Pakistan Journal of Advances in Medicine and Medical Research (PJAMMR)
ISSN: (Online) 2957-5893
Website: https://www.pjammr.com/index.php/pjammr/homepage

Open Access
Volume 4, Issue 2, 2026

Original Article

Frequency of Extradural Hematoma Among Patients with Delayed Presentation After Head Injury.

Muhammad Ali Noman[1], Imran Khan[2],Mehran Ali[3], Mohammed Danial[4],Muhammad Nasir Khan[5],Sayed Wajid Ali[6]

1. Associate professor Neurosurgery, Hayatabad Medical complex, Peshawar
2. Assistant professor Neurosurgery, Hayatabad medical complex, Peshawar
3. Assistant Professor, Neurosurgery, Qazi Hussain Ahmad Medical Complex, Nowshera
4. Medical student, Bachelor of Medicine and Surgery, Peshawar Medical College.
5. Registrar, Neurosurgery, Hayatabad Medical Complex, Peshawar
6. TMO Neurosurgery, Hayatabad Medical Complex, Peshawar

Keywords: extradural hematoma, head injury, skull fracture, delayed presentation, Glasgow Coma Scale

Article History
Received:12-02-2026
Revision:14-03-2026
Accepted:18-05-2026
Published:10-07-2026

Corresponding Author:
Imran khan
Assistant Professor, Neurosurgery
Hayatabad Medical Complex, Peshawar
Email:dr.imran_1984@yahoo.com

DOI: 10.69837/pjammr.v4i2.122

How to Cite This Article:

Noman MA, Khan I, Ali M, Danial M, Khan MN, Ali SW. Frequency of Extradural Hematoma Among Patients with Delayed Presentation After Head Injury. **Pak J Adv Med Med Res. 2026;4(2):66-71.**

ABSTRACT

Background: Extradural hematoma is a potentially life-threatening complication of head injury, requiring timely diagnosis and management. Delayed hospital presentation may increase the likelihood of missed or clinically significant hematoma.

Objective: To assess the frequency of delayed onset extradural hematoma (EDH) in patients presenting with head injuries.

Methodology: 150 patients presenting with head injuries and skull fractures. The patients were 18 years or older of either gender. Patients were managed surgically or conservatively depending on the condition of the patients. Delayed presentation was defined as 6 hours or more. All the patients were assessed for the presence of EDH on CT scan.

Results: Mean age was 28.93 ± 6.64 years. Male patients were 105 (70%) and 45 (30%) were female patients. The frequency of extradural hematoma was 14 (9.3%). A significant association was observed between EDH and both lower GCS score at presentation and a delayed time to presentation > 8 hours.

Conclusion: The frequency of delayed onset of traumatic extradural hematoma in patients who were presented with head injuries in our study was 9.3%.

INTRODUCTION

The skull forms from the fusion of several flat bones, linked by cranial sutures. The inner table is composed of fibrous and thick dura mater. The subdural space is a small area located between the innermost part of the dura mater and the thin layer of arachnoid substance that surrounds the inner surface of the brain [1, 2]. In the absence of an external fracture, cranial contents can be damaged by head deformity following a specific impact. Extreme blunt force may result in a fracture of the skull at or near the impact site. Head injury is increasingly recognized as a significant health issue, with reports demonstrating that it accounts for 1% of total deaths as well as 15% of fatalities among adults aged 15 to [3]. Hematoma within the skull, especially extradural hematoma (EDH), represents a prevalent form of brain injury caused by trauma. This occurs as a consequence of blood buildup between the layers of the dura mater as well as the skull's outer table. The dura mater encases the brain, increasing the risk of hemorrhage outside the brain. [4, 5]. EDH may worsen a patient's condition by increasing intracranial pressure, which damages sensitive brain tissue and can cause brain shift. In cases of skull trauma or fracture lines intersecting the groove of the middle meningeal vessels, there is a possibility of tearing of the trunk, diploic vein, as well as dural venous sinus that can lead to an EDH [6, 7]. Bleeding from an artery contributes to the swift expansion of a hematoma as well as a rapid decline in mental state, whereas bleeding from a vein as well as diploic channels results in the development of an EDH after a long period of time. Regular neuroobservation is crucial in these cases, and the Glasgow Coma Scale should be monitored continuously. Deterioration in consciousness and the development of focal signs indicate a rapidly expanding EDH [8-10]. Traumatic EDH is a serious neurosurgical emergency that usually presents soon after head injury. However, the hematoma develops in a delayed fashion despite an initially normal or stable neurological status. Identifying the frequency of delayed-onset EDH in patients with head injuries is therefore crucial, as it can help guide clinical surveillance strategies and determine the need for repeat neuroimaging, facilitate timely intervention, which ultimately improves outcomes in patients who might otherwise deteriorate unexpectedly.

Material and Methods

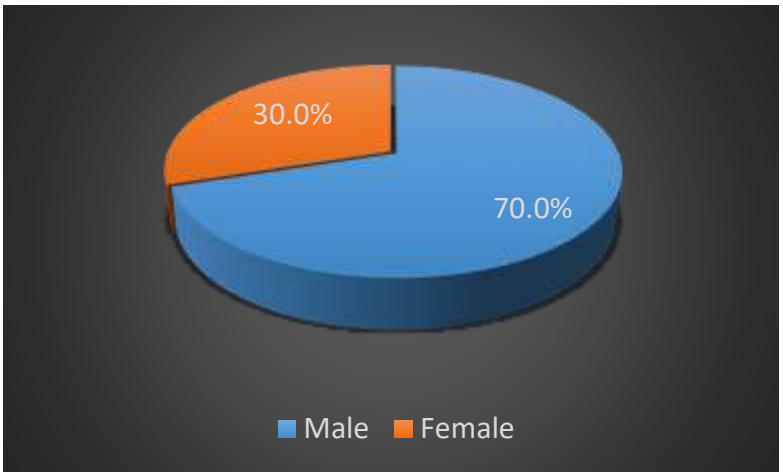
This cross-sectional study was carried out in the Department of Neurosurgery (Hayatabad Medical Complex, Peshawar) from August 2024 to August 2025, after obtaining ethical approval from the hospital. One hundred and fifty patients aged 18 years or above of either gender who were presented with head trauma and were found to have a skull fracture on radiographic evaluation were enrolled in the study. Patients were excluded if their EDH was determined to be secondary to a pre-existing bleeding disorder, an underlying vascular malformation, or if it occurred as a post-operative complication. Upon arrival, each patient underwent a standardized management protocol. Initial resuscitation and stabilization were performed in accordance with advanced trauma life support principles. A thorough clinical assessment was performed, including detailed documentation of the mechanism of injury and a comprehensive neurological examination. The Glasgow Coma Scale score was recorded at the time of admission and classified as mild (13-15), moderate (9-12), or severe (3-8). Pupillary response and the presence of any focal neurological deficits were also recorded. A non-contrast computed tomography scan of the head was obtained for every patient for confirmation of the skull fracture, its characterization, and the identification of an extradural hematoma. For our study, a delayed presentation was defined as a time interval of 6 hours or more from the moment of injury to the patient's arrival at the hospital facility. A senior neurosurgeon with more than five years of experience made the management decision, whether surgical intervention or conservative treatment, based on clinical and radiological findings. All the data were analyzed with SPSS 26. Age was summarized as mean ± standard deviation. Gender,

along with the presence of EDH and other clinical variables, was evaluated using frequencies and percentages. To assess the association of EDH with various parameters, we used the chi-square test, where P value ≤ 0.05 was considered significant.

RESULTS

The mean age in our study was 28.93 ± 6.64 years. Most patients were male (105, 70%), and 45 (30%) were female (Figure 1). The most common mechanism of injury in road traffic accidents was reported in 81 (54.0%) cases, followed by falls from a height in 34 (22.7%) cases. Upon initial assessment, the majority of patients, 101 (67.3%), presented with a mild head injury. Around 33 (22.0%) patients had a moderate head injury, while 16 (10.7%) presented with a severe injury (Table 1).Extradural hematoma was identified in 14 (9.3%) patients (Table 2). Two factors demonstrated a highly significant association with the presence of an extradural hematoma. Severe GCS at presentation was more prevalent in the EDH group (9 patients, 64.3%) than in the non-EDH group (7 patients, 5.1%). Second, presentation timing was also a significant factor. Delayed presentation beyond 8 hours was more common in those with an EDH, affecting 11 (78.6%) patients (Table 3).

Figure 1. Gender distribution of patients presenting with head injuries.



Gender distribution of patients presenting with head injuries.

Table 1. Clinical characteristics of the patients presenting with head injuries

Clinical characteristics	n	%
Mechanism of injury		
Traffic accident	81	54.0
Fall from height	34	22.7
Physical assault	24	16.0
Other	11	7.3
GCS score at presentation		
Mild (13–15)	101	67.3
Moderate (9–12)	33	22.0
Severe (3–8)	16	10.7
Time to presentation		
6–8 hours	109	72.7
>8 hours	41	27.3
Location of skull fracture		
Frontal	31	20.7
Parietal	50	33.3
Temporal	42	28.0
Occipital	27	18.0
Management		
Surgical	96	64.0
Conservative	54	36.0

GCS = Glasgow Coma Scale. Values are presented as frequency (n) and percentage (%).

Table 2. Frequency of extradural hematoma among patients presenting with head injuries

Extradural hematoma	n	%
Yes	14	9.3
No	136	90.7
Total	**150**	**100.0**

Values are presented as frequency (n) and percentage (%).

Table 3. Association of extradural hematoma with demographic, clinical, injury-related, and management variables

Parameter	Category	EDH Yes n (%)	EDH No n (%)	p-value
Gender	Male	12 (85.7)	93 (68.4)	0.17
	Female	2 (14.3)	43 (31.6)	

Mechanism of injury	Traffic accident	8 (57.1)	73 (53.7)	0.85
	Fall from height	2 (14.3)	32 (23.5)	
	Physical assault	3 (21.4)	21 (15.4)	
	Other	1 (7.1)	10 (7.4)	
GCS score at presentation	Mild (13–15)	1 (7.1)	100 (73.5)	<0.001
	Moderate (9–12)	4 (28.6)	29 (21.3)	
	Severe (3–8)	9 (64.3)	7 (5.1)	
Time to presentation	6–8 hours	3 (21.4)	106 (77.9)	<0.001
	>8 hours	11 (78.6)	30 (22.1)	
Fracture location	Frontal	2 (14.3)	29 (21.3)	0.45
	Parietal	7 (50.0)	43 (31.6)	
	Temporal	4 (28.6)	38 (27.9)	
	Occipital	1 (7.1)	26 (19.1)	
Management	Surgical	11 (78.6)	85 (62.5)	0.23
	Conservative	3 (21.4)	51 (37.5)	

EDH = extradural hematoma; GCS = Glasgow Coma Scale. Values are presented as frequency (n) and percentage (%). Percentages are calculated within the EDH groups. A p-value ≤0.05 was considered statistically significant.

DISCUSSION

The findings of our study which identified 9.3% frequency of dDelayed extradural hematoma (EDH) in a cohort of 150 head-injured patients with fractured skull, who were presented at 6 or more hours, contributed to the literature on this neurosurgical emergency. This frequency aligns with findings reported in studies that demonstrated considerable variation. Khan et al. reported 2% EDH in a hospital-based analysis, which is relatively lower than our findings.[11] Around 32.3% was reported in a study which specifically focused on patients with radiologically confirmed skull fractures by Haq et al.[12] Our finding however aligns with the 11.03% reported by Khattak et al and the 8.4% documented by Mezue et al (2012) in a Nigerian cohort.[13, 14] This variation is not unexpected and is largely attributable to fundamental differences in study design and patient selection.The demographic profile of our patient group reinforces the well-established epidemiology of traumatic EDH. The mean age of 28.93 ± 6.64 years and a higher male majority of 70.0% are findings consistently found in several studies. Rehman et al reported a nearly identical mean age of 27.6 years, and an even more skewed male-to-female ratio of 11.7:1.15. Similarly, Mezue et al. and Ghosh et al. found peak incidences in the second and third decades of life, with male percentages of 83% and 85%, respectively.14,15 This recurring pattern shows that EDH remains primarily more prevalent in young males, a trend often attributed to their greater exposure to high-risk activities. In our study, RTA was the leading mechanism of injury (54.0%), a finding that is consistent across the literature. Khan et al. documented that 52% of incidents were due to RTA.[11] Mezue et al. also reported similar findings, attributing 57% of cases to RTA.[14] Rehman et al. documented that 25 out of 38 cases were due to traffic accidents.[15] The most important findings of our analysis are the strong, statistically significant associations between EDH development and two key variables: the Glasgow Coma Scale (GCS) at presentation and time to presentation. Our data indicate that patients who developed an EDH were more likely to present with a lower GCS score (64.3% vs. 5.1%) and to arrive at the hospital after a delay of more than 8 hours (78.6% vs. 22.1%). A study conducted in Pakistan by Khalid et al. operated on 116 patients with acute epidural hematoma; they found that patients with lower GCS had a higher mortality rate, and those who presented after 6 hours had a higher mortality rate and lower functional recovery.[16] Rehman et al clearly demonstrated that larger hematoma size correlated with poorer GCS and worse outcomes.[15] Our study suggests that patients arriving later than 8 hours post-injury constitute a high-risk group. This is supported by Mezue et al (2012), who reported an average presentation delay of 94.2 hours in their cohort and noted that

mortality was notably higher in patients presenting after 72 hours.[14]Interestingly, our study did not find a statistically significant association between the presence or location of a skull fracture and the development of EDH, which contrasts somewhat with the study by Haq et al. (2021) that focused on this specific relationship. This discrepancy may be due to our smaller sample size of EDH patients (n=14) or differences in radiographic interpretation.[12]The significant association between delayed presentation and the diagnosis of EDH suggests that this factor should be heavily considered in clinical decision-making. We would strongly suggest that a history of head injury with a presentation delay exceeding 8 hours should be considered a major warning, prompting urgent neuroimaging even in the absence of dramatic neurological deficits at the moment of examination.

CONCLUSION

The frequency of delayed onset of traumatic extradural hematoma in patients who were presented with head injuries in our study was 9.3%; we found a notable association of EDH with lower GCS and delayed presentation of more than 8 hours.

Ethical Approval

Ethical approval was obtained from the Institutional Review Board/Ethics Committee of Hayatabad Medical Complex, Peshawar, before commencement of the study. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki and applicable institutional guidelines.

Informed Consent

Written informed consent was obtained from all participants before enrollment in the study. For participants who were unable to provide consent because of their clinical condition, consent was obtained from an authorized family member or legally acceptable representative, where applicable.

Conflict of Interest

The authors declare that they have no conflicts of interest related to this study or its publication.

Funding

The authors received no financial support from any public, commercial, or not-for-profit funding agency for the conduct of this study or preparation of the manuscript.

Data Availability Statement

The data generated and/or analyzed during the current study are not publicly available because they contain potentially identifiable clinical information but may be available from the corresponding author on reasonable request, subject to institutional and ethical restrictions.

Authors' Contributions (ICMJE)

Muhammad Ali Noman: Conception and design of the study, supervision, interpretation of the results, critical revision of the manuscript, and final approval of the version to be published.

Imran Khan: Conception and design, supervision of data collection, interpretation of findings, critical revision of the manuscript, and final approval of the final version.

Mehran Ali: Data collection, clinical assessment, literature review, manuscript drafting and revision, and final approval of the manuscript.

Mohammed Danial: Literature review, data collection, manuscript drafting, manuscript revision, and final approval of the manuscript.

Muhammad Nasir Khan: Data collection, clinical assessment, interpretation of findings, manuscript revision, and final approval of the manuscript.

Sayed Wajid Ali: Data collection, literature review, manuscript revision, and final approval of the manuscript.

All authors agree to be accountable for all aspects of the work and ensure that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

ICMJE Statement

All authors confirm that they meet the authorship criteria of the International Committee of Medical Journal Editors (ICMJE). All authors made substantial contributions to the conception or design of the study, acquisition or interpretation of data, participated in drafting or critically revising the manuscript for important intellectual content, approved the final version to be published, and agree to be accountable for all aspects of the work.

REFERENCES

1. Tsai YC, Rau CS, Huang JF, Chang YM, Chia KJ, Hsieh TM, et al. The association between skull bone fractures and the mortality outcomes of patients with traumatic brain injury. Emerg Med Int. 2022;2022(1):1296590.
2. Sidpra J, Jeelani NU, Ong J, Birch W, Mankad K. Skull fractures in abusive head trauma: a single center experience and review of the literature. Child's Nervous Sys. 2021;37(3):919-29.
3. Jennet B, MacMillan R. Epidemiology of head injury. Br Med J 1981;282:101-104.
4. Kulesza B, Mazurek M, Rams Ł, Nogalski A. Acute epidural and subdural hematomas after head injury: clinical distinguishing features. Indian J Surg. 2021;83(1):96-104.
5. Aromatario M, Torsello A, D'Errico S, Bertozzi G, Sessa F, Cipolloni L, et al. Traumatic epidural and subdural hematoma: epidemiology, outcome, and dating. Medicina. 2021;57(2):125.
6. Ssebakumba MK, Lule H, Olweny F, Mabweijano J, Kiryabwire J. Thirty-day clinical outcome of traumatic brain injury patients with acute extradural and subdural hematoma: a cohort study at Mulago National Referral Hospital, Uganda. Egyptian J Neurosurg. 2020;35(1):3.
7. Su TM, Lin CC, Lan CM, Lee TH, Hsu SW, Lu CH. Head trauma associated with supra-and infratentorial epidural hematoma: diagnostic and surgical considerations. World Neurosurg. 2023;176:e273-80.
8. Choi DH, Jeong TS, Kim WK, KNTDB Investigators. Clinical outcome of patients diagnosed with traumatic intracranial epidural hematoma with severe brain injury (Glasgow Coma Scale < 8) who undergo surgery: a report from the Korean Neuro-Trauma Data Bank System. Korean J Neurotrauma. 2022;18(2):153.
9. Bisen YT, Korde P, Dighe O, Iratwar S, Bisen G, Korde PA, et al. Decompressive craniectomy in the management of low Glasgow coma score patients with extradural hematoma: a review of literature and guidelines. Cureus. 2023;15(1): e33790
10. Backus BE, Moustafa F, Skogen K, Sapin V, Rane N, Moya-Torrecilla F, et al. Consensus paper on the assessment of adult patients with traumatic brain injury with Glasgow Coma Scale 13–15 at the emergency department: a multidisciplinary overview. Eur J Emerg Med. 2024;31(4):240-9.
11. Khan MJ, Shaukat A, Khalid M, Aziz MA. Surgical management and outcome analysis of extradural hematoma at Combined Military Hospital Rawalpindi. Pak Armed Forces Med J. 2009;59(1):70–3.
12. Haq MA, Abbas G, Ali A, Hamid M, Ahmed D, Javed S, et al. Frequency of Extradural Hematoma in Patients with Skull Fracture after Head Injury. Pak J Neurol Surg. 2021;25(1):49–56.
13. Khattak AU, Iftikhar-ul-Haq M, Azam F. Frequency of Extradural Hematoma in Patients with Head Injury. Pak J Neurol Surg. 2012;16(2):83–6.
14. Mezue WC, Ndubuisi CA, Chikani MC, Achebe DS, Ohaegbulam SC. Traumatic extradural hematoma in Enugu, Nigeria. Niger J Surg. 2012;18(2):80–4.
15. Rehman L, Karachi NJ. Association of Outcome of Traumatic Extradural Hematoma with Glasgow Coma Scale and hematoma size. Ann Pak Inst Med Sci. 2010;6(3):133–8.
16. Khalid S, Khan SA, Abbasi T, Aurangzeb A; Faiza; Khan AM. Mortality And Prognostic Factors In Patients Operated For Acute Epidural Hematoma. J Ayub Med Coll Abbottabad. 2023;35(Suppl 1)(4):S769-S773.