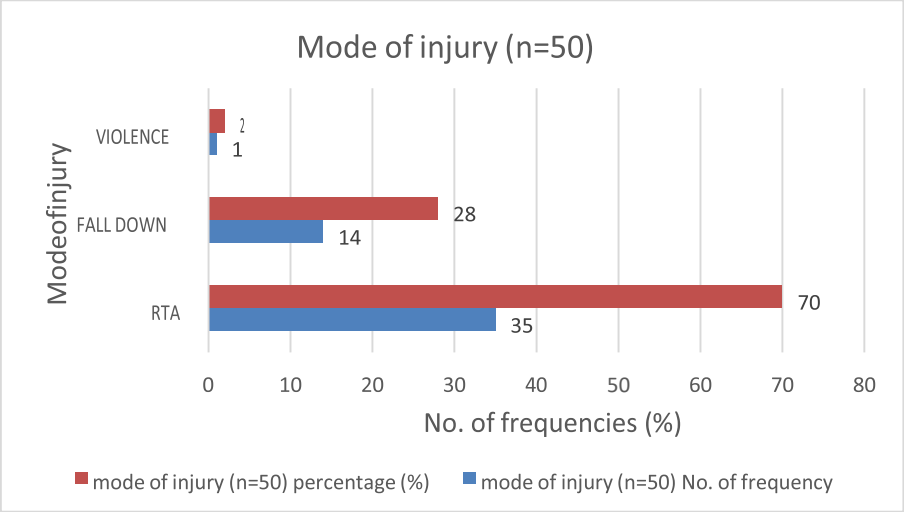
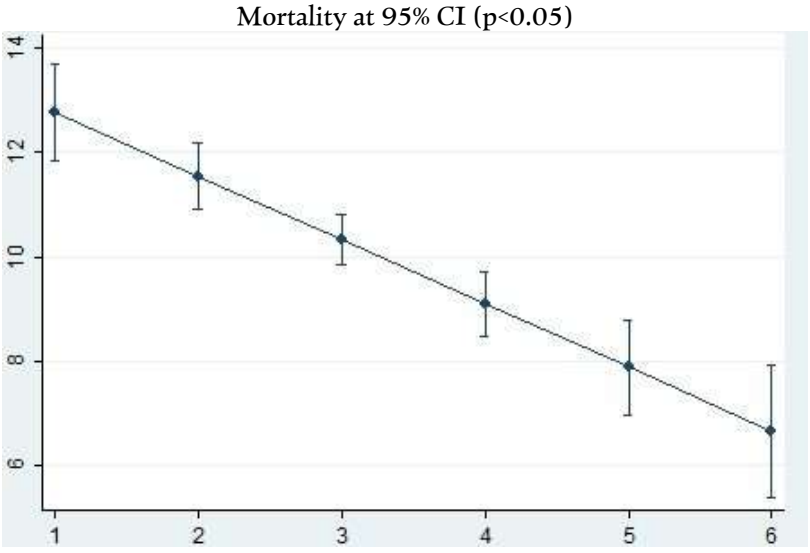


Figure III) Mode of injuries:

TABLE I) TBI classification and outcome:

	OUTCOME			
GCS	FAVOURABLE	UN-FAVOURABLE	SENSITIVITY (%)	SPECIFICITY (%)
3-8	4	3	10.53	75
9-12	34	9	89.47	25

Figure IV) Correlation of GCS and Rotterdam score with mortality regression analysis:



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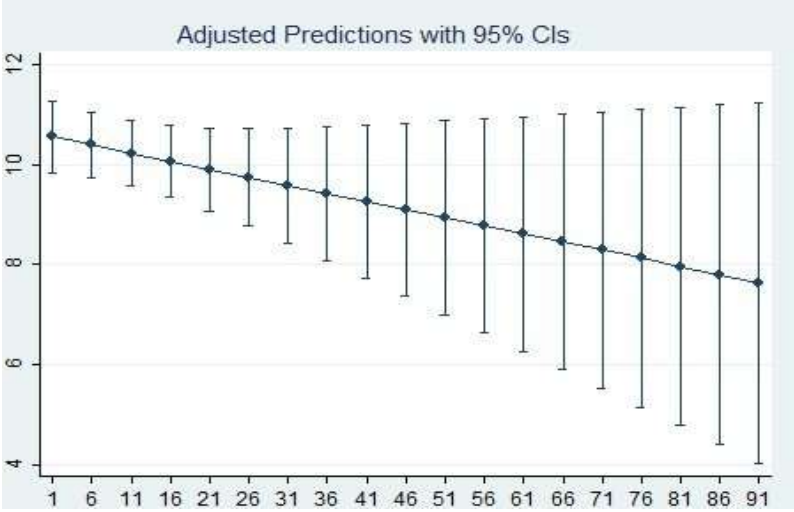
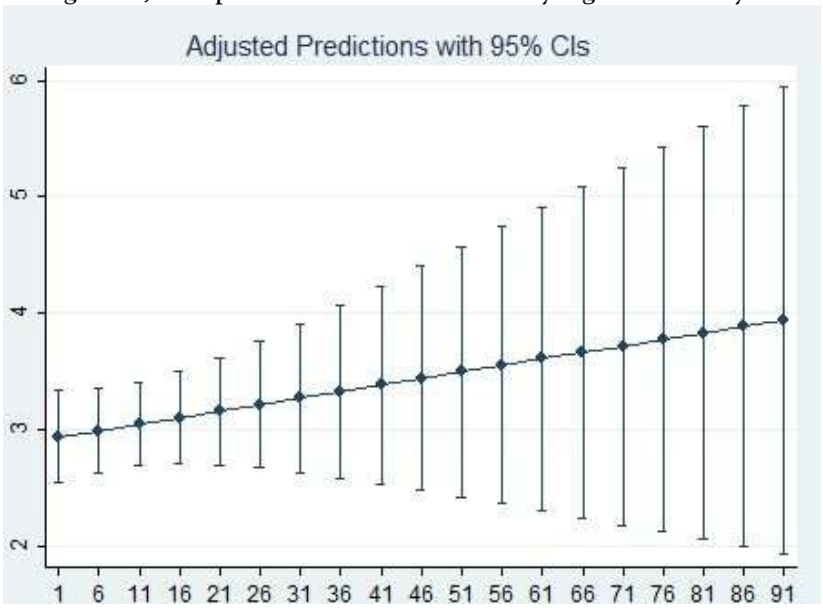


Figure V) Comparison of GCS and ICU stay regression analysis:



GCS ICU stay in (days) Figure VI) Comparison of Rotterdam score and ICU stay regression analysis:

Rotterdam score ICU stay (in days)

DISCUSSION

Traumatic Brain Injuries (TBIs) is one the leading cause of mortality and morbidity in developing countries and globally. Rapid motorization and urbanization is key factor for the RTAs/ RTIs. Nuclear families and neglecting older population is found to be important factor for morbidity and mortality in head injuries due to fall downs. Domestic violence is still very less common cause for the TBIs. Since 45 years, GCS is still maintaining its popularity in predicting mortality and length of stay in ICU over other different scoring systems for assessing the neurological outcomes in TBIs. GCS can also predict the need of intubation and neurosurgical intervention. In 2005, newly developed Rotterdam CT scan score also gain its position in prognostic models for TBIs. It can also predict outcome in the form of mortality. But it has some fallacies i.e. it doesn't include all the types haemorrhages and diffuse axonal injuries.

LIMITATIONS OF STUDY

- Small size of study population
- Single hospital study
- CT scan has limited assess in diffuse axonal injury and haemorrhagic contusion in early stage and also not included in Rotterdam CT score

CONCLUSION

GCS and Rotterdam score is statistically significant in predicting mortality and ICU stay in TBIs adult victims.

PREVENTIVE STRATEGIES:

- Wear helmet/ seatbelt.
- Avoid drink and drive.
- Improve quality of roads and follow traffic rules.
- Holistic take care of children and geriatric population.

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CONFLICT OF INTEREST: None

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REFERENCES

Gururaj G, Kolluri S.V.R, Chandramouli B.A, Subbakrishna D.K and Kraus JF, "Traumatic Brain Injury", National Institute of Mental Health & Neuro Sciences, Publication no. 61, Bangalore - 560029, India. 2005

Sanjay Kumar Singh et al. / Transportation Research Procedia 25C (2017) 4712– 4723

Sharma SM. Road Traffic Accidents in India. Int J Adv Integ Med Sci 2016;1(2): 57 64

Nair SS, Surendran A, Prabhakar RB, Chisthi MM. Comparison between FOUR score and GCS in assessing patients with traumatic head injury: a tertiary centre study. Int Surg J 2017; 4:656-62

Georgios MATIS and Theodossios BIRBILIS, The Glasgow Coma Scale - A brief review. Past, present, future Acta neurol. belg., 2008, 108, 75-89

TEASDALE G. M., JENNETT B. Assessment and prognosis of coma after head injury. Acta Neurochir. (Wien), 1976, 34 : 45-55.

TEASDALE G. M., PETTIGREW L. E., WILSON J. T., MURRAY G., JENNETT B. Analyzing outcome of treatment of severe head injury : a review and update on advancing the use of the Glasgow Outcome Scale J. Neurotrauma, 1998, 15 : 587-597

Ahmed Said Okasha • Akram Muhammad Fayed et al., The FOUR Score Predicts Mortality, Endotracheal Intubation and ICU Length of Stay After Traumatic Brain Injury Neurocrit Care DOI 10.1007/s12028-014-9995-6

J. Leitgeb • W. Mauritz et al., Glasgow Coma Scale score at intensive care unit discharge predicts the 1-year outcome of patients with severe traumatic brain injury Eur J Trauma Emerg Surg (2013) 39:285–292 DOI 10.1007/s00068-013-0269-3

Maegele M, Lefering R, Sakowitz O et al., The incidence and management of moderate to severe head injury—a retrospective analysis of data from the Trauma Register of the German Trauma Society. Dtsch Arztebl Int 2019; 116: 167–73. DOI: 10.3238/ arztebl. 2019.0167

Tamer Abdullah Helmy et al., Study the Prognostic Value of Computed Tomographic Characteristics in Cases of Traumatic Brain Injury, American Journal of Research Communication. 2015: Vol 3(11)