Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2024i1.1226
*Biol. Clin. Sci. Res. J., Volume, **2024**: 1226*
Original research article

FREQUENCY OF CT FINDINGS IN PATIENTS WITH MINOR HEAD INJURIES

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(Received, 27th June 2024, Revised 20th October 2024, Published 31st October 2024)

Abstract: *Minor head injuries are a common occurrence in emergency departments, often resulting from road traffic accidents, falls, and other blunt trauma incidents. While patients with a Glasgow Coma Scale (GCS) score of 13 to 15 are generally considered to have minor injuries, computed tomography (CT) imaging plays a crucial role in identifying potential intracranial complications that may not be evident clinically.* ***Objective:*** *This study aimed to evaluate the computed tomography (CT) findings in patients presenting with minor head injuries to determine the prevalence of intracranial complications.* ***Methods:*** *A cross-sectional study was conducted involving 86 patients presenting with minor head injuries at a tertiary care hospital. Minor head injuries were defined as having a Glasgow Coma Scale (GCS) score of 13 to 15. Patients with polytrauma, previous neurosurgery, or severe critical conditions were excluded. Clinical assessments included demographic information, injury mechanisms, and symptoms such as loss of consciousness, vomiting, headaches, and post-trauma seizures. All patients underwent CT scans, which were interpreted by radiologists blinded to clinical data. CT findings were categorized, and statistical analysis was performed to evaluate the prevalence of different intracranial injuries.* ***Results:*** *The mean age of the study participants was 40.27 years, with a male predominance (61.6%). Road traffic accidents were the most common cause of injury (44.2%), followed by falls (37.2%). CT scans revealed that 31.4% of patients had subgaleal hematomas, 11.6% had subdural hematomas, 8.1% had skull fractures, and 5.8% had brain contusions. Notably, 43% of the patients presented with normal CT findings, indicating the absence of acute complications.* ***Conclusion:*** *Although a substantial number of patients with minor head injuries had normal CT findings, the detection of significant intracranial conditions such as subgaleal and subdural hematomas emphasizes the importance of routine imaging in this patient population. Early detection through CT imaging is essential in guiding clinical management and preventing potential complications in patients with minor head injuries.*

Keywords: Minor head injury, CT scan, subgaleal hematoma, subdural hematoma, Glasgow Coma Scale, intracranial pathology.

Introduction

Brain dysfunction induced by an external force, typically a severe blow to the head, is known as traumatic brain injury. It is brain damage that happens out of the blue. It could be due to a blow, collision, or sudden movement of the head. Brain injuries can be classified as either open or closed (1). When an object pierces or penetrates the skull, this can occur. A penetrating injury is another name for it. Traumatic brain injury can also occur as a result of a sudden blow to the head (2). Every year, many people across the globe deal with the ongoing problem of traumatic brain injury. The CDC reports that between 2001 and 2010, there was an increase in the overall rates of traumatic brain injury-related hospitalizations, emergency department visits, and fatalities (3).

Although there has been an increase in awareness, a restructuring of management and standards, and substantial technological breakthroughs in current treatment regimens, the number of deaths attributable to TBIs has reduced over the same period when viewed individually. The total rates of traumatic brain injuries are probably underreported because some of these injuries never make it to a doctor (3, 4). Traumatic brain injury is most common in the 0-4 age range, followed by teenagers and young adults. The incidence peaks again in the geriatric population. Overall, falls and car accidents are the two most common causes of traumatic brain injury (5).

Neurocranial traumatic lesions are detected with a brain computed tomography scan (6). It is regarded as the gold standard for diagnosing life-threatening neurocranial emergencies (7). Nevertheless, CT scans should be judiciously employed in patients due to their association with pharmaceutical drowsiness, radiation-induced cancers, and heightened financial costs (8). Several guidelines exist to assess patients with mild traumatic injuries who may require a CT scan. Common indications for head CT according to these guidelines comprise amnesia, advanced age, and vomiting. Nevertheless, the overutilization of CT continues to be an issue (9).

The rationale for studying CT findings in patients with minor head injuries is grounded in the need to enhance diagnostic accuracy and management strategies for this common clinical scenario. By systematically analyzing CT findings in this patient population, we can better understand the spectrum of injuries associated with minor head trauma, establish clearer guidelines for imaging protocols, and improve triage processes to ensure that patients receive appropriate follow-up care.

Methodology

The study employed a cross-sectional design and was conducted from August 2023 to February 2024 Radiology Department of burn and Plastic Surgery Unit, Hayatabad

Medical Complex, Peshawar. Eighty-six patients presenting with minor head injuries were included in the study, provided they met the inclusion criteria, which required a Glasgow Coma Scale (GCS) score between 13 and 15. Patients with polytrauma, prior neurosurgical interventions, or those whose condition was deemed too critical for a CT scan were excluded. Each patient underwent a comprehensive clinical evaluation, including detailed history-taking and physical examination, to document demographic details, injury mechanism, and clinical symptoms such as loss of consciousness, vomiting, headaches, and seizures.

CT scans were performed on all patients within the first 24 hours of admission using a standard axial scanning protocol. The scans were interpreted by experienced radiologists who were blinded to the clinical presentation of the patients. Findings such as subgaleal hematomas, subdural hematomas, skull fractures, and brain contusions were recorded in a structured format. Data were collected on a predesigned form and entered into SPSS 24 for analysis. Statistical analysis was performed in terms of mean and standard deviation along with frequencies and percentages.

Results

The study included a total of 86 patients with a mean age of 40.27 ± 12.95 years. The body mass index (BMI) of the patients ranged from 21.30 to 28.60, with a mean of 24.83 ± 2.18 Kg/m². Regarding gender, 53 patients (61.6%) were male, and 33 patients (38.4%) were female. In terms of residence, 44 patients (51.2%) were from urban areas, and 42 patients (48.8%) were from rural areas. The education status showed that 41 patients (47.7%) were educated, while 45 patients (52.3%) were uneducated. Socioeconomic background was reported with 34 patients (39.5%) from a lower socioeconomic background, 45 patients (52.3%) from a middle background, and 7 patients (8.1%) from a higher background. (Table 1)

For the Glasgow Coma Scale (GCS) score, three patients (34.9%) had a score of 13, twenty-six patients (30.2%) had a score of 14, and 30 patients (34.9%) had a score of 15.

The aetiology of injury revealed that 38 patients (44.2%) sustained injuries due to road traffic accidents, thirty-two patients (37.2%) due to falls, eleven patients (12.8%) from assaults and interpersonal violence, and 5 patients (5.8%) from sports-related injuries. (Figure 1). Clinically, thirty-nine patients (45.3%) presented with loss of consciousness, twenty-five patients (29.1%) with vomiting, 14 patients (16.3%) with headaches, and 8 patients (9.3%) with post-trauma seizures (Table 2).

CT scan findings showed that 7 patients (8.1%) had skull fractures, 10 patients (11.6%) had subdural hematomas, twenty-seven patients (31.4%) had subgaleal hematomas, and 5 patients (5.8%) had brain contusions. Additionally, thirty-seven patients (43.0%) had normal CT scan results. (Table 3).

Table 1 Demographics

Demographics		Frequency	Percentage
Gender	Male	53	61.6%
	Female	33	38.4%
Residence	Urban	44	51.2%
	Rural	42	48.8%
Education status	Educated	41	47.7%
	Uneducated	45	52.3%
Socioeconomic background	Lower background	34	39.5%
	Middle background	45	52.3%
	Higher background	7	8.1%

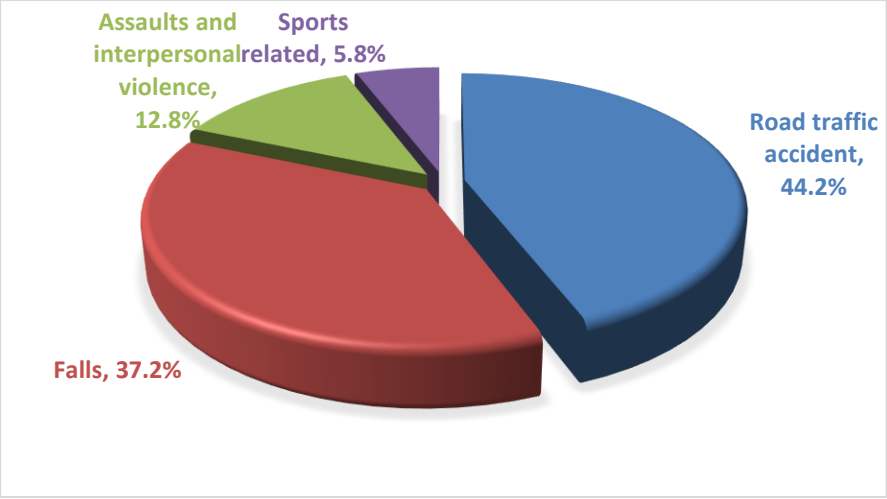

Figure 1 Etiology of minor head injury

[Citation: Ihsan, Q.U.A., Khan, K.A., (2024). Frequency of ct findings in patients with minor head injuries. *Biol. Clin. Sci. Res. J.*, **2024***: 1226*. doi: https://doi.org/10.54112/bcsrj.v2024i1.1226]

Table 2 Clinical Presentation of Minor Head Injury

Clinical Presentation of minor head injury	Frequency	Per cent
Loss of consciousness	39	45.3%
Vomiting	25	29.1%
Headache	14	16.3%
Post-trauma seizure	8	9.3%

Table 3 CT scan findings

CT Scan Findings	Frequency	Per cent
Skull Fracture	7	8.1%
Subdural Hematoma	10	11.6%
Subgaleal Hematoma	27	31.4%
Brain Contusion	5	5.8%
Normal CT findings	37	43.0%

Discussion

Our study included 86 patients with a mean age of 40.27 years and a nearly balanced gender distribution of 61.6% male and 38.4% female. The mean age of patients in our study (40.27 years) was also slightly higher than those observed in similar research. For instance, in the study by Bordignon KC et al., the mean age was 30.8 years. (10) This could reflect regional or social differences in the causes of trauma, as our study had a slightly older population more likely to be involved in road traffic accidents than younger populations, who might have higher incidences of interpersonal violence or falls, as reported in some studies.

The predominant cause of injury was road traffic accidents, accounting for 44.2% of cases, followed by falls (37.2%). This is consistent with other studies, such as the one by Ahmad I et al., which reported road traffic accidents as the leading cause of head injuries at 47.8%, followed by falls (29.6%) and assaults (19.9%). (11)

In terms of Glasgow Coma Scale (GCS) scores, our study had a fairly even distribution of patients with scores of 13, 14, and 15, with 34.9% of patients having a score of 13, while the remaining patients had scores of 14 and 15. This is quite similar to the distribution observed by Jamali K et al., where the majority of patients had a GCS score of 15, and a minority had scores of 13 and 14. (12) GCS remains a critical parameter for assessing the severity of head injuries, but our findings, along with others, indicate that even patients with seemingly mild GCS scores may harbour significant intracranial pathologies, further supporting the use of CT imaging as a diagnostic tool in minor head injuries.

Regarding clinical presentations, 45.3% of our patients experienced loss of consciousness, and 29.1% presented with vomiting. These figures are relatively consistent with the findings of Jamali K et al., who reported vomiting in 56.3% of their patients, followed by loss of consciousness in 22.1%. (12) The strong association of vomiting and loss of consciousness with intracranial abnormalities emphasizes the need for CT imaging in these patients despite their minor head injury status.

Furthermore, the presence of skull fractures was relatively consistent across studies, though the percentage varied slightly. Our study observed skull fractures in 8.1% of patients, similar to the 7.4% reported by Hamrah et al., and slightly lower than the 28.4% in Ahmad et al.'s study. The variance in fracture rates may be attributed to differences in the severity of trauma or the mechanisms of injury prevalent in different regions.

In terms of CT findings, our study observed that 31.4% of patients had subgaleal hematomas, 11.6% had subdural hematomas, and 8.1% presented with skull fractures. These findings align with Hamrah H et al., who found subgaleal hematomas in 80.9% of patients, with a lower frequency of intracranial pathologies such as skull fractures and brain contusions, observed in 7.4% of patients. (10) This discrepancy in subgaleal hematoma prevalence could be due to variations in trauma mechanisms and patient demographics, as well as differences in sample size, with our study featuring a smaller cohort of 86 patients compared to Hamrah H et al.'s 94 patients. (10)

Interestingly, both our study and others, like that by Bordignon KC et al., observed a significant portion of patients with normal CT findings. In our cohort, 43% of patients had normal scans, a figure comparable to the 60.75% reported in the aforementioned study. (10) The similarities in normal CT findings suggest that even in cases where head injuries are clinically significant, a large percentage of patients may not show acute intracranial pathology on CT, highlighting the importance of clinical indicators in decision-making for imaging.

Conclusion

In conclusion, our study highlights the critical role of CT scans in the evaluation of minor head injuries. While a significant portion of patients had normal CT findings, we identified important intracranial pathologies, such as subgaleal and subdural hematomas, in a notable number of cases. These findings emphasize that even in minor head trauma, imaging is essential for detecting potentially serious conditions that may not be immediately evident through clinical evaluation alone. The study also identified road traffic accidents as the leading cause of injuries in our cohort, further supporting the need for targeted imaging in such cases. Overall, our results advocate for the routine use of CT scans in patients with minor head injuries to ensure timely diagnosis and treatment.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate.

Approved by the department concerned. (IRBEC-TCH-044/23)

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

Authors Contribution

QURRAT-UL-AIN IHSAN (Assistant Professor)
Data Analysis, Concept & Design of Study
KAMRAN ALI KHAN (Principal medical officer)
Drafting, Revisiting Critically & Final Approval of version

References

1. Jiang J-Y, Gao G-Y, Feng J-F, Mao Q, Chen L-G, Yang X-F, et al. Traumatic brain injury in China. The Lancet Neurology. 2019;18(3):286-95.
2. Ownbey MR, Pekari TB. Acute Mild Traumatic Brain Injury Assessment and Management in the Austere Setting—A Review. Military medicine. 2022;187(1-2):e47-e51.
3. Mani K, Cater B, Hudlikar A. Cognition and return to work after mild/moderate traumatic brain injury: A systematic review. Work. 2017;58(1):51-62.
4. Masel BE, DeWitt DS, Levin H, Shum D, Chan R. Traumatic brain injury disease: long-term consequences of traumatic brain injury. Understanding traumatic brain injury: Current research and future directions. 2014;28.
5. Rutland-Brown W, Langlois JA, Thomas KE, Xi YL. Incidence of traumatic brain injury in the United States, 2003. The Journal of Head Trauma Rehabilitation. 2006;21(6):544-8.
6. Bouida W, Marghli S, Souissi S, Ksibi H, Methammem M, Haguiga H, et al. Prediction value of the Canadian CT head rule and the New Orleans criteria for positive head CT scan and acute neurosurgical procedures in minor head trauma: a multicenter external validation study. Annals of emergency medicine. 2013;61(5):521-7.
7. Burstein B, Upton JE, Terra HF, Neuman MI. Use of CT for head trauma: 2007–2015. Pediatrics. 2018;142(4).
8. Stanley RM, Hoyle Jr JD, Dayan PS, Atabaki S, Lee L, Lillis K, et al. Emergency department practice variation in computed tomography use for children with minor blunt head trauma. The Journal of Pediatrics. 2014;165(6):1201-6. e2.
9. Melnick ER, Shafer K, Rodulfo N, Shi J, Hess EP, Wears RL, et al. Understanding overuse of computed tomography for minor head injury in the emergency department: a triangulated qualitative study. Academic Emergency Medicine. 2015;22(12):1474-83.
10. Bordignon KC, Arruda WO. CT scan findings in mild head trauma: a series of 2,000 patients. Arquivos de neuro-psiquiatria. 2002;60:204-10.
11. AHMAD I, RAZA MH, ABDULLAH A, SAEED S. Intracranial CT Scan Findings in the Patients of Head Injury: An Early Experience at Dera Ghazi Khan Teaching Hospital. Pakistan Journal Of Neurological Surgery. 2020;24(3):248–52-–52.
12. Jamali K, Asadi AH. Evaluation Of Ct Scan Results In Patients With Minor Head Trauma Based Its Indications And Final Clinical Results In Patients Referred To Emergency Department Of Namazi Hospital In 2016. International Journal of Medical Investigation. 2018;7(1):49-55.