INTRODUCTION

Although children and adults are affected by traumatic injuries the problems that are worse in the pediatric group due to the long-term implications of the mortality and morbidity. Measurable deficits occur even after mild-to-moderate head injury, but are markedly greater after severe injury.\textsuperscript{1,2} In addition, the presence of an intracranial injury contributes significantly to the mortality resulting from poly trauma.\textsuperscript{3,4} Head injuries of varied severity are increasingly being recorded at emergency department in pediatric population in recent times.\textsuperscript{5,6} Although the etiology varies with age and geographic location, economic status, road traffic accidents (RTA), falls, and child abuse account for most.\textsuperscript{5-8} Dewan et al., incorporated traumatic brain injury (TBI) data from five continents and concluded the global incidence of pediatric TBI to be in between 47 and 280 per 100,000 children; it has a bimodal age distribution with very young children (0–2 years) and adolescents (15–18) more commonly injured; and TBI in males is reportedly more common over the age of 3 years.\textsuperscript{6} According to the same study, fortunately in most cases, pediatric TBI is mild
Results

One hundred and fifty patients aged between 1 day and 18 years were included in the study comprising 66.67% males and 33.33% females (Table 1). The most common modes of injury were fall 56.67% followed by RTAs 23.33%, assault 6.67%, and others 13.33% which include sports injury, hit by some object on head, and firearm injury. RTAs had a poor outcome in 14.29%, while patients with fall had a poor outcome of 14.12% (Table 1). Majority of our patients had a GCS of 13–15 (mild head injury), 74.66% followed by 9–12 (moderate), 18%, and 8 or less (severe head injury) 7.33%. In group of patients in the category of GCS ≤8, poor outcome was seen in 63.64% (Table 1). Out of the 150 patients, 80% patients had normal pupils, 14.67% had anisocoria, and 5.33% patients had fixed dilated pupils. Fixed dilated pupil had poor outcome (100%) followed by anisocoria (20%) and normal pupils (20%), which was statistically significant. CT scan findings were noted as normal in 12% patients, isolated skull fracture in 16%, contusion or haemato ma in 32%, extradural haemorrhage (EDH) in 10.67%, subdural haemorrhage (SDH) in 10%, pneumocephalus in 8%, brain oedema in 6%, and subarachnoid haemorrhage in 5.33%. Among the mode of injury, it is evident that diffuse brain oedema had poor outcome in 44.45%, SDH in 20%, and contusion in 14.59%, while, in EDH, it was 18.75% (Table 2). We inferred that poor outcome was associated with the highest (68%) being midline shift (MLS) >3 mm and it was 12.77% with MLS of <3 mm and it was 10.26% in patients with no MLS (Table 2). Out of the 150 patients, 62% were managed...
conservatively and the rest were managed surgically. The various surgical procedures performed in patients include fracture debridement and elevation in 20%, haematoma or contusion removal in 10.67%, and decompressive craniectomy in 7.33% (Table 3). Other associated injuries included facial bone fracture in 14%, abdominal organ injury in 4%, limb fracture in 7.33%, spinal injury in 3.33%, chest injury in 4.67%, and multiple injuries in 9.33% (Table 4); Glasgow coma scale was evaluated as shown in Table 5.

**DISCUSSION**

Management of pediatric TBI in neurosurgical units has much scope for modification and renovation. Good prognosis in most cases is usual in childhood head-trauma cases. Injuries are mostly sustained as a part of polytrauma and seldom in isolation and are approached in a similar fashion as done in cases of adulthood poly trauma. No real difference in outcome in age groups above and below 5 years has been demonstrated by recent study by Wani et al., and Suresh et al. The age has been described as a definite factor for determination of morbidity/mortality by few old studies and these results perhaps had been derived from comparison between adults and children with TBI. It has been evident that fall followed by RTA has been the most common two modes of pediatric TBI as reported in series. Poor outcome was seen in patients with low GCS (<8) and good outcome in patients presenting with initial GCS >9. Initial GCS score has been shown to be the most statistically important clinical factor predicting outcome. Delayed presentations to the emergency and utterly inadequate pre-hospital care are likely two main culprits for poorer prognosis in countries like India. Pupillary response is another strong predictor of final outcome in cases of pediatric TBI. Invariably poor outcome is seen in cases with dilated and fixed pupils. In this series of paediatric TBI, outcome was strongly related to pupillary size and reaction. Brain oedema followed by evidence of SDH and SAH on CT scan of brain had poorer outcome compared to evidences of EDH, pneumocephalus, fracture, and contusion on initial brain imaging. This has been found in many studies. EDH is rare in paediatric head trauma and can occur without skull fracture, compared to adults. Diffuse cerebral oedema was associated with poorer outcome in our series like in the previous studies. Final outcome, as assessed by GOS scale, revealed death in only 10.66% cases and completely normal outcome in 60% cases and 12% had severe disability.
LIMITATIONS OF THE STUDY
Sample size was less and thus did not represent the entire population. Pre-hospital care was not included in this study. Long term follow up could not be done.

CONCLUSION
The most important prognostic factors regarding paediatric TBI are GCS at presentation, pupillary status, associated injuries, and CT scan findings. Outcome would have been better had presentation of patients would have been early along with proper prehospital management. Diffuse cerebral oedema has resulted in poor outcome.

ACKNOWLEDGMENT
Dr. Jayanta Ghosal and Dr. Sumanta Sarkar have reviewed the literature, interpreted the results and helped in preparing the manuscript. With their help I have designed and prepared the first draft of the manuscript.

REFERENCES


Authors' Contributions:
AG- Concept and design of the study, prepared first draft of manuscript; JG, SS- Interpreted the results; reviewed the literature and manuscript preparation; AC- Concept, coordination, statistical analysis and interpretation, preparation of manuscript.

Work attributed to:
Institute of Post-Graduate Medical Education and Research and SSKM Hospital, Kolkata - 700 020, West Bengal, India.

Orcid ID:
Dr. Arijit Ghosh - https://orcid.org/0000-0002-4849-0403
Dr. Aniruddha Chattopadhyay - https://orcid.org/0000-0002-4000-7181
Dr. Jayanta Ghosal - https://orcid.org/0000-0002-5716-7552
Dr. Sumanta Sarkar - https://orcid.org/0000-0002-5777-845X

Source of Support: Nil, Conflicts of Interest: None declared.