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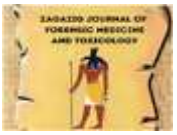

Traumatic Head and Brain Injuries in Cases Attending Assiut University Hospitals: Medicolegal Evaluation and Outcomes

Asmaa H. M. Soliman*[1], Shimaa A. Elghazally[2], Doaa Almaz[1]

1 Department of Forensic Medicine and Clinical Toxicology, Faculty of Medicine, Assiut University, Assiut, Egypt
2 Occupational and Environmental Medicine Department, Assiut University, Assiut, Egypt

ABSTRACT

Introduction: Head injuries represent a major threat to public health and are significant risk factors for disability and death across all age groups worldwide. **Objectives:** The purpose of this study was to assess the medico legal aspect of traumatic head injuries and to identify factors affecting the outcome and mortality rates following these injuries. **Methods:** This was cross-sectional study of 2917 cases with head injuries attended to the Emergency and Neurosurgery Departments at Assiut University Hospitals, Assiut, Egypt, over a period of one year from September 2021 to August 2022. Demographic data and injury characteristics were gathered. The severity of head injury was assessed by the Glasgow Coma Scale (GCS). **Results:** A total of 2917 individuals with head injuries met the inclusion criteria. Nearly one third (34.2%) were in age <10 years and (27.9%) were between (25 to <50) years old. 79.7% of cases were males. Fall from height was the most common mode of injuries (23.3%) followed by motor car accidents (21.2%). Accidental manner of exposure was the most common (94.2%). 32.7%of head injuries were found at multiple sites of skull vault. Concomitant abdominal injuries were found in (87.4%) of cases. Vomiting was the most frequent clinical presentation (53.6%) among study cases. Mixed types of intracranial hemorrhage (18.7%) were the most frequent Computed Tomography (CT) scan findings. 75% of the study patients had complete recovery while 9% of them died. Intracranial hemorrhage was the most leading cause of death (37.5%). **Conclusion:** Adult males were most frequently exposed to head trauma, and falls from height were responsible for the majority. Death rate was significantly high in old age, in those with GCS score ≤13 and in those with associated cardiothoracic and urogenital injuries.

Key words: Traumatic head injuries, Medico-legal, Glasgow coma scale, CT scan, Multiple trauma, Egypt.

**Corresponding author: Asmaa Hasan Mohamed Soliman, asmaahsoliman@gmail.com*

ORCID ID:0000-0002-1427-2280

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I. INTRODUCTION

Head injury is defined as any trauma to the head other than superficial injuries to the face (National Clinical Guideline Centre, 2014). It was found that evaluation of the clinical and pathological features of head injury is of great value and early high-quality clinical management of these injuries may be associated with better outcome (Wang et al., 2018). The main risk to patients who have sustained a recent head injury is the development of a clinically important brain injury that may require early neurosurgical intervention (Gerritsen et al., 2018). Traumatic brain injury (TBI) is a major health problem and is a leading cause of worldwide permanent or temporary disabilities and mortalities among all injuries (Izzy et al., 2022).

Head injuries can cause focal brain damage in the form of intracranial hemorrhage and brain injuries, including subdural, subarachnoid, epidural, intraventricular and intracerebral hemorrhage. Diffuse brain injury can also occur in these injuries because of deceleration and acceleration forces (Ng and Lee, 2019). Trauma represents a major cause of deaths and disabilities especially in low- and middle-income countries. In Egypt, deaths related to trauma are usually under reported or misclassified due to lack of accurate local data and in 2010 it was the 8th cause of deaths (Abdelgeleel et al., 2019). Head injury is public health threat and may result in permanent infirmities or great disabilities especially among young and middle-aged subjects who are involved in productive activities and represent the work force in the community and therefore preventive and effective early management is crucial to reduce its hazards on the community especially in developing countries. It is therefore the aim of this study is to evaluate the medico legal aspect and the outcome following head injury, and to identify factors which affect the prognosis in relation to in-hospital mortality rate.

II. PATIENTS AND METHODS

This was a cross-sectional study that included the patients of head trauma attended within 24 hours after trauma to the Emergency and Neurosurgery Departments at Assiut University Hospitals, Assiut, Egypt over a period of 1 year between September 2021 to August 2022. All data of the patients were collected retrospectively based on the admission data regarding demographic data (age and gender), injury characteristics (etiology of trauma, mechanism, manner, and

sites of head trauma), management plan and the outcome after injury (death or recovery either complete or incomplete) (Staton et al., 2017). Patients with missing or incomplete data were excluded. The research was approved by the Faculty of Medicine's Local Ethical Committee, Assiut University, Egypt (code number is 04-2024-300388).

The diagnosis was based on a history of trauma, clinical manifestations, and radiological examination. All the patients were observed and treated in the Department of Neurosurgery in collaboration with other department according to the needs of the patients as follow:-

(1) The clinical presentation

A. Level of Consciousness and initial vital parameters:

The Glasgow Coma Scale is commonly used in patients with acute head injury to monitor the clinical course and guide early management. According to the GCS scores, cases were classified into mild with score (13-15), moderate with score (9-12), and severe with score (3- 8) (Khari et al., 2022).

B. Symptoms and signs of concussion: headache, vomiting, blurring of vision, transient loss of consciousness, irritability, confusion, and memory loss.

C. Symptoms and signs of compression: high blood pressure, full pulse, fever, signs of lateralization, and seizures.

(2) Investigation to confirm diagnosis:

Head (CT) scan at admission was carried out to all admitted patients to rapidly visualize acute brain injuries (e.g. epidural hematoma, subdural hematoma, subarachnoid hemorrhage, cerebral hemorrhage) and skull fractures (Kulesza et al., 2021).

(3) Treatment measures: Conservative or surgical treatment.

Informed consent

The informed consent was waived as the patients' data was collected from the hospital medical report anonymously.

Statistical analysis

Data entry and analysis were carried out using SPSS version 20. Descriptive statistics were done in the form of frequencies, median and interquartile range then analytic statistics were done as chi square (X2) and man-Whitney U tests. Multivariable analysis by binary logistic regression analysis was applied to identify the different predictors of mortality from head injuries. Values were considered significant when P values are equal to or less than 0.05.

III. RESULTS

A total of 2917 individuals with head injuries who met the inclusion criteria were enrolled into this study. Age ranged from 1 to 90 years with a median of 18. It was found that nearly one third of the head injury patients were in the age group of 1 to <10 years old (34.2%) and more than one quarter of them were in the age group of 25 to <50 years old (27.9%). More than three quarters of study patients were males (79.7%). Direct impact was the most common mechanism of injury (60%) followed by rotational movement (37%). Accidental manner of exposure was the most common among cases (94.2%) (Table 1). Fall from height was the most common mode of head injuries (23.3%) followed by motor car accidents (21.2%) and motorcycle accidents (20.2%). On the other side, firearm injuries (1.8%), animal bites (1.5%), sharp object injuries (0.1%), and train accidents (0.8%) were the least reported modes (Figure 1). The current results revealed that about one third of head injuries among study patients were found at multiple sites (32.7%). Injuries at temporal and parietal regions were also common 22.4 % and 20.3 % respectively. The most common injuries associated with head trauma were abdominal injury (87.4%), cardiothoracic (18.3%) and maxillo-facial (16.1%) while urogenital (3.5%) and vascular injuries (5.8%) were least associated injuries (Table 2). Table (3) shows that falls from height (35.9%), falls on ground (17.2%) and animal bites (2.4%) were significantly higher as modes of head injuries in younger age category ≤18 years old than older age >18 years old, (10.6%), (6.2%) and (0.6%) respectively. On the contrary, motor car accidents (26.2%), motorcycle accidents (22.3%), assault from others (24.1%) and firearm injuries (3%) were reported in higher percent in age category >18 years old than those ≤18 years old, (16.2%), (18%), (2.3%) and (0.5%) respectively. Compared to females, male patients significantly reported higher percentages in motor car accidents, motorcycle accidents, assault from others. On the other side, falls from height and falls on ground were more frequently among female patients compared to males. Regarding the clinical characteristics and management pattern of study patients. A total of 61.8% had GCS scores (GCS =13-15), 37% had scores (GCS =9-12), and 1.2% had scores (GCS 3-8). The common clinical presentation among study cases was vomiting (53.6%), followed by transient loss of consciousness 13.7%. Seventy-four per cent patients were managed conservatively while 26% were managed surgically and only 9% of cases needed

admission in ICU. Hospital stays of patients enrolled in this study ranged from 0 to 206 days with a median of three days and most of them spent ≤15 days in the hospital (93.2%) (Table 4). Regarding CT scan findings in Figure (2); Mixed types of intracranial hemorrhage (18.7%) were the most common findings followed by fractures combined with hemorrhage (16.1%), comminuted fractures (13.4%), sub-glial hematoma (11.7%), brain contusion (9.9%) and depressed fractures (7.9%), while normal CT found in (2.3%) of cases and subdural hemorrhage was least reported finding (1.4%). Outcomes of head injury patients were declared in Figure (3); 75% of the study patients had good recovery and discharged, 9% of them died, 5.3% were referred to private department, 1.1% were discharge before completing their treatment plan based on either family or patient's request and 9.6% escaped before any intervention. Intracranial hemorrhage was the most leading cause of mortality in patients with head injuries (37.5%) as shown in (Figure 4) followed by injury to brain parenchyma (23.8%) and cerebral edema (20.6%), while pyogenic meningitis (1.2%) and brain laceration (16.9%) were the least reported causes. Table (5) shows that there was statistically significant higher occurrence of mortality among older patients, moderate and severe cases according to GCS scores, conservatively managed patients and cases who need admission to ICU. The mortality rate was significantly high among head injury patients with associated cardiothoracic and urogenital injuries. The death frequency was high among male patients, but this was statistically insignificant. Additionally, head trauma in single site was associated with higher percentage of deaths in comparison with multiple sites of head trauma but statistically insignificant. Higher percentages of mortality were also found among cases with mixed types of intracranial hemorrhage in CT reports but without significant difference. Multivariable logistic regression for predictors of mortality among patients with head injuries was demonstrated in Table (6); for each variable in the equation: coefficient (*B*), standard error of *B*, Wald statistic, estimated odds ratio Exp (*B*), and confidence interval for Exp (*B*) were calculated. Exp(B) or the odds ratio, is the predicted change in odds for a unit increase in the predictor. The following factors were significantly associated with the occurrence of mortality among studied participants: age; elderly patients had significantly higher risk of mortality than young patients (odds ratio=1.043) (C.I.=1.035-1.051), GCS score

less than 13 had about 6.8 times greater risk of mortality than those with GCS score ≥ 13 (odds ratio= 6.8) (C.I.= 4.714-9.836), conservatively managed patients had 3 times higher odds of mortality occurrence (odds ratio= 2.958) (C.I.= 1.945-4.499), patients who admitted to ICU had 9 times higher risk of mortality (odds ratio= 9.050) (C.I.=6.065-13.502), those with associated cardiothoracic injury were 2.4 times higher risk of mortality (odds ratio= 2.378) (C.I.=1.672-3.382) and patients who had associated urogenital injury were 3.3 times more at risk to die (odds ratio= 3.327) (C.I.= 1.743-6.350). The occurrence of mortality was insignificantly associated with the sex of the patients, the findings in CT reports and the presence of mixed types of hemorrhage.

Table (1): Characteristics of head injuries of the studied cases attended the Emergency and Neurosurgery Departments, Assiut University Hospitals during the studied period

Age (years)	**number= 2917**	**%**
Median and Range	18(29) (1-90)	
1-<10 years	998	34.2
10-<25 years	752	25.8
25-<50 years	815	27.9
>50 years	352	12.1
Sex		
Male	2325	79.7
Female	592	20.3
Manner of exposure		
Accidental manner	2749	94.2
Homicidal manner	144	4.9
Suicidal manner	24	0.8
Mechanism of injury		
Direct impact	1751	60.0
Rotational movement	1078	37.0
Combined mechanism	88	3.0

Table (2): Sites of head injuries and concomitant injuries of the studied cases attended the Emergency and Neurosurgery Departments at Assiut University Hospitals during the studied period

Sites of head trauma	**No. (n=2917)**	**%**
Multiple sites	953	32.7
Temporal	652	22.4
Parietal	592	20.3
Frontal	423	14.5
Occipital	112	3.8
Middle cranial fossa	107	3.7
Base of skull	43	1.5
Anterior cranial fossa	35	1.2
Associated other injuries		
Abdominal Injury	2550	87.4
Cardiothoracic Injury	534	18.3
Maxillo-facial Injury	470	16.1
Ophthalmological Injury	363	12.4
ENT Injury	240	8.2
Urogenital Injury	103	3.5
Vascular Injury:	170	5.8
Compartment Syndrome	138	4.7
Complete ischemia	10	0.3
Incomplete ischemia	22	0.8

N: number of cases

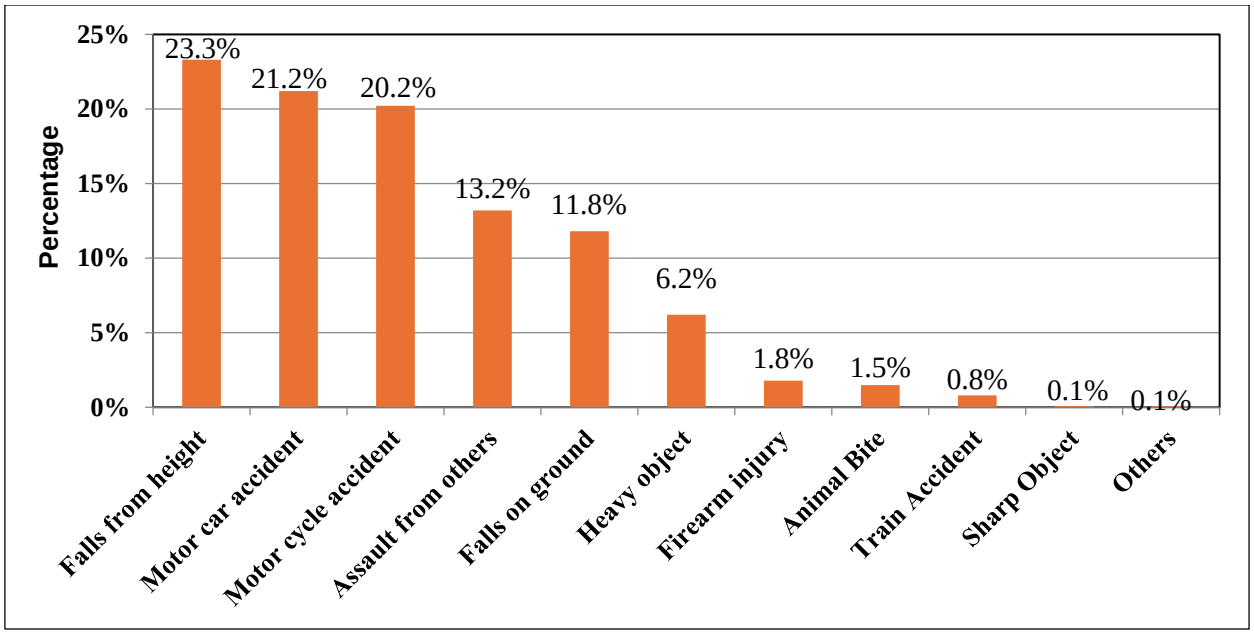

Figure (1): Mode of head injuries of the studied cases attended the Emergency and Neurosurgery Departments at Assiut University Hospitals during the studied period

Table (3): Mode of head injuries of the studied cases attended the Emergency and Neurosurgery Departments at Assiut University Hospitals during the studied period in relation to age and sex of patients using Chi-square test:

Mode of head injuries	Age categories		P. value
	Age category ≤18 N =1461	Age category >18 N =1456	
Assault from others	34 (2.3%)	351 (24.1%)	0.0001*
Animal bite	35 (2.4%)	9 (0.6%)	
Firearm injury	8 (0.5%)	44 (3%)	
Falls from height	525 (35.9%)	154 (10.6%)	
Falls on ground	252 (17.2%)	91(6.2%)	
Heavy object	98 (6.7%)	82 (5.6%)	
Motor car accident	236 (16.2%)	381 (26.2%)	
Motorcycle accident	263 (18%)	325 (22.3%)	
Sharp object	2 (0.1%)	1 (0.07%)	
Train accident	6 (0.4%)	16 (1.1%)	
Others	2 (0.1%)	2 (0.1%)	
Mode of head injuries	**Sex**		**P. value**
	Male (N= 2325)	**Female (N= 592)**	
Assault from others	357 (15.4%)	28 (4.7%)	0.0001*
Animal bite	37 (1.6%)	7 (1.2%)	
Firearm injury	47(2%)	5 (0.8%)	
Falls from height	457 (19.7%)	222 (37.5%)	
Falls on ground	228 (9.8%)	115 (19.4%)	
Heavy object	145 (6.2%)	35 (5.9%)	
Motor car accident	504 (21.7%)	113 (19.1%)	
Motorcycle accident	527 (22.7%)	61(10.3%)	
Sharp object	1 (0.04%)	2 (0.3%)	
Train accident	19 (0 .8%)	3 (0.5%)	
Others	3 (0.1%)	1(0.2%)	

*Significant (p value ≤ 0.05), N: number of cases

Table (4): Clinical characteristics and management pattern of head trauma cases attended the Emergency and Neurosurgery Departments at Assiut University Hospitals during the studied period

Severity of head injury (Admission GCS score)	**No. (n=2917)**	**%**
Severe (score3-8)	35	1.2
Moderate (score= 9-12)	1078	37.0
Mild (score= 13-15)	1804	61.8
Clinical presentation		
Vomiting	1564	53.6
Transient loss of conscious	401	13.7
Confusion	160	5.5
Seizures	149	5.1
Fever	126	4.3
Lateralization	123	4.2
Memory loss	99	3.4
Irritability	92	3.2
Headache	61	2.1
High Blood pressure, full pulse	56	1.9
Blurring of vision	49	1.7
Gradual loss of consciousness	37	1.3
Management		
Conservative	2159	74.0
Surgical	758	26.0
ICU admission		
Need	262	9.0
No need	2655	91.0
Hospital stays (days)		
Median and Range	3(4) (0-206)	
0-15 days	2719	93.2
16-30 days	133	4.6
>30 days	65	2.2

GCS: Glasgow Coma Scale, ICU: Intensive care unit, N: number of cases

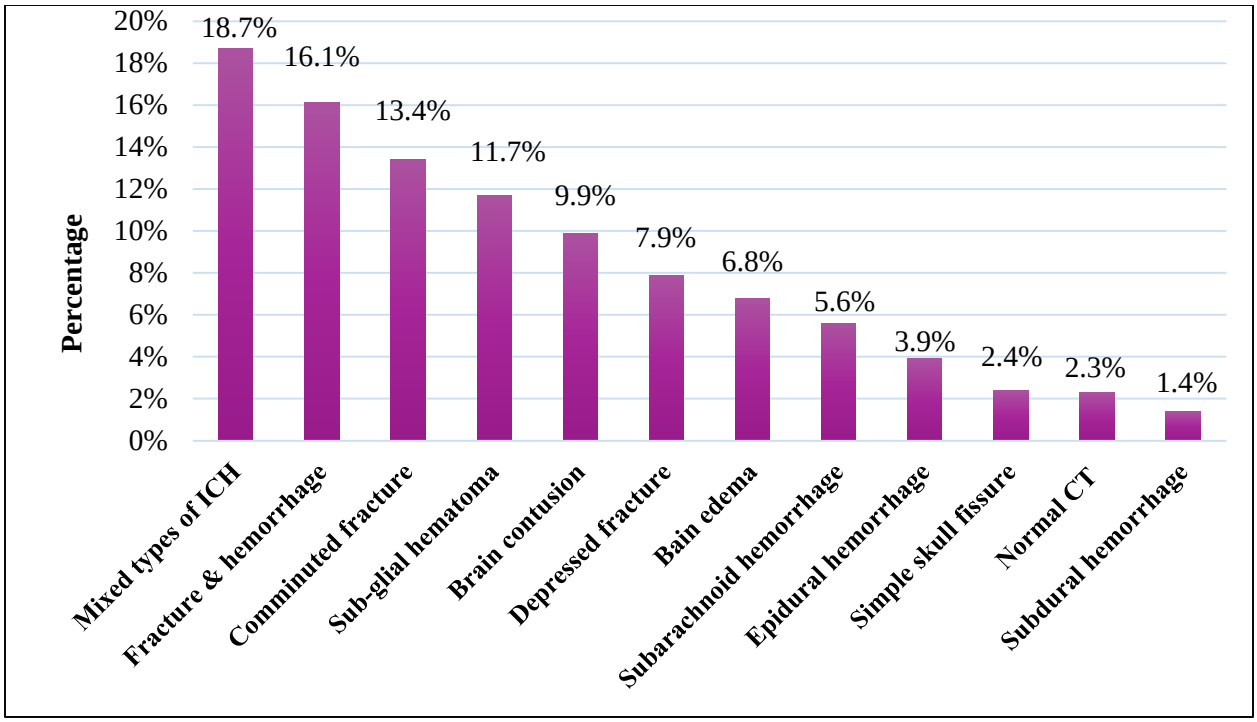

Figure (2): CT scan findings of the studied cases attended the Emergency and Neurosurgery Departments at Assiut University Hospitals during the studied period, (ICH: intra cranial hemorrhage)

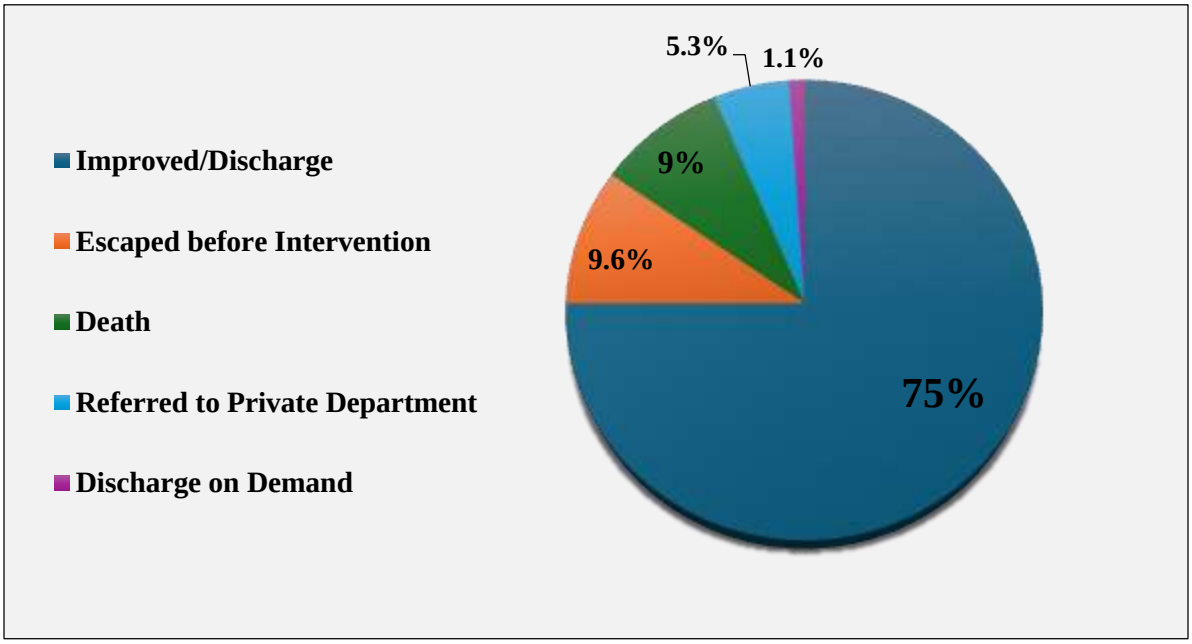

Figure (3): Outcomes of head injury of the studied cases attended the Emergency and Neurosurgery Departments at Assiut University Hospitals during the studied period

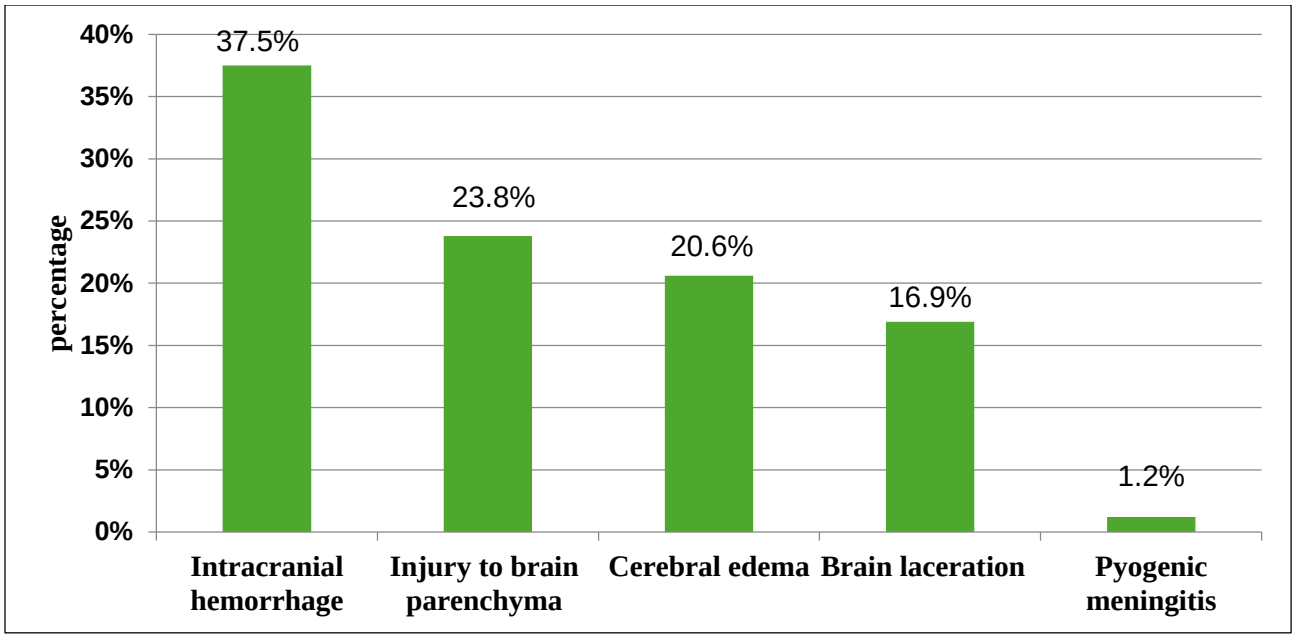

Figure (4): Causes of death following head injury among the studied cases attended the Emergency and Neurosurgery Departments at Assiut University Hospitals during the studied period

Table (5): Differences in demographic, clinical and CT findings characteristics in relation to mortality occurrence following head injury among patients attended the Emergency and Neurosurgery Departments at Assiut University Hospitals during the studied period using Chi-square and Mann-Whitney U tests:

Variables	Survived (N =2188)	Died (N =263)	P -value
Age (years)			
1-<10 years	793 (36.2%)	45 (17.1%)	0.0001*
10-<25 years	576 (26.3%)	52 (19.8%)	
25-<50 years	607 (27.7%)	89 (33.8%)	
>50 years	212 (9.7%)	77 (29.3%)	
Median	18 (27)	32(36)	
Sex			0.339
Male	1760 (80.4%)	215 (81.7%)	
Female	428 (19.6%)	48 (18.3%)	
Severity of head injury (Admission GCS score)			0.0001*
Severe (score≤ 8)	5 (0.2%)	27 (10.3%)	
Moderate (score= 9-12)	713 (32.6%)	186 (70.7%)	
Mild (score= 13-15)	1470 (67.2%)	50 (19.0%)	
Management			0.0001*
Conservative	1559 (71.3%)	217 (82.5%)	
Surgical	629 (28.7%)	46 (17.5%)	
ICU admission			0.0001*
True	74 (3.4%)	111 (42.2%)	
False	2114 (96.6%)	152 (57.8%)	
Sites of head trauma			0.220
Single site	1449 (66.2%)	181 (68.8%)	
Multiple sites	739 (33.8%)	82 (31.2%)	
Cardiothoracic Injury			0.0001*
True	313 (14.3%)	117 (44.5%)	
False	1875 (85.7%)	146 (55.5%)	
Urogenital Injury			0.0001*
True	55 (2.5%)	26 (9.9%)	
False	2133 (97.5%)	237 (90.1%)	
CT scan findings			0.09
Normal CT	54 (2.5%)	2 (0.8%)	
Mixed types of ICH	405 (18.5%)	58 (22.1%)	
Others	1729 (79.0%)	203 (77.2%)	

*Significant (p value ≤ 0.05), ICH (intra cranial hemorrhage), ICU: Intensive care unit, N: number of cases

Table (6): Predictors of mortality following head injuries among patients attended the Emergency and Neurosurgery Departments at Assiut University Hospitals during the studied period using Binary logistic regression test

Predictors of mortality	B	S.E.	Wald statistic	Df	Sig.	Exp (B)	95% C.I. for EXP(B)	
							Lower	Upper
Age (Ref= young age)	0.042	0.004	110.483	1	0.0001*	1.043	1.035	1.051
Sex (Ref= Female)	0.269	0.211	1.628	1	0.202	0.764	0.506	1.155
GCS score (Ref≥13)	1.918	0.188	104.544	1	0.0001*	6.810	4.714	9.836
Management (Ref= surgical)	1.085	0.214	25.713	1	0.0001*	2.958	1.945	4.499
ICU admission (Ref= No)	2.203	0.204	116.421	1	0.0001*	9.050	6.065	13.502
Associated cardiothoracic Injury (Ref= No)	0.866	0.180	23.253	1	0.0001*	2.378	1.672	3.382
Associated urogenital Injury (Ref= No)	1.202	0.330	13.290	1	0.0001*	3.327	1.743	6.350
CT scan findings (Ref= Normal CT)			1.405	2	0.495			
Mixed types of ICH	0.863	0.864	0.997	1	0.318	2.370	0.436	12.896
Other findings	0.700	0.851	0.677	1	0.411	2.014	0.380	10.679
Constant	6.435	0.908	50.208	1	0.0001*	0.002		

Ref: reference group, B: beta coefficient, S.E; standard error, Df; degree of freedom, Sig; Significant (p value <0.05), EXP (B): exponential value of B (estimated odds ratio), C.I; confidence interval, ICU: Intensive care unit

IV. DISCUSSION

The purpose of this study was to identify factors that may affect the prognosis and mortality rate in head trauma patients during their clinical management. In the current study, a total of 2917 patients subjected to head trauma attended to the Emergency Department which was a large number over one year in comparison with other studies conducted in Egypt Refaat et al., (2019), El-Farouny, (2021) and this could be explained by the great flow of traumatized patients from other governorates in upper Egypt to Assiut University Hospitals. The age of the head injury patients ranged from 1 to 90 years. About (34.2%) of the patients in the present study were less than 10 years old and this agrees with the study of Hyder et al., (2009), Iyer and Patel, (2020) that focused on child injuries and that may be attributed to inadequate childcare or uncontrolled childhood activities. Additionally (27.9%) of subjects who sustained a head injury in this study were in the age group of 25 to <50 years old. Trauma is common among middle age

group that usually include young adults with more outdoor activities and working people who may be more exposed to road traffic accidents than other age groups, also more than three quarters of study patients were males (79.7%). The previous findings agree with Montaser and Hassan, (2013), Mahran et al., (2016) in Egypt and agree with findings of Wang et al., (2018), Al-Hajj et al., (2021) who referred to increased risk of injury in their study among young adults and middle-aged males compared to female.

The most common causes of head trauma in this study were mainly fall from height (23.3%), motor car accidents (21.2%) and motorcycle accidents (20.2 %). The current finding corresponds to the results observed by (Mahran et al., 2016). These causes usually attributed to accidental manner of exposure that was found to be the predominant manner in the current study (94.2%) in comparison with homicide (4.9%) and suicide (0.8%) and this comes in line with (Al-Qazzaz and Jabor, 2014, Refaat et al., 2019, Ullah et al., 2020, Al-Hajj et al., 2021).

Statistically significant relation was found in this study regarding mode of injuries in relation to age and sex of the victims. It was observed that assaults from others, firearm injuries, motor vehicle accidents were more frequent in age above 18 years. On the contrary, animal bites, falls from height and falls on ground were significantly frequent in young age and teenagers ≤18 years. These findings are consistent with Al-Hajj et al., (2021) in certain points that mentioned that accidental falls in schools and homes are common causes of child trauma, also this review focused on one study that reported child trauma from animal bite. However, this review reported that children are more exposed to assaults from others than adults.

Evident gender differences were observed in this study with different modes of head injuries. All causes were significantly frequent in males, and this can be explained by that males frequently work outdoors and therefore more often frequently exposed to road traffic accidents and injuries, also men are more vulnerable to assaults and firearm injuries in agreement with El-Farouny, (2021). On the contrary, higher percent of head injuries among females were caused by falls from height and falls on ground compared with other causes and this finding disagrees with the results of Ramadan et al., (2020) who reported higher frequency of falls among males.

The current results revealed that about (32.7%) of head injuries were found at multiple sites of the skull vault and this may be because of the trauma nature, also the temporal, parietal and frontal regions were more commonly involved in head injuries than other sites in the occipital region and skull base and this is consistent with the finding of Refaat et al., (2019), El-Farouny, (2021) and this could be explained by that skull base and occiput are more protected than other sites.

Head injuries in many cases occur with significant associated injuries, mainly maxillofacial injuries, chest, and cardiac injuries and this usually will have a bad impact on the outcome and prognosis of those cases (Odeyemi et al., 2020). The most common injuries associated with head trauma in this study were abdominal injury in (87.4%) of subjects followed by cardiothoracic in (18.3%) of subjects followed by maxillo-facial in (16.1%) of study subjects.

In agreement with Arumugam et al., (2015), head injuries were reported to occur in association with abdominal injuries especially in major trauma patients. However, the study of Raza et al., (2018) reported a low percentage of abdominal trauma and attributed this to the protection maintained by pelvic bones. Additionally, the study El Shehaby et al., (2020), Elsayed et al., (2021) in Egypt found a common association of Maxillofacial fracture and closed head injuries in addition to the results of Raza et al., (2018), Prasetyo et al., (2023) in Indonesia and this agree with the current results. Maxillofacial injuries were found to be frequently associated with head trauma as facial bones are more prominent and less protected especially without helmet use.

Urogenital (3.5%) and vascular injuries (5.8%) were the least associated injuries in the current study. The results of Abdelgeleel et al., (2019) in Egypt and Javanmard et al., (2019) declared that urogenital injuries comprise a low percent of injuries in multiple trauma patients, and this coincides with current results. According to Atia et al., (2021), peripheral vascular injuries can occur in association with traumatic head injuries especially in motor vehicle accidents with high rate of amputation and disability later.

Glasgow Coma Scale is important to assess the level of head injury and to measure the neurological disorder Putri and Widasmara, (2019). In the present study, (61.8%) and (37%) of patients were presented with GCS scores ≥13 and GCS (9-12) respectively,

while only 1.2% of patients had low score (3-8) and this is in line with El-Farouny, (2021), Elsayed et al., (2021) while the studies of Salama et al., (2015), Alnaami et al., (2019) were not consistent with this result and reported higher percentage of severe injuries with low GCS score. The current results revealed statistically significant higher occurrence of mortality among severe cases with low GCS scores. According to Alnaami et al., (2019), Liu et al., (2021), GCS score has been frequently used as one of the most important predictors of outcome after head injury especially low GCS score.

The common clinical presentation among the present study cases was vomiting (53.6%), followed by transient loss of consciousness of 13.7% and this is consistent with (Refaat et al., 2019). Borland et al., (2018) mentioned that vomiting is a common symptom following mild head injury at any given age and in several guidelines, it is a useful prognostic symptom in mild head injuries.

Different abnormal CT findings were noted during this study while normal free scans were found in only 2.3 % of cases. Mixed types of intracranial hemorrhage (18.7%) were the most frequent findings in CT scan. These CT findings are ascribed to the results of Refaat et al., (2019) while disagree with Menon et al., (2008) who found that subdural hemorrhage is the most common finding while combinations of all hemorrhages were the least observed in his study. CT reports in this study also revealed combined fractures and hemorrhage in (16.1%) of reports and this agrees with the results of Prasetyo et al., (2023) who observed combined fractures and hemorrhages in CT reports.

Individual fractures were also observed in CT reports in this study however its frequency is less in comparison with combined fractures and intracranial hemorrhage in agreement with (Prasetyo et al., 2023). Comminuted fractures were the most frequent and found in (13.4%) followed by depressed fractures in (7.9%) of cases while, simple fissure fracture was found in only 2.4% of CT reports. On the contrary, the study of Refaat et al., (2019) found that fissure fracture was the most common among other types of fractures.

Regarding outcomes in head injury patients, 75% of the study patients had good recovery and discharged while 9% of them died in agreement with El-Farouny, (2021) however, the study of Hassan et al., (2017), Abdelgeleel et al., (2019) reported higher mortality rate. In the present study, intracranial hemorrhage was the leading

cause of mortality in (37.5%) of cases followed by injury to brain parenchyma in (23.8%). In agreement with the previous finding, the study of Al-Qazzaz and Jabor, (2014), Alexis et al., (2018) declared that brain injuries were the first leading cause of death following head trauma mainly intracranial hemorrhages.

Multivariable logistic regression for predictors of mortality among patients with head injuries was done. In this study, there was statistically significant higher occurrence of mortality among elderly patients, and this comes in line with the studies of Gerritsen et al., (2018), Liu et al., (2021) who mentioned that old age has been associated with unfavorable outcomes and high mortality rate. However, the study of Ullah et al., (2020) mentioned that age is not related to the outcome following head trauma. Additionally, Staton et al., (2017), Putri and Widasmara, (2019), mentioned that the death rate was high with low GCS score within the first 24 hours, and this comes in line with the current results.

Surgical intervention was required in 26% of the current study cases while 74% patients were managed conservatively and only 9% of cases needed admission in ICU. Conservatively managed patients and cases who need admission to ICU showed significantly higher frequency of mortality and this result is comparable with Alnaami et al., (2019) who mentioned that surgical intervention was useful in reducing mortality among his study victims. This means that early surgical intervention may be lifesaving in head trauma patients especially in severe cases that may be associated with other injuries, however 17.5% of subjects who were subjected to surgery died in this study and this may be attributed to post surgical complications or other complicated associated injuries.

The mortality rate was significantly high among head injury patients with associated cardiothoracic and this comes in line with Schieren et al., (2020) who mentioned that patients with combined head trauma and thoracic injuries will be in greater need to prolonged mechanical ventilation and ICU admission and consequently long hospital stay and this usually will be associated with high mortality rates.

The mortality rate was also significantly high among head injury patients with associated urogenital injuries despite the lower frequency of these injuries in comparison with other concomitant injuries. An explanation to the previous finding in this

study is that the presence of traumatic urinary tract injuries could worsen the clinical course of head trauma patient especially if acute kidney injury (AKI) occur which is relatively common following brain trauma according to (Luu et al., 2021).

V. LIMITATION OF THE STUDY

- The sample size was high in comparison with other studies in other governorates however, it is not actually representative especially with the great flow of traumatized patients from other governorates in upper Egypt to Assiut University Hospitals.
- A strong limitation also is the retrospective nature of the study with absence of long-term follow-up of the patients and possible consequences after head trauma.
- Missing some of the patient's data and inaccurate documentation is considered another limitation.

VI. CONCLUSION

Adult males represented most cases. Injuries were also frequent among young adult and middle-aged subjects. The most common causes of traumatic head injuries were falls from height and road traffic accidents. The most common injuries associated with head trauma in this study were abdominal injuries followed by cardiothoracic and maxillo-facial injuries. Most of the patients sustained mild head injuries and were conservatively managed however the death rate was 3 times higher than those who underwent surgical intervention. Intracranial hemorrhage was the most leading cause of death among died subjects. Death rate was significantly high in old age and in those with associated cardiothoracic and urogenital injuries.

VII. RECOMMENDATIONS

- Early surgical intervention helps in early effective management and could greatly reduce the unfavorable outcome in head trauma patients.
- GCS score should be combined with CT scan examination to completely assess the severity of the case and treatment plan.
- Great attention and care should be given to the associated injuries that may increase the death rate and victims with multiple trauma should be considered "at risk".

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الملخص العربي

إصابات الرأس والمخ بين الحالات المترددة علي مستشفيات جامعة أسيوط: التقييم الطبي الشرعي والنتائج

أسماء حسن محمد سليمان[1]،شيماء عبد السميع الغزالي[2]، دعاء محمد جمعه ألمظ[1]

1- قسم الطب الشرعي والسموم الاكلينيكية -كلية الطب – جامعة أسيوط
2- قسم الصحة العامة وطب المجتمع -كلية الطب – جامعة أسيوط

المقدمة: تمثل إصابات الرأس تهديدًا كبيرًا للصحة العامة في جميع الفئات العمرية في جميع أنحاء العالم وهي عوامل خطر كبيرة للإعاقة وقد تصل إلي الوفاة وقد وجد أن التقييم السريري الجيد لإصابات الرأس له قيمة كبيرة ويؤدي إلي نتائج أفضل لهذه الاصابات.

الهدف من الدراسة: تقييم الجانب الطبي القانوني لإصابات الرأس وتحديد العوامل التي تؤثر على النتائج ومعدلات الوفيات بعد هذه الإصابات.

طريقة الدراسة: دراسة مقطعية شملت مرضى اصابات الرأس الذين حضروا إلى أقسام الطوارئ وجراحة الأعصاب في مستشفيات جامعة أسيوط خلال 24 ساعة من وقت الاصابة ، وذلك خلال عام واحد بداية من شهر سبتمبر 2021 حتي شهر أغسطس 2022. تم جمع جميع بيانات المرضى المتعلقة بالبيانات الديموغرافية (العمر والجنس)، ووصف الإصابة (السبب، والأليه المحدثه، وهل الاصابه عرضيه ام جنائيه ام انتحارية واماكن الاصابه بالرأس)، وخطة العلاج والنتيجة بعد الإصابة (الوفاة أوالشفاء التام أوالشفاء غير التام).

النتائج: شملت الدراسة 2917 شخصًا تعرضوا لإصابات في الرأس والمخ وكان ما يقرب من الثلث (34.2%) أعمارهم أقل من 10 سنوات و(27.9%) تتراوح أعمارهم بين (25 إلى أقل من 50) عامًا. كان أكثر من ثلاثة أرباع (79.7%) الحالات من الذكور. كان السقوط من ارتفاع هو أكثرأسباب الإصابات شيوعًا (23.3%)، يليه الإصابات نتيجة حوادث السيارات (21.2%). الاصابات العرضية كانت هي الأكثر شيوعاً بين الحالات (94.2%). وجد أن ما يقرب من ثلث إصابات الرأس (32.7٪) حدثت في مواقع متعددة من الجمجمة. اكثر الاصابات المصاحبة كانت في البطن (87.4%).أظهرت صور الأشعة المقطعية أن الأنواع المختلطة من النزيف داخل الجمجمة (18.7%) هي الأكثر شيوعًا. أظهرت النتائج أن (75٪) من مرضى الدراسة قد تعافوا بشكل كامل بينما حدثت الوفيات في (9٪) منهم وكان النزف داخل الجمجمة هو السبب الرئيسي للوفاة (37.5%).

الخلاصة: كانت الإصابات عرضية ومتكررة بين الشباب البالغين ومتوسطي العمر وكان معدل الوفيات مرتفعًا بين الاشخاص المتقدمين في العمروكذلك بين الأشخاص الذين يعانون من إصابات مصاحبة في القلب والصدر والجهاز البولي التناسلي.

التوصيات: في ضوء هذه النتائج نوصي بأن التدخل الجراحي يمكن أن يقلل بشكل كبير من النتائج الغير مرضية لإصابات الرأس كما يجب العناية بالاصابات المصاحبه لإصابات الرأس والتي قد تزيد من معدل الوفيات.