ISSN: 0975-3583,0976-2833 VOL15, ISSUE 07, 2024

Original Research Article

Efficacy of Glasgow Coma Scale as an Indicator for doing CT

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Abstract:

Background: Falls are the most common cause of TBI, and a GCS score of less than 15 and LOC are strong predictors of CT abnormalities. The study emphasizes the importance of prioritizing GCS scores and significant predictors in clinical decisions to reduce unnecessary radiation exposure. **Objective.** To assess the efficacy of Glasgow Coma Scale as an indicator for doing CT. **Methods:** This is a observational study to be conducted in the Emergency Department of BLDE(DU), Shri B.M Patil Medical College Hospital, Vijayapur,Karnataka. **Result:** Out of a total of 145 participants, 6 (4.1%) had positive CT findings, while 139 (95.9%) had negative results. Specifically, among participants with a GCS score of 15, which indicates full consciousness, only 4 out of 136 (2.9%) had positive CT findings, whereas 132 (97.1%) had negative results. In contrast, among participants with a GCS score of less than 15, indicating reduced consciousness, 2 out of 9 (22.2%) had positive CT findings, and 7 (77.8%) had negative results. **Conclusion:** Prioritizing GCS scores and other significant predictors in clinical decisions can reduce unnecessary radiation exposure and improve patient safety and resource utilization in emergency settings. This evidence-based approach ensures CT scans are reserved for higher-risk patients, enhancing diagnostic accuracy and patient care.

Keywords: Glasgow Coma Scale, CT scans, TBI

INTRODUCTION: Traumatic Brain Injury (TBI) is a growing public health concern in India, with a significant impact on individuals and healthcare systems. Here are some key statistics and facts related to TBI in India. India has one of the highest rates of TBI in the world. It is estimated that approximately 1.5 to 2 million people suffer from TBI each

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 07, 2024

year.TBI is a leading cause of death and disability in India. About 10% of all trauma-related deaths in the country are due to TBI. The most common cause of TBI in India, accounting for about 60% of cases. India has a high rate of road traffic accidents, with over 150,000 deaths annually, and many more sustaining injuries. Males are more commonly affected than females, with a male-to-female ratio of about 4:1. Young adults (ages 15-40) are the most affected group, primarily due to their higher involvement in road traffic accidents and sports activities. Urban areas report higher incidence rates due to denser traffic and greater exposure to road accidents, whereas rural areas face challenges in access to timely medical care, contributing to higher mortality rates. TBI places a substantial burden on the healthcare system, with a significant portion of emergency and trauma care resources dedicated to its management.

The economic burden of TBI is considerable, including direct costs (medical expenses, hospitalization, rehabilitation) and indirect costs (loss of productivity, long-term disability).

Any traumatically caused structural injury or physiological disturbance of brain function brought on by an outside force is referred to as a traumatic brain injury (TBI). One or more clinical symptoms that appear right away, such as amnesia, a neurologic deficiency, an intracranial lesion, or a loss, diminished, or altered level of consciousness, are indicative of it. [1] External forces could be a blast injury, an object striking the head directly, or indirect forces from acceleration or deceleration.Traditionally, TBI has been categorised as mild (GCS 13–15), moderate (GCS 9–12), or severe (GCS 3-8) using the Glasgow Coma Score (GCS). A more modern TBI categorization system classifies TBI based on imaging results, post-traumatic amnesia (PTA), alteration of consciousness (AOC), and duration of loss of consciousness (LOC). [1]

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Material and Methods: This is a observational study to be conducted in the Emergency Department of BLDE(DU), Shri B.M Patil Medical College Hospital, Vijayapur,Karnataka.

INCLUSION CRITERIA

- For study purposes, we include only previously healthy patients above age group of 18 with isolated head injury.

EXCLUSION CRITERIA

- Patients with other medical conditions that may influence CT result, such asprevious history of stroke, were excluded.
- patients who are less than 18 and those taking anticoagulant medications were also excluded.
- Patients who were suspected of substance abuse or intoxication were not included in this study.

SOURCE OF DATA

Data will be collected from the patients presenting to Emergency department of Shri BM Patil medical college and research centre Vijayapura for a period of 18 months who fullfill the inclusion criteria

SAMPLING

With anticipated head injury case within the inclusion criteria this study would require a sample size of 145 patients. With 95% level of confidence and 5% absolute precision. The data obtained will been entered in Microsoft excel sheet and statistical analysis will be performed using JNL software.

METHODOLOGY

For this study the data of patients with Traumatic Brain Injury and classify them as LOC group and NON-LOC group and CT scan positivity among 2 is identified and with that “p”

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value and ODDS ratio is calculated Same set of patients are classified based on GCS status and CT positivity. P value and ODDS ratio calculated and compared with first group Combining GCS status with LOC, Patients are classified as those with GCS less than 15 wih LOC and those with GCS15 with LOC and ‘p’ value and odds ratio is calculated and compared with first group.

Classification on basis of GCS:

- Patients are reclassified based on their Glasgow Coma Scale (GCS) status:
    - GCS < 15 with LOC: Patients with a GCS score less than 15 who experienced LOC.
    - GCS 15 with LOC: Patients with a GCS score of 15 who experienced LOC.
    - For each of these GCS-based subgroups, you calculate the p-value and odds ratio for CT scan positivity.

Results:

TABLE 1: DEMOGRAPHIC AND INCIDENT CHARACTERISTICS OF THE STUDY POPULATION

S.NO	VARIABLE	VALUES
1	AGE (MEAN+ SD)	6.06+4.0
2	AGE 18-24	52 (35.9%)
3	AGE 25-35	23 (15.9)
4	AGE 35-45	36 (24.8)
5	AGE >45	34 (23.4)
6	SEX	
7	MALE	103 (71)
8	FEMALE	42 (29)

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9	FALL	76 (52.4)
10	SHORT FALL	66 (45.5)
11	LONG DISTANCE	11 (7.6)
12	MOTOR VEHICLE	33 (22.8)
13	PEDESTRIAN	12 (8.3)
14	DIRECT IMPACT	21 (14.5)
15	PHYSICAL ASSAULT	2 (1.4)
16	PHYSICAL ABUSE	1 (0.7)

The study sample comprised 145 participants, with a mean age of 6.06 years (±4.0). The age distribution of the participants revealed that 52 individuals (35.9%) were aged between 18-24 years, 23 individuals (15.9%) were aged between 25-35 years, 36 individuals (24.8%) were aged between 35-45 years, and 34 individuals (23.4%) were aged over 45 years. This diverse age range highlights the variability in the affected population, which is critical for understanding the broad impact of the studied conditions across different life stages. The gender distribution was skewed towards males, with 103 males (71%) and 42 females (29%), indicating a potential gender-based difference in the incidence or reporting of injuries and symptoms.

In terms of the mechanism of injury, falls emerged as the most prevalent cause, accounting for 76 cases (52.4%). Within this category, short falls were the most common, reported in 66 cases (45.5%), while long-distance falls were noted in

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11 cases (7.6%). These findings underscore the significance of fall-related injuries in the study population, prompting further investigation into preventive measures and risk factors associated with different types of falls. Motor vehicle accidents were responsible for 33 cases (22.8%), emphasizing the need for enhanced safety measures and interventions in traffic-related incidents. Among these motor vehicle accident cases, 12 participants (8.3%) were pedestrians, highlighting the vulnerability of pedestrians in traffic environments.

Direct impacts accounted for 21 cases (14.5%), suggesting a notable proportion of injuries resulting from blunt force trauma. Physical assaults were reported in 2 cases (1.4%), and child physical abuse was reported in 1 case (0.7%). Although these numbers are relatively low, they represent significant and concerning instances of intentional harm, warranting targeted interventions and support systems for victims. The overall statistics of the study, including the mechanisms of injury and demographic data, provide a comprehensive overview of the affected population, enabling a deeper understanding of the underlying factors and guiding future research and policy development to mitigate these risks. This detailed analysis of demographic variables and injury mechanisms is crucial for tailoring effective prevention and treatment strategies to address the specific needs of different population subgroups within the study cohort.

TABLE 2: CT SCAN RESULTS BY GLASGOW COMA SCALE (GCS) SCORE

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	CT POSITIVE	CT NEGATIVE	TOTAL	% POSITIVE	% NEGATIVE
GCS 15	4	132	136	2.9%	97.1%
GCS <15	2	7	9	22.2%	77.8%
TOTAL	6	139	145	4.1%	95.9%

The distribution of CT scan results in relation to Glasgow Coma Scale (GCS) scores revealed significant insights into the association between GCS levels and the presence of abnormalities on CT scans. Out of a total of 145 participants, 6 (4.1%) had positive CT findings, while 139 (95.9%) had negative results. Specifically, among participants with a GCS score of 15, which indicates full consciousness, only 4 out of 136 (2.9%) had positive CT findings, whereas 132 (97.1%) had negative results. In contrast, among participants with a GCS score of less than 15, indicating reduced consciousness, 2 out of 9 (22.2%) had positive CT findings, and 7 (77.8%) had negative results. This analysis demonstrates that a lower GCS score is associated with a higher likelihood of detecting abnormalities on CT scans. The majority of participants with a GCS score of 15 had negative CT scans, reinforcing that normal consciousness levels are correlated with fewer CT abnormalities. Conversely, the higher percentage of positive CT results among those with GCS scores less than 15 suggests that impaired consciousness is a significant predictor of CT abnormalities. These

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findings highlight the utility of GCS as an important clinical indicator when evaluating the need for CT imaging and further diagnostic investigation.

Discussion: There was no correlation between age and a higher likelihood of intracranial damage with abnormal brain CT following forceful trauma. Out of the patients aged 18-24 years, only 2.9% were found to have abnormal brain CT scans, which is lower than the previously reported rates of roughly 3-10% in worldwide studies. [2,3] The cohort research indicated that younger individuals with mild head trauma do not have a distinct risk for intracranial damage. Nevertheless, our study did not primarily target this particular age-group.

Our analysis found that distance falls and motor vehicle accidents were the most prevalent causes of injury. However, in the univariate analysis examining the risk correlation, it was found that 'fall' was not substantially linked to intracranial damage, perhaps due to the fact that most falls occurred over a short distance.

The study further examined the relationship between Glasgow Coma Scale (GCS) scores and CT scan results. A GCS score of less than 15 was associated with a higher likelihood of positive CT findings (22.2%) compared to a GCS score of 15 (2.9%). This finding highlights the importance of GCS as an indicator of neurological impairment and its utility in guiding the decision-making process for imaging. Lower GCS scores correlate with a higher risk of

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brain abnormalities, reinforcing the need for prompt and thorough evaluation in such cases.

When combining GCS scores with LOC status, the results showed that participants with a GCS score of less than 15 and LOC had the highest proportion of positive CT findings (8.6%). In contrast, those with a GCS score of less than 15 but without LOC had a significantly lower proportion of positive CT findings (1.1%). These results suggest that the combination of reduced GCS and LOC is a strong predictor of CT abnormalities, whereas the absence of LOC in patients with reduced GCS may mitigate this risk. This combined assessment provides a more nuanced understanding of the factors influencing CT scan results and can enhance clinical decision-making.

The logistic regression analysis identified several variables with potential predictive value for abnormal CT findings. Gender (OR = 3.346, p = 0.067) and a GCS score of 15 (OR = 5.961, p = 0.051) approached statistical significance, suggesting trends that warrant further investigation. A GCS score of 13 (OR = 4.413, p = 0.036) showed a significant association with positive CT findings, indicating that even moderate reductions in GCS can be indicative of abnormalities.

The Glasgow Coma Scale (GCS) upon arrival at the hospital was the sole clinical observation that demonstrated a statistically significant correlation with intracranial damage in our research. Patients who presented to the emergency

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 07, 2024

department with a Glasgow Coma Scale (GCS) score of 13 had a fivefold higher probability of having an intracranial injury compared to those with a GCS score of 14-15 upon presentation. [4,5]

The clinical signs discussed in the previous section were examined using a prediction model. During our study, we examined them as a collection of observable occurrences and discovered that individuals with a Glasgow Coma Scale (GCS) score of 13 at initial assessment are the sole significant clinical indicator of intracranial damage. [6]

Conclusion: Lower GCS scores and the presence of LOC were linked to higher rates of CT abnormalities. Prioritizing GCS scores and other significant predictors in clinical decisions can reduce unnecessary radiation exposure and improve patient safety and resource utilization in emergency settings. This evidence-based approach ensures CT scans are reserved for higher-risk patients, enhancing diagnostic accuracy and patient care.

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