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## A death calls from unsafe heights. A study of factors influencing the outcome of surgically treated pediatric head trauma patients in baghdad

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### ABSTRACT

Pediatric head injury accounts for a large number of admissions in emergency rooms, it is a major cause of morbidity and mortality in children over 1 year of age. The aim of this study is to assess the outcome of surgically treated pediatric patients with head trauma in Baghdad. This prospective cross-sectional study was conducted in neurosurgery hospital in Baghdad including fifty-two patients of the pediatric age group from 1 year to 14 years old with surgically operated head trauma, in the period from 1/10/2014 till 1/10/2015. All the patients were received; examined and managed properly and followed up till 6 months after surgery. The outcome was truly affected by the mechanism of injury ( $p=0.001$ ), falls from heights were the most common mechanism, and it was significantly related to mortality, it also increased the rate of disability, while it had no significance regarding a good functional recovery. There were associated orthopedic injuries which also affected the outcome significantly ( $p=0.01$ ) increasing the mortality and disability. The outcome was truly affected by pediatric coma scale ( $p=0.001$ ), functional recovery was increased with higher score and mortality increased with a lower score, and disability increased in both severe and moderate scores. Pediatric trauma score had a significant effect on the outcome ( $p=0.001$ ), in the score (less than 0) it increased the mortality, in the score (0-5) morbidity was increased. Falls from heights are the most common mechanism of pediatric head trauma and greatly affect the outcome. Concomitant orthopedic injuries are associated with poor outcome. Pediatric coma scale, pediatric trauma score are significant tools in predicting the outcome.



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### INTRODUCTION

Pediatric head injury accounts for a large number of admissions in emergency rooms, and it is a major cause of morbidity and mortality in children over 1 year of age. The most common type of injury is fall from heights, followed by motor vehicle accidents (Alexiou *et al.*, 2011).

Due to causing severe brain injury. The outcome measurement is fundamental to the effective evaluation of clinical management of any illness. In a disease process such as head injury, which has an infinite variation in severity and which is influenced

by countless variables, objective measures of outcome are critical in the assessment of treatment regimens. The Glasgow outcome scale (GOS) is the most widely used method for assessing outcome after head trauma. It is also used to assess the outcome of many other neurosurgical disorders (Kaye and Andrewes, 2000; Winn *et al.*, 2011).

The aim of this study is to assess the outcome of surgically treated pediatric patients with head trauma in Baghdad.

## MATERIALS AND METHODS

This prospective cross-sectional study was conducted in neurosurgery hospital in Baghdad including fifty-two patients of the pediatric age group from 1 year to 14 years old with surgically operated head trauma, in the period from 1/10/2014 till 1/10/2015. All the patients were received; examined and managed properly and followed up till 6 months after surgery.

The patients were included in the study after taking consent, they were transferred from Baghdad and its territories, all information regarding age, gender, residency, time of trauma, mechanism of injury, time of admission, detailed history and full general and neurological examination were recorded.

Cranial CT scan was done for all patients; pediatric coma scale and pediatric trauma Score were recorded.

All patients in this study were surgically treated, and operative details were addressed.

Immediate postoperative neurological status and period of intensive care stay were recorded.

All patients were followed up after 6 months from the time of surgery, and the Glasgow outcome scale (GOS) recording was done for them (Bahloul *et al.*, 2011). In this study, all the grades between death and good functional recovery were considered as a disability

The analysis of data was done by using statistical package for social sciences (SPSS) version 17, chi-square for continuous variables and t-test for discrete variables were used, regression models were considered for determination of the independent effect of variables on the outcome, a p-value less than 0.05 was considered significant.

## RESULTS AND DISCUSSION

In our study; there were 52 cases of pediatric head trauma treated surgically, 53% were males while 47% were females, 36.5% were (1-3) years, 30.7%

were (4-6) years, and 32.6% were (7-14) years. There were 82.7% with good functional recovery, 7.7% with a disability, and 9.6% were dead. Regarding the mechanism of injury, falls from heights were the most common mechanism (46.1%), followed by car accidents (19.2%), fan injury (9.7%), while other injuries like motorcycle accidents, bullets, stabbing, shell injuries collectively comprised (25%). The patients received after 4 hours of injury were 53.8 %, while 46.2% were received before 4 hours since their injury. There were associated orthopedic injuries in 38.4% of cases while 61.6% were without such injuries. Regarding pediatric coma scale; it was (3-8) in 15.4% of patients, (9-12) in 25% of patients, and (13-15) in 59.6% of them. Regarding pediatric trauma score; it was (9-12) in 46.2% of cases, (6-8) in 36.6%, (0-5) in 9.6%, and (below 0) in 7.6%. There were intracranial extradural hematomas in 44.2% of cases, while subarachnoid hemorrhage with contusions comprised 21.1% of patients and acute subdural hematoma in 11.6%, other hematomas comprised 23.1% of total patients. All patients were surgically treated, a craniotomy was the treatment option in 30.8%, 25% were treated with craniectomy, while 21.2% were operated with dural repair, other types of surgeries comprised 23%. There were 67.3% urban and 32.1% of suburban people.

The outcome was truly affected by the mechanism of injury ( $p=0.001$ ), falls from heights was the most common mechanism, and it was significantly related to mortality, it also increased the rate of disability, while it has no significance regarding a good functional recovery. There were associated orthopedic injuries which also affect the outcome significantly ( $p=0.01$ ) increasing the mortality and disability. The outcome was truly affected by pediatric coma scale ( $p=0.001$ ), functional recovery was increased with higher score and mortality increased with a lower score, and disability increased in both severe and moderate scores. Pediatric trauma score had a significant effect on the outcome ( $p=0.001$ ), in the score (less than 0) it increased the mortality, in score morbidity was increased (as shown in the Table 1).

In this study, there were 82.7% with good functional recovery, 7.7% with a disability, and 9.6% were dead. The disability is low in comparison with other articles such as that of. which showed a disability approximating 20% (Bahloul *et al.*, 2011; Chillab *et al.*, 2019), may be due to different main mechanism of injury in both studies.

Considering the mechanism of trauma, falls were the commonest cause of injury (46.1%) and it sig-

**Table 1: Distribution of studied variables according to the outcome**

Variable	Number	Mortality	Disability	Good recovery	p-value
1-3 years	19	3	2	14	0.349
4-6 years	16	1	1	14	
7-14 years	17	1	1	15	
Gender	28	3	1	24	0.419
Male					
Female	24	2	3	19	
Mechanism of injury					0.001
Fall from heights	24	4	2	18	
Car accident	10	1	0	9	
Fan injury	5	0	0	5	
others	13	0	2	11	
The time between injury and reception	24	1	2	21	0.1
Less than 4 hours					
More than 4 hours	28	4	2	22	
Associated orthopedic injuries	20	4	4	12	0.01
yes					
no	32	1	0	31	
Pediatric coma scale	8	4	2	2	0.001
3-8					
9-12	13	1	1	11	
13-15	31	0	1	30	
Intracranial hemorrhage					0.471
Extradural hematoma	23	0	1	22	
Subarachnoid hemorrhage with contusions	11	2	1	8	
Acute subdural hematoma	6	3	1	2	
Others	12	0	1	11	
Pediatric trauma score	24	0	0	24	0.01
9-12					
6-8	19	0	0	18	
0-5	5	1	4	0	
Less than 0	4	4	0	0	
Type of surgery	16	1	1	14	0.5
Craniotomy	13	1	1	11	
Craniectomy					
Dural repair	11	1	1	9	
Others	12	2	1	9	
Urban	17	1	1	12	0.1
Suburban	35	4	3	31	

nificantly affected the outcome, it was compatible with study of (Park *et al.*, 2004) Children especially in suburban regions living in houses with unsafe higher tiers were more prone to fall (Shamran *et al.*, 2018; Al-Grawi and Al-Awsi, 2018).

Pediatric coma scale was regarded as one of the important prognosticators of the outcome because the lower the score, the higher the mortality, while 30 out of 31 with score 13-15 lived without a disability. This was compatible to a study done by (Kumar *et al.*, 2009).

The outcome was affected by associated orthopedic injuries, which comprised more than one-third of cases; increasing both mortality and disability. May be due to blood loss or fat embolism. This was agreed in a study done by in USA (Al-Grawi and Al-Awsi, 2018; Jagannathan *et al.*, 2008; Alsudani, 2017; Alsudani and Al-Shibli, 2015; Chalap and Al-Awsi, 2019; Al-Awsi *et al.*, 2019).

Some studies like that published in Journal of Trauma (Ott *et al.*, 2000; Abdulhussein and Al-Awsi, 2019) in 2000 and a study of (Zuccarello *et al.*, 1985) considered that the prognostic value of Pediatric trauma score was questionable and a matter of debate, our study has shown it as a prognostic tool of outcome because there was a significant relationship between the score and the outcome. All patients in this study who presented with a score less than zero was dead, and 4 out of 5 who presented with a score between 0-5 were with a disability while the fifth one was dead.

Patients age, gender, time between injury and reception in the emergency room, type of intracranial hematoma, type of surgery, address of patients showed no significant relation to the outcome.

## CONCLUSION

Falls from heights are the most common mechanism of pediatric head trauma and greatly affect the outcome. Concomitant orthopedic injuries are associated with poor outcome. Pediatric coma scale, pediatric trauma score are significant tools in predicting the outcome.

## Recommendation

Issuing new legislations to restrict unsafe building designs. More educational programs for the parents about the risks of pediatric head injury and means of avoiding it. Availability of rescue teams in trauma sites to ensure safe and abrupt transportation of trauma patients. Establishing pediatric trauma centres that involve teams of multiple specialities as orthopedics and pediatric surgeries to ensure the collaborative work because pediatric head injuries

may involve injuries of other organs, and they may cost lives.

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