



## The Prognosis Of Traumatic Acute Subdural Hematoma In A Tertiary Care Center & Research Institute Of North India

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Type of Publication: Original Research Paper

Conflicts of Interest: Nil

### Abstract

**Background:** Acute traumatic subdural hematoma is life-threatening and is associated with high unfavorable outcomes in developing countries.

**Aims & Objective:** to identify factors contributing to outcomes after severe traumatic brain injury (TBI) due to acute subdural hematoma (SDH).

**Methods:** this was a retrospective-prospective cohort study of patients who got injury and presented with acute traumatic subdural hematoma. Further patient were evaluated on the basis that underwent neurosurgery for acute subdural hematoma and rest who were managed conservatively over a period of 18 months (from September 2020 to February 2022). Demographic data, clinical characteristics, and the time intervals from injury to initial management were investigated to determine the interactions between all these factors and outcomes. Outcomes were graded according to the Glasgow outcome scale at the time of admission and patients were followed up for three months after injury. Patients were evaluated for 3 months post discharge.

**Results:** out of all 42 patients only 9 had complete functional recovery. Out of 7 patients who had surgical evacuation for traumatic acute subdural hematoma, 3 patients died (42.8%), while rest 35 was managed conservatively over a period of 18 months.

**Conclusion:** the rate of unfavorable outcomes in acute subdural hematoma was high. The Glasgow coma score at admission was an important predictor for outcome in traumatic acute subdural hematoma and further interventions along with management was an important factor to decide the outcomes.

**Keywords:** surgical outcome, TBI, SDH, functional outcome, time from injury to surgery, GCS

### Introduction

Traumatic brain injury (TBI) is defined as an alteration in brain function, or other evidence of brain pathology, caused by an external force.<sup>[1]</sup> It varies in severity from mild TBI (which includes concussion) to moderate and severe TBI. Severe TBI carries a high mortality rate, estimated at 30- 40% in observational studies on unselected populations.<sup>[2]</sup> Those who survive they face a potential chances of physical, psychiatric, emotional and cognitive

disabilities, which disrupt the living conditions of patients and their families and pose huge economic burden to community. Morbidities in these cases are not only restricted to more severe cases, persist frequently after moderate or mild TBI. It is a growing public health problem of substantial proportions. Over 50 million TBIs occur internationally each year.<sup>[3]</sup> The epidemiology of TBI is changing in developed countries, where it was found that TBI incidence is raising in the elderly and at the same

time in developing countries the incidence of TBI from road traffic incidents is increasing. Across all ages, TBI represents 30 to 40% of all-injury related deaths, and neurological injury is expected to remain the most important cause of disability from neurological disease (2–3 times higher than that for Alzheimer disease or cerebrovascular disorders) till 2030.<sup>[4]</sup>

Traumatic brain injury (TBI) has higher rates of morbidity and mortality. It further leads to varying degrees of dependency, emotional instability and economic imbalance. It occurs as a result of injury to brain within the cranium. It has been assessed from various studies that male population is major victim of these injuries.<sup>[5]</sup> Traumatic acute subdural hematoma (ASDH) is highly life threatening traumatic brain injury with a mortality rate ranging from 30% to 70%.<sup>[6]</sup> The advancement along with availability of computerized tomography scan (CT-scan) has hiked the ability of physicians to assess and diagnose the lesions with greater accurately. CT imaging has helped a lot to decline the rates of morbidities and mortalities throughout the globe. Despite that mortality and morbidity rates are still higher in developing countries.<sup>[7]</sup> Most of the cases of ASDH were unilateral and involved the parietal lobe of brain parenchyma.<sup>[8]</sup> There are many factors which are associated in the prognosis of ASDH. These generally include Glasgow Coma Scale (GCS) score, pupillary abnormalities, systemic blood pressure, respiratory rate, glycemic status, length of hospital stay, hypoxia, presence or absence of a sub-arachnoid bleed, intra-ventricular hemorrhage and time of interventions, care of comatose patients, comorbidities and nosocomial infections.<sup>[9]</sup> It has been proved that early surgical interventions have reduced the mortality rate of ASDH where surgical removal of hematoma was mandatory. In India nearly two million people sustain brain injuries, 0.2 million succumb to death and nearly a million need rehabilitation services every year. The majorities of these individuals are males, in their early years (5 - 44 years) and often involved in road traffic injuries. The survivors of injuries had various problems in day-to-day life affecting almost every sphere of life. There is lack of comprehensive, integrated, preventive and rehabilitative programmes in order to manage patients of TBI throughout country.<sup>[10]</sup> There is utmost need to open and strengthen trauma centres

nationwide to prevent further mortalities and morbidities.

## Materials And Methods

**Study Area:** Patients of trauma who were brought to Department of Surgery Rajshree Medical Research institute, Bareilly, Uttar Pradesh, India.

**Study Design:** retrospective-prospective cohort study.

**Study Period:** September 2020 to February 2022.

**Sampling technique:** This was a retrospective review of all patients who got injury and presented with acute traumatic subdural hematoma. Further patient were evaluated on the basis that underwent neurosurgery for acute subdural hematoma and rest who were managed conservatively over a period of 18 months (from September 2020 to February 2022). Demographic data, clinical characteristics, and the time intervals from injury to initial management were investigated to determine the interactions between all these factors and outcomes. Outcomes were graded according to the Glasgow outcome scale at the time of admission and patients were followed up for three months after injury. Data were collected from previously prepared patient information sheets.

**Study variables:** Demographic data (age and sex), the time between the injury and start of management. GCS score at the time of admission, and Glasgow Outcome Scale (GOS) score after 3 months of treatment were evaluated. Factors which affected the outcomes were determined.

**Inclusion Criteria:** all patients who got injury and presented with acute traumatic subdural hematoma were included in study.

**Exclusion Criteria:** patients with non-traumatic or hypertensive subdural hematoma were excluded from study.

**Study tools:** Secondary data was collected trauma records of patients who were brought to Department of Surgery Rajshree Medical Research institute, Bareilly, Uttar Pradesh, India with history of head injury. The Glasgow Coma Scale (GCS) score was used to classify the severity of the injuries. Patients with GCS of 13-15, 9-12, and  $\leq 8$  were classified as mild, moderate, and severe injury respectively. The outcome was measured using GOS till 3 month after discharge. The GOS 1 indicated mortality and GOS

2-4 indicated a residual disability whereas GOS 5 indicated good functional recovery. The GOS 2 indicated vegetative state, GOS 3 indicated severe disability, GOS 4 implied moderate disability. Only GOS 5 was used to describe a favorable outcome while GOS scores 1-4 were regarded as unfavorable

outcomes. This scale was chosen because of its established validity; inter observer invariability, and its wide adoption as a standard means of describing outcomes in head injury.

**Statistical Analysis:** Data collected was analyzed with the help of Statistical Methods.

**Results**

**Table 1. Age and gender tabulated against the outcome**

Clinical Variables	No. of Patients	Mortality	Residual Disability	Functional Recovery
<b>Gender</b>				
Male	34	15	12	7
Female	8	3	3	2
<b>Age (Yrs)</b>				
0 – 13	3	2	1	0
14 – 25	12	5	5	2
26 – 45	18	7	5	6
46 – 60	9	5	4	1

Table 1. and Fig. 1 reveals that total of 42 patients were admitted for traumatic acute subdural hematoma. Of the total of 42 cases, 34 were males, and 8 were females, with a male to female ratio of 4.25:1.

Fig. 1: depicting male to female ratios of acute subdural injuries leading to mortality, residual disability & functional recover

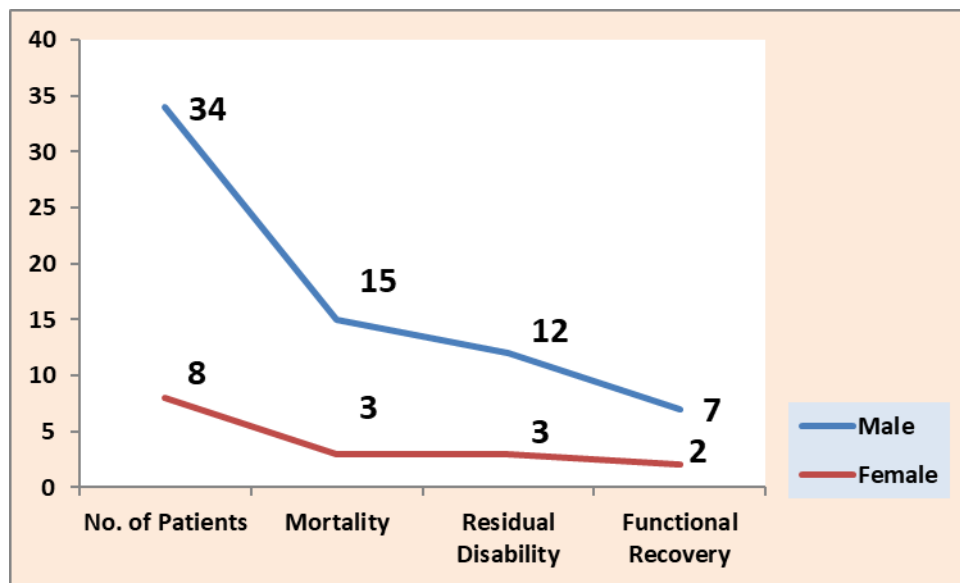
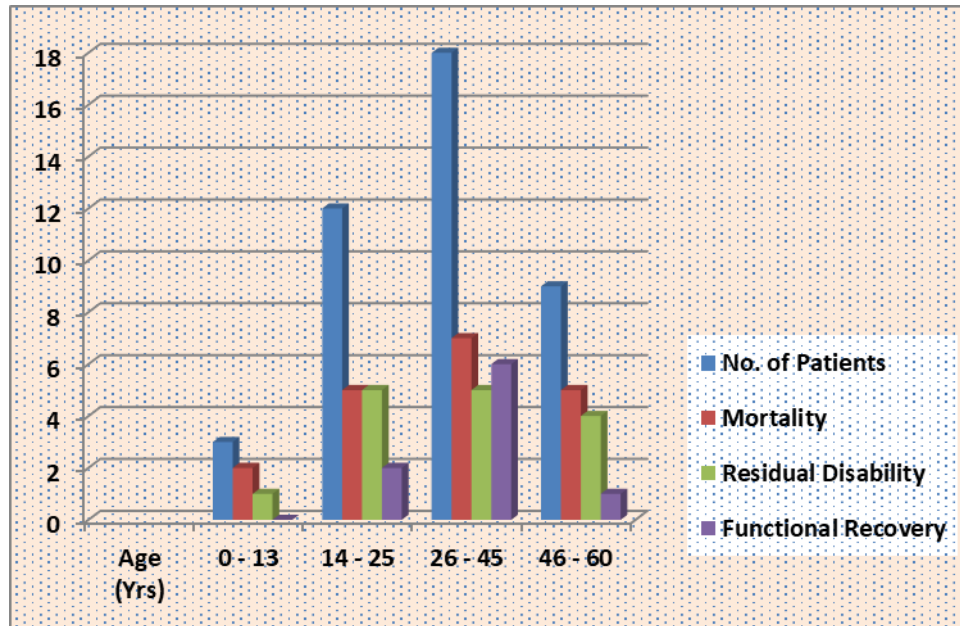


Table 1. & Fig. 2 describes that there was an uneven age distribution as most patients (58.8%) were in the 25 to 45 years age category. Six of the nine patients (66.0%) with good functional outcomes were between the ages of 26 to 45 years

**Fig. 2** describing number of acute subdural injuries leading to mortality, residual disability & functional recovery.

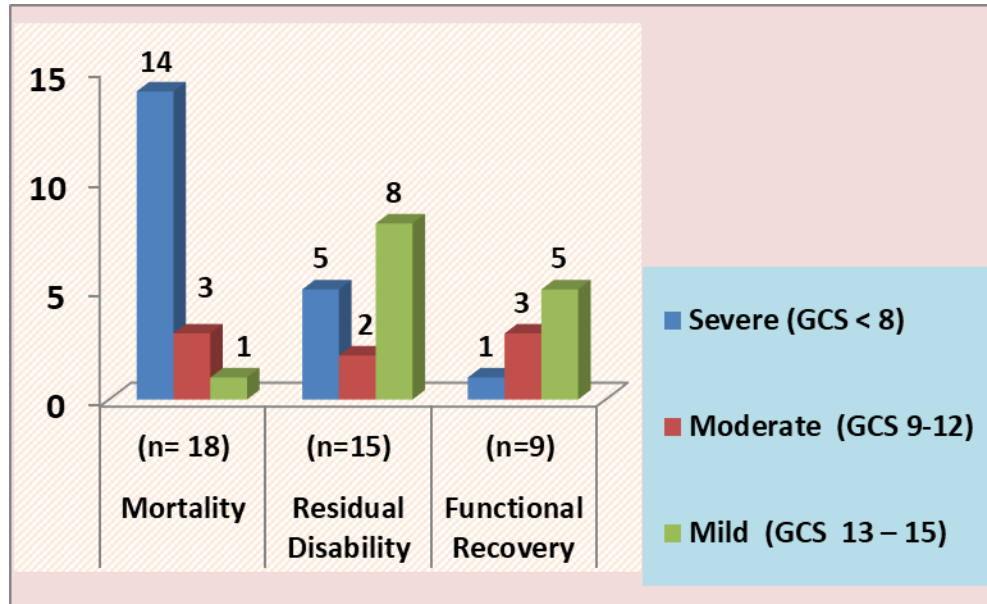


**Table 2.** Glasgow coma scale tabulated with surgical outcome

Glassgow Coma Score (GCS Score)	Mortality (n= 18)	Residual Disability (n=15)	Functional Recovery (n=9)
Severe (GCS < 8)	14	5	1
Moderate (GCS 9-12)	3	2	3
Mild (GCS 13 – 15)	1	8	5

Table 2 & Fig. 3 illustrated that the injury severity at presentation assessed using the GCS showed 33.3% (14 of 42) of patients presented with mild injury, 19.0% (8 of 42) of patients presented with moderate injury while severe brain injury was seen in (GCS≤8) 47.6%. An overall 42.8% (18 of 42) mortality was recorded, with most deaths in the severely injured patients (14 of 18) deaths. There is an uneven distribution of mortality in these categories. Three deaths (16.6%) were recorded for the moderately injured group and one patient died in the mildly injured group. In this group eight had residual disabilities and five had full recovery. Good functional outcome was recorded in 37.5% (Three of 8) of these patients with moderate injury. Only five of the patients who presented with GCS of 13-15 had a favorable outcome. Around 7.1% of patients (one of 14) with mild injury, died.

**Fig. 3: Glasgow coma scale with surgical outcome**



### Discussion

In our study we found that majority of patients who got TBI were male who comprised 81% of total cases while female predominance was 19%. Male proportion was higher which can be attributed to their more indulgence in road traffic accidents, violence, indulgence in more adventurous activities, unsafe and dangerous working conditions. In a similar study done by, Sahinoglu M, *et al.*: they found that male patients constituted 79.8% which exactly corresponds to finding of our study.<sup>[11]</sup> This can be due to our social culture where females do not practice much unskilled external work and prefer less journeys.

In our findings we came across that ASDH developed in approximately a third of brain injuries due to severe head trauma and presented as a life-threatening condition in the neurosurgical emergency. Out of our 42 patients, the mortality rate was 43%, which is comparable to previously reported high mortality rates in study done by Elhawary MA, *et al.*: where they found mortality rate was as high as 53.3%.<sup>[12]</sup>

Increasing age has been associated with higher mortality from traumatic brain injury. In our study, we observed a higher mortality rate (55.5%, 5 out of 9) in patients aged 46 to 60 (n=9), compared to the mortality rate (41.6%, n=5) in patients between the ages of 14 to 25 (n=12). This corresponds to other studies by Kulesza *et al.*, found that 35-year-old patients had more frequently a favorable outcome

than the elderly patients (80% vs. 61.11%). The mortality rate in older patients is higher which may be explained by that older patients may have pre-existing co-morbidities that may worsen their clinical prognosis.<sup>[9]</sup>

In our present study all patients were operated on as soon as possible after indications for surgical evacuation of subdural hematoma were indicated. This evacuation was further dependent on the GCS score, hematoma thickness, parenchymal edema and other factors concerned to injury. The surgical evacuation was achieved by decompressive craniotomy or craniectomy. Decompressive craniotomy was used in patients with lower GCS and severe edema to provide enough space for brain relaxation and to prevent herniation. Bullock *et al.* described the indications for surgical evacuation in ASDH, these include (i) thickness greater than 10mm or midline shift greater than 5mm on CT and (ii) GCS less than 9 plus SDH less than 10mm or midline shift less than 5mm if the GCS score decreased at any point in the delays between injury and hospital admission.<sup>[13]</sup>

Patients with ASDH frequently presented with altered states of consciousness. The GCS is a practical classification method that directly reflects brain damage, reflects clinical status, and provides information on survival during follow-up. The GCS at presentation has been regarded as one of the most important predictors of surgical outcome in acute

subdural hematoma. In study on risk factor for mortality done by Arumugam G *et al.* found that patients who were intubated had a 15.6 times higher chance of mortality, Patients who were brought to hospital more than 6 hours after trauma had a mortality rate that was 2.9 times higher than those who were brought earlier.<sup>[14]</sup> Those who complained of vomiting, seizure, cerebrospinal leak, having fever and hyponatremia were found to be at higher risk leading to mortality.

### Conclusion

The rate of unfavorable outcomes in acute subdural hematoma is high in comparison to acute epidural hematoma. The GCS at admission is an important predictor for outcome in traumatic acute subdural hematoma. There were no significant relationship between the outcomes and the gender distribution. It is reasonable to perform a timely surgical decompression of acute subdural hematoma as soon as possible. Early interventions can prevent hypoxia to brain and prevent further worsening of GCS which will further decrease mortality and morbidities. There is utmost need of opening and strengthening emergency trauma centres at higher numbers for early accessibility, so as to achieve better outcomes in case of brain injuries.

### References

1. Menon DK, Schwab K, Wright DW, Maas AIR. Position Statement: Definition of Traumatic Brain Injury. *Arch Phys Med Rehabil* 2010; 91: 1637–40
2. Rosenfeld J V, Maas AI, Bragge P, Morganti-kossmann MC, Manley GT, Gruen RL. Early management of severe traumatic brain injury. *Lancet* 2012; 380: 1088–98.
3. Feigin VLV, Theadom A, Barker-Collo SL, et al. Incidence of traumatic brain injury in New Zealand: a population-based study. *Lancet Neurol* 2013; 12: 53–64.
4. WHO. Neurological Disorders: Public Health Challenges. 2006 [http://www.who.int/mental\\_health/neurology/neurological\\_disorders\\_report\\_web.pdf](http://www.who.int/mental_health/neurology/neurological_disorders_report_web.pdf) (accessed March 15, 2017).
5. Thanni L, Kehinde O: Trauma at a Nigerian teaching hospital: pattern and documentation of presentation . *Afr Health Sci.* 2006, 6:104-107.
6. Chen SH, Sun JM, Fang WK: The impact of time from injury to surgery in functional recovery of traumatic acute subdural hematoma. *BMC Neurol.* 2020, 20:226. 10.1186/s12883-020-01810-4
7. Alagoz F, Yildirim AE, Sahinoglu M, et al.: Traumatic acute subdural hematomas: analysis of outcomes and predictive factors at a single center. *Turk Neurosurg.* 2017, 27:187-191. 10.5137/1019-5149.JTN.15177-15.2
8. Adeyekun AA, Obi-Egbedi-Ejakpovi EB: Computerised tomographic patterns in patients with head injury at the university of Benin teaching hospital. *Niger J Clin Pract.* 2013, 16:19-22. 10.4103/1119-3077.106717
9. Kulesza B, Litak J, Mazurek M, Nogalski A: Initial factors affecting 6-month outcome of patients undergoing surgery for acute post-traumatic subdural and epidural hematoma. *Folia Med (Plovdiv).* 2020, 62:94-104. 10.3897/folmed.62.e47743.
10. Elovic E, Baerga E, Cuccurullo SJ, Greiss C, Thomas A, Levine J, et al. Traumatic brain injury. *Phys Med Rehabil Board Rev Fourth Ed.* 2019;55–100.
11. Alagoz F, Yildirim AE, Sahinoglu M, et al.: Traumatic acute subdural hematomas: analysis of outcomes and predictive factors at a single center. *Turk Neurosurg.* 2017, 27:187-191. 10.5137/1019-5149.JTN.15177-15.2
12. Elhawary MA, El Shokhaiby UM, Ali WE, Gafar AM, Abd El Rahman AA: Factors affecting the prognosis of traumatic acute subdural hematomas. *Sci J Al-Azhar Med Fac Girls.* 2019, 3:246-251. 10.4103/sjamf.sjamf\_12\_19
13. Bullock MR, Chesnut R, Ghajar J, et al.: Surgical management of acute subdural hematomas . *Neurosurgery.* 2006, 58: S2-16-S2-24,. 10.1227/01.NEU.0000210364.29290.C9
14. Arumugam G, Krishnaswamy V, Nair N, Visweswaran V, Naidu B, Ganesh K: Factors influencing the outcome of patients with

traumatic acute subdural hematoma (ASDH) - a  
single centre analysis. Interdiscip Neurosurg.

2021, 25:101130. 10.1016/j.inat.2021.101130.