MEDICO LEGAL ASPECTS OF TRAUMATIC HEAD INJURIES IN BENHA UNIVERSITY HOSPITAL (PROSPECTIVE ANALYTICAL STUDY)

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ABSTRACT

Introduction: Traumatic head injury is one of the most common causes of death and disability worldwide. The clinical and pathological features of head injury are not only helpful for its diagnosis and treatment, but also can help analyze the wounding mechanism in the field of forensic medicine. **Objectives:** Our study was designed to investigate cases of traumatic head injury referred to neuro-surgery department of Benha university hospital during the period starting from March-2016 till February-2017 to describe epidemiological and medico legal features of these cases. **Subjects and methods:** Data was obtained from the available medico legal reports and was statistically analyzed. **Results:** There were 548 cases admitted to neurosurgery department out of 1382 cases representing 39.7%. Most of them were males in the age group (0-9) years and was admitted mostly in summer (40.9%). The most common outcome was complete recovery (90.9%). Blunt head trauma was the most frequent type of trauma (57.3%) while the most frequent site affected was the multiple sites (24.5%). RTA were the most frequent cause of head injury (66.8%). The most frequent manner of head injury was accidental (88%). The most common mechanism of injury to the head trauma was direct impact (41.6%). Intracranial hemorrhage was the most common type of head injury lesion representing (35.4%). According to GCS, Mild cases (13-15) outnumbered the other degrees of coma representing 81.8%. Intra cranial hemorrhage was the most common finding of CT (35.5%) while the least common was brain edema (2.4%). **Conclusion**: The total number of traumatic head injury cases was 548. The most commonly affected age group was children. Males represented most cases. The peak incidence of traumatic skull fractures was in summer. The most common cause of traumatic skull fractures was road traffic accident followed by fall. Accidental infliction was the most common manner. The most commonly affected bone was multiple sites. Most cases had full recovery.

Keywords: Traumatic head injury, Manner, Medico legal, CT finding, RTA

INTRODUCTION

Traumatic head injury (THI) is one of the prevalent causes of global death and disability. lately, head injury (HI) cases have increased in both developed and developing nations. Therefore, it is of great value to evaluate the clinical and pathological features of head injury **(Wang et al., 2018).**

Every injury that results in harm to the scalp, skull or brain can be sort out as a HI which can be caused by traffic mishap, falls, sports and gunshot wounds. Vehicle accidents are one of the most prevalence causes of THI as they are deemed to be one of the main causes of fatality due to road-traffic accidents (RTA) **(Chelly et al., 2017)**

THI seriousness extended from mild to severe as it can induce astute alterations in molecular signaling, changes in the structures and function of the cell, and/or tissue injury, like contusion, hemorrhage, and diffuse axonal injury **(Pearn et al., 2017**).

The epidemiology of serious THI is changing. These epidemiologic patterns may be used for management, monitoring, guidance for injury prevention measures and foreteller of mortality **(David et al., 2017)**.

Blunt force cranial trauma may result from interpersonal violence (e.g. assault), accident (e.g. effect in traffic crashes) or self-inflicted injury (suicide by jumping from elevated locations), while sharp force trauma is predominantly linked to interpersonal violence. Scientists agree that cranial injuries are more probable to result from interpersonal violence than postcranial fractures **(Kranioti , 2015)**

banning of head and neck injury have to be the target and this can be accomplished by get better socioeconomic condition, educational standard level, add more security measures in this progressing and changeful lifestyle and the extension of corroboration to the judicial authorities by best submission of evidences as an expert to avoid failure of justice **(Kumar et al., 2017)**.

The study was map out to investigate cases of traumatic head injuries referred to Neuro-surgery department of Benha university hospital over the period starting from March-2016 till February-2017 to characterize epidemiological and medico legal pattern of these cases to propose measures to be possessed to lowering the traumatic head injury.

MATERIALS & METHODS

I- Patients:

This prospective study was carried out on 548 patients of traumatic head injury patients admitted to Neurosurgery department, Benha University Hospitals, Qaluiobia, Egypt.

Data of this study were collected from patient's records. The research was endorsed by the Faculty of Medicine's Local Ethical Committee, Benha University, Egypt.

II- Methods:

***Clinical Design of the Study:**

I- Socio-epidemiological aspect of the study:

1-<u>Age groups:</u>

-The studied patients were classified into 4 groups as following: (0-9 y), (10-24 y), (25-49 y) and ≥50 years

2-<u>Gender:</u> Number of males and females and the sex ratio.

<u>3-Seasonal variation:</u> Summer,

winter, spring or autumn.

4-Outcome: Complete recovery or permanent infirmity or death in relation to onset of head trauma (at day of trauma, within 3 months, within more than 3 months up to 6 months).

II- Medico legal aspects of the study:

1-Type of trauma: (Blunt, sharp, firearm, penetration, multiple).

2-Sites of head trauma: (Parietals, Temporal, occipital, frontal, face, multiple).

3-Manner of exposure: (Accidental, homicidal, suicidal).

4-Causes of injury: (fall, Road traffic accident, gunshot, abuse, sports).

5-Mechanism of injury: (severe blow, rotational movement, combined mechanism).

III- Clinical aspect of the study:

***(1) The clinical presentation**:*

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

B- Symptoms and signs of compression: high blood pressure, full pulse, fever, signs of lateralization, seizures

C- CNS manifestations (Level of Consciousness):

The Glasgow Coma Scale (GCS) is a commonly used "bedside" method. GCS was classified into mild, moderate and severe (13-15; 9-12 and ≤ 8, respectively) ***(Hassan et al., 2017).***

(2) Treatment measures:

Conservative or surgical treatment.

III- Investigational aspects of the study:

Computed tomography of the head (CT):

CT scan was carried out to all admitted

patients with head trauma. CT scan can rapidly visualize fractures and detect proof of brain bleeding (hemorrhage), blood clots (hematomas), bruised brain tissue (contusions) and inflammation of brain tissue and brain edema ***(Longo, 2014)***

Statistical analysis

According to ***Khothari (2004)*** Tabulating and analyzing the information gathered using SPSS version 16 (Spss Inc, Chicago, ILL Company). The amount and percentages of categorical data were provided. The exact test of Chi square (X2) or Fisher (FET) was used.

RESULTS

(A) Incidence:

The present work reported a total of 548 cases due to traumatic head injury admitted at neurosurgery department representing 39.7% of the total number (1382) of cases that had been admitted during the studied period, as showed in table.(١)

(B) Socio-demographic characteristics of the studied cases:

Age, gender and seasonal variation:

The present work showed that the majority (38.7%) of cases was in the age group I (0-9) years followed by age group II (10-24) (32.8%). The majority (66.8%) of cases were males. The most prevalent cases were occurred in summer (40.9%) as shown in table .(٢)

Outcome:

Complete recovery was the most prevalent outcome representing 90.9% followed by permanent infirmity (4.7%) while the least number of patients has died after head injury (4.4%) as seen in fig (١) .

-Type and site of trauma:

Blunt head trauma was the most frequent type of trauma 57.3% followed by multiple trauma (43.7%). The least frequent was penetrating type of trauma (1.1%). Moreover, the most frequent site affected was the multiple sites (24.5%) while anterior cranial fossa and base of skull were the lowest frequent sites (0.4%) as shown in table (3) with highly statistically significant difference between different types of head trauma in relation to the sites of trauma (table 4)

-Cause of head injury:

RTA were the most common cause of head injury representing 66.8% of cases followed by fall (29.6%), while the sport related injuries were the least frequent ones (0.4%) as shown in table (5). There was a highly statistically significant difference between different causes of head injury in relation to the age groups where RTA was more common in age group II, Fall was more common in age group I, firearm injuries were more common in age group III. Assault related injuries were more common in age group II as shown in fig. (2)

Table (1): Head injury cases admitted to Neurosurgery Department

Cases admitted at neurosurgery department	Number	%
Head injury cases	548	39.7
Other cases	834	60.3
Total	1382	100.0

Table (2): Distribution of the studied cases according to age, sex and seasonal variation

Demographic data	Number	%
❖ **Age groups**		
Group I (0-9 years)	212	38.7
Group II (10-24 years)	180	32.8
Group III (25-49 years)	130	23.7
Group IV (50+ years)	26	4.8
❖ **Gender**		
Males	366	66.8
Females	182	33.2
❖ **Season**		
Summer	224	40.9
Autumn	114	20.8
Winter	76	13.9
Spring	134	24.4
Total	548	100.0

-Manner of trauma:

The most frequent manner of head injury was accidental (88%) while suicidal manner was the least frequent (2.6%) as shown in fig. (3). A statistically significant difference between manners of infliction of injuries in relation to season of admission where most of the accidental and homicidal head injury cases occurred in summer while most of suicidal head injury cases occurred in spring as shown in table (6). A relation between manners of infliction with types of trauma was done and we found that accidental manner was the most common in all types of injuries except firearm cases all were homicidal. As shown in fig. (4), this relationship was discovered to be statistically extremely important.

-Mechanism of injury:

As regards the mechanism of injury, most of cases resulted from severe blow to the head (41.6%) while the least common was combined mechanism (17.2%) (fig. 5).

Table (3): Distribution of patients as regard type and site of trauma.

❖ Type of head trauma	Number	%
Blunt	314	57.3
Sharp	30	5.4
Penetrating	6	1.1
Firearm	8	1.5
Multiple	190	34.7
❖ **Site**		
Parietal	126	22.9
Temporal	110	20.1
Frontal	108	19.7
Occipital	56	10.2
Middle cranial fossa	10	1.8
Anterior cranial fossa	2	0.4
Base of skull	2	0.4
Multiple sites	134	24.5
Total	548	100.0

Table (4): Relation between type and site of trauma among the studied cases.

Type / Site	Blunt		Firearm		Penetrating		Sharp		Multiple		Total		FET	P
	No	%	No	%	No	%	No	%	No	%	No	%		
Frontal	72	22.9%	0	.0%	4	66.7%	2	6.7%	30	15.8%	108	19.7%		
Temporal	60	19.1%	2	25.0%	0	.0%	8	26.7%	40	21.1%	110	20.1%		
Parietal	86	27.4%	2	25.0%	0	.0%	8	26.7%	30	15.8%	126	23.0%		
Occipital	32	10.2%	0	.0%	2	33.3%	8	26.7%	14	7.4%	56	10.2%		
ACF	2	.6%	0	.0%	0	.0%	0	.0%	0	.0%	2	.4%		<0.001
MCF	2	.6%	0	.0%	0	.0%	0	.0%	8	4.2%	10	1.8%		
Base	2	.6%	0	.0%	0	.0%	0	.0%	0	.0%	2	.4%	69.9	
Multiple	58	18.5%	4	50.0%	0	.0%	4	13.3%	68	35.8%	134	24.5%		
Total	314	100.0%	8	100.0%	6	100.0%	30	100.0%	190	100.0%	548	100.0%		

P value >0.05 is non-significant (NS) *ACF=Anterior cranial fossa*
P<0.05 is significant (S) *MCF= Middle cranial fossa*
P≤0.001 is highly significant (HS) *Fisher's exact test (FET)*

Table (5): Distribution of patients as regard cause of head injury

Cause of head injury	Number	%
RTA	366	66.8

Fall	162	29.6
Firearm injuries	8	1.4
Assault	10	1.8
Sport related injuries	2	0.4
Total	548	100.0

Table (6): *Relation between manner of infliction of injures and seasonal variation.*

Manner / Season	Accidental		Homicide		Suicide		Total		FET	P
	No	%	No	%	No	%	No	%		
Summer	196	40.7%	24	46.2%	4	28.6%	224	40.9%	14.8	0.022
Autumn	108	22.4%	6	11.5%	0	.0%	114	20.8%		
Winter	68	14.1%	4	7.7%	4	28.6%	76	13.9%		
Spring	110	22.8%	18	34.6%	6	42.9%	134	24.4%		
Total	482	100.0%	52	100.0%	14	100.0%	548	100.%		

(C) Clinical data characteristics of the studied cases:

-Clinical presentation:

Most patients presented with vomiting (65.0%) followed by transient loss of conscious (53.3%) while memory loss was the least symptoms appeared in

The patients received conservative treatment outnumbered the patients who received surgical intervention patients with traumatized head injuries (1.3%) as shown in table (7).

-Severity of head trauma according to GCS:

Mild cases outnumbered the other degrees of coma representing 81.8% as shown in table (8).

-Treatment:

representing 80.3% and 19.7% respectively, as shown in table (9)

-CT findings:

Intra cranial hemorrhage was the most common finding of CT (35.5%) while the least common was brain edema (2.5%) while distribution of patients according to type of intracranial trauma in CT epidural hemorrhage was the most common finding appeared in CT (37.6%) while the least common type of hemorrhage was subarachnoid hemorrhage (14%). However, on distribution of patients according to type of fractures in CT where the most prevalent type of fracture was simple fissure (50%) while the least one was comminuted fracture (12.5%), as shown in table (10), fig. (6) (7) (8) & (9).

Table (7): Distribution of the patients according to their clinical presentation with traumatized head injuries.

Clinical presentations	Number	%
Scalp injuries	101	18.4
Headache	52	9.5
Vomiting	356	65.0
Blurring of vision	10	1.8
Transient loss of conscious	292	53.3
Confusion	64	11.7
Irritability	10	1.8
Memory loss	7	1.3
Gradual loss of consciousness	54	9.9
High Blood pressure, Full pulse	28	5.1
Fever	26	4.7
Lateralization	48	8.8
Seizures	38	6.9

Table (8): Distribution of severity of head trauma among the studied cases according to GCS scale.

Severity	Number	%
Mild (13-15)	448	81.8
Moderate (9-12)	66	12.0

Severe (3-8)	34	6.2
Total	548	100.0

Table (9): Distribution of patients according to types of treatment.

Treatment	Number	%
Conservative treatment	440	80.3
Surgical intervention	108	19.7
Total	548	100.0

Table (10): Distribution of patients according to CT finding

CT findings		Number	%
❖ **Free (No lesion)**		73	13.4
❖ **Sub-glial hematoma**		101	18.4
❖ **Intracranial hemorrhage**	**Epidural**	73	37.6
	Subdural	28	14.4
	Subarachnoid	27	14
	Mixed types	66	34
❖ **Skull fracture**	**Simple fissure**	28	50
	Comminuted	7	12.5
	Depressed	21	37.5
❖ **Mixed type (Fracture & hemorrhage)**		70	12.7
❖ **Brain contusion**		40	7.3
❖ **Bain edema**		14	2.5
Total		548	100.0

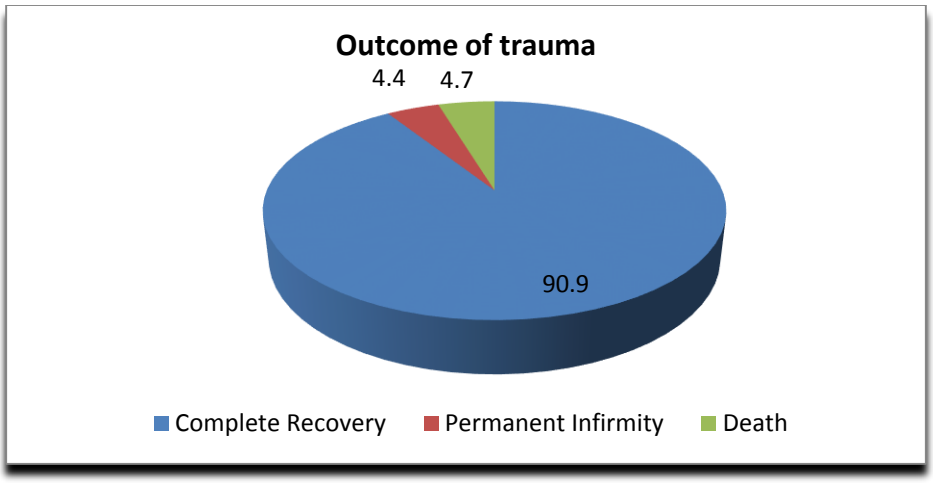

Figure (1): Distribution of the studied cases according to outcome of trauma

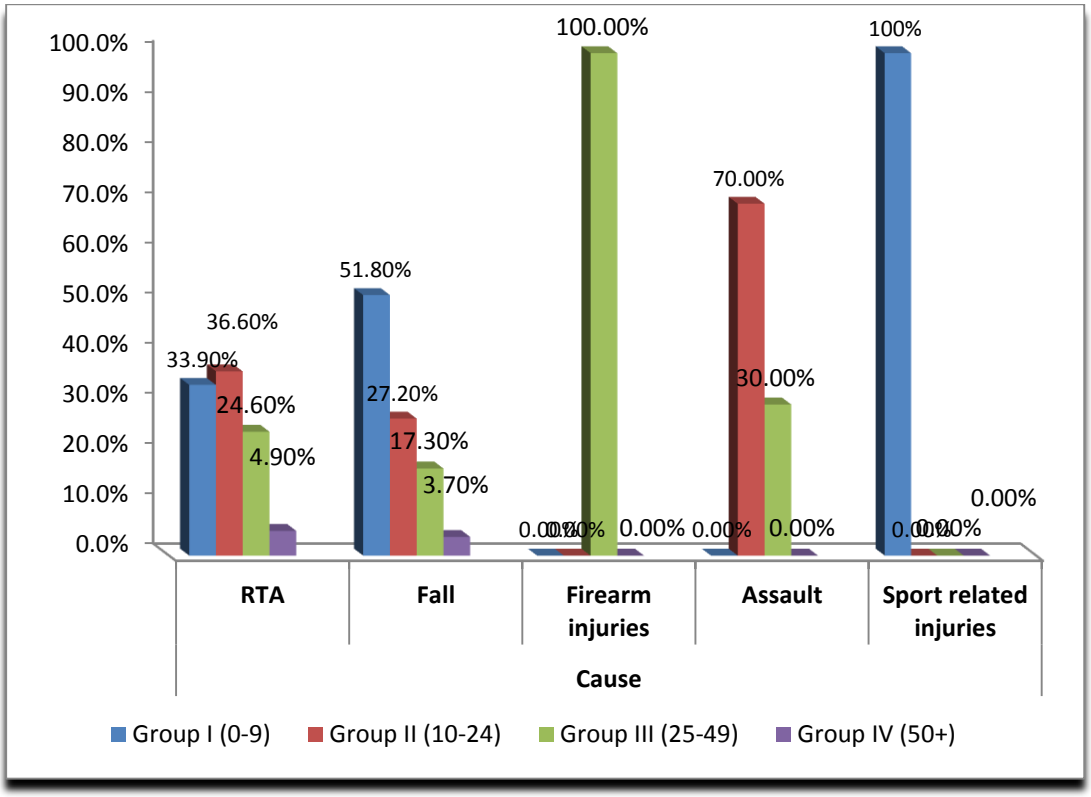

Figure (2): Relation between the cause of head injury and age group

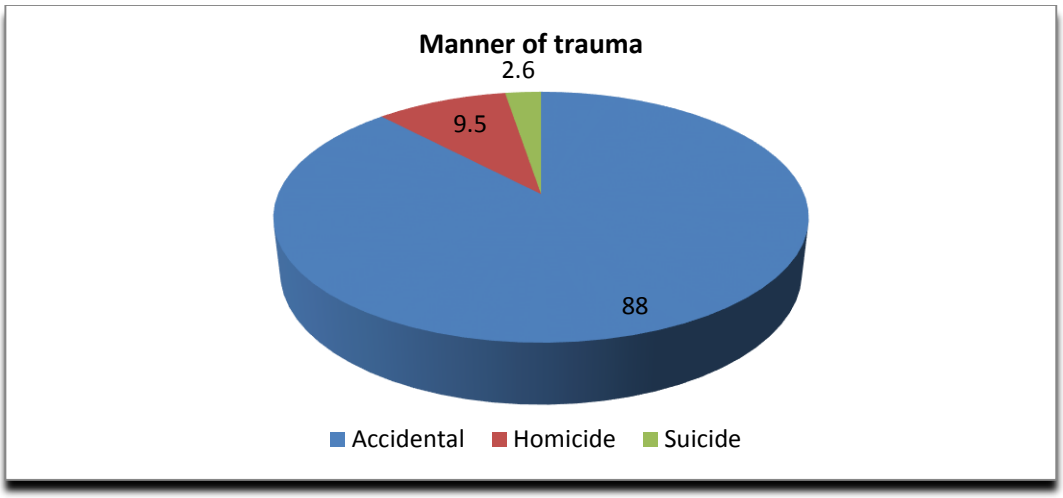

Figure (3): Distribution of patient as regard the manner of infliction.

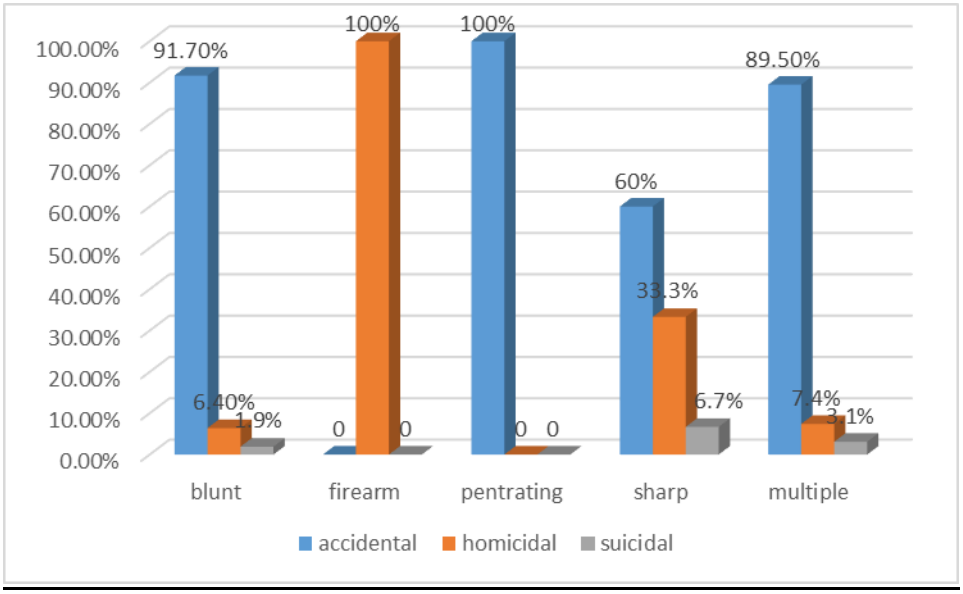

Figure (4): Relation between type of trauma and manner of infliction.

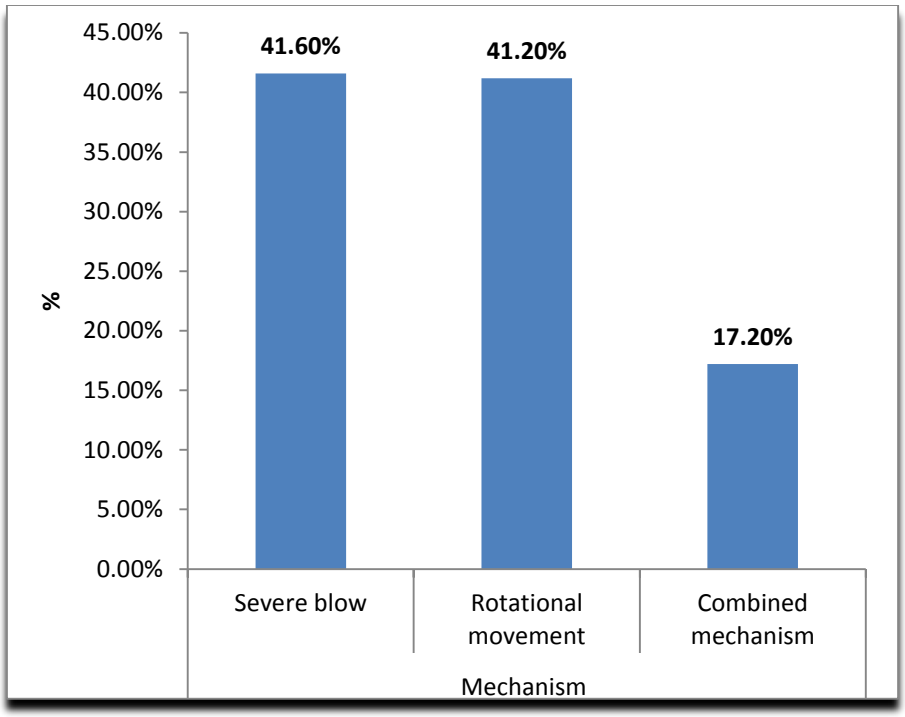

Figure (5): Distribution of the studied cases according to mechanism of injury

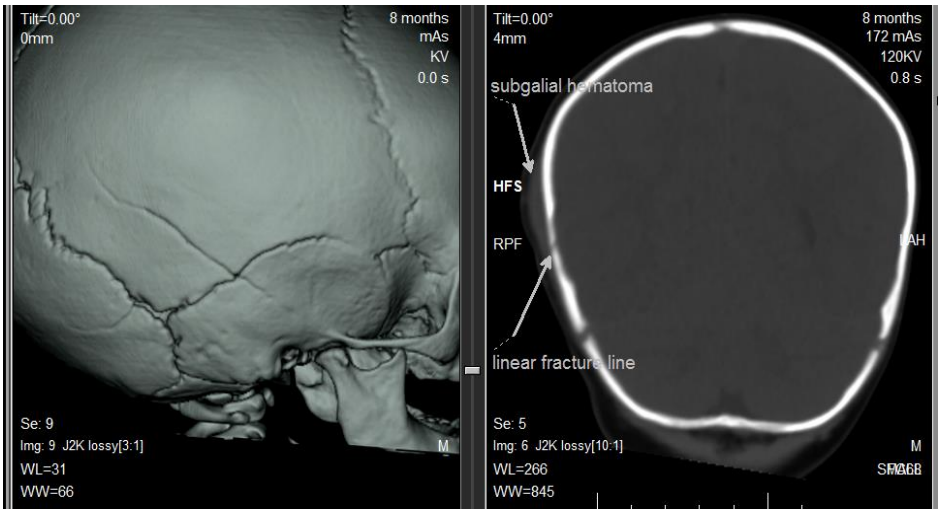

Figure (6): CT scan showing right hair line fracture is seen traversing the right parietal and temporal bone intersecting and traversing the right squamous suture, yet no overriding calvarial bones with small relatively dense right parieto-temporal sub-galial hematoma is seen

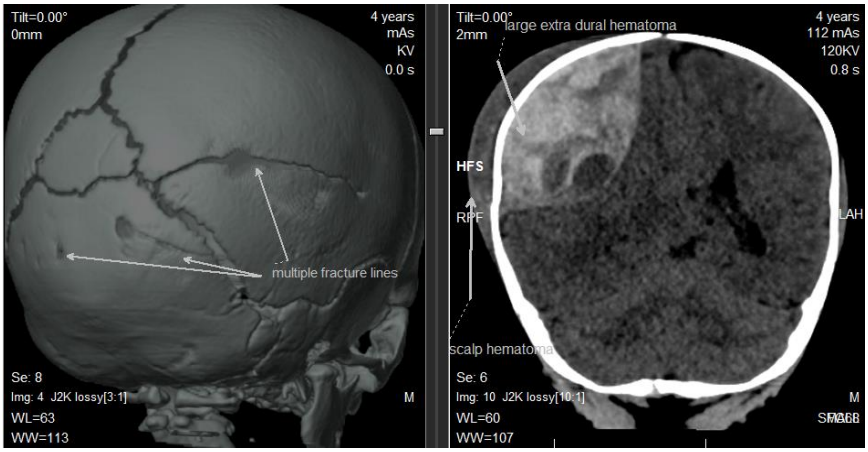

***Figure (7)*:** A large hyperdense extra-dural hematoma with cystic areas within is seen in the right fronto-parietal region; exerting positive mass effect in the form of effacement of the overlying cortical sulci and compression of the ipsilateral right lateral ventricle and contralateral midline shift and right uncal herniation, Underlying multiple transverse and oblique fracture lines are seen involving both right and left parietal and occipital bones and overlying right scalp hematoma is also noted.

Right fronto-temporal contusion

Left parietal fissure fracture associated with subgalial hematoma

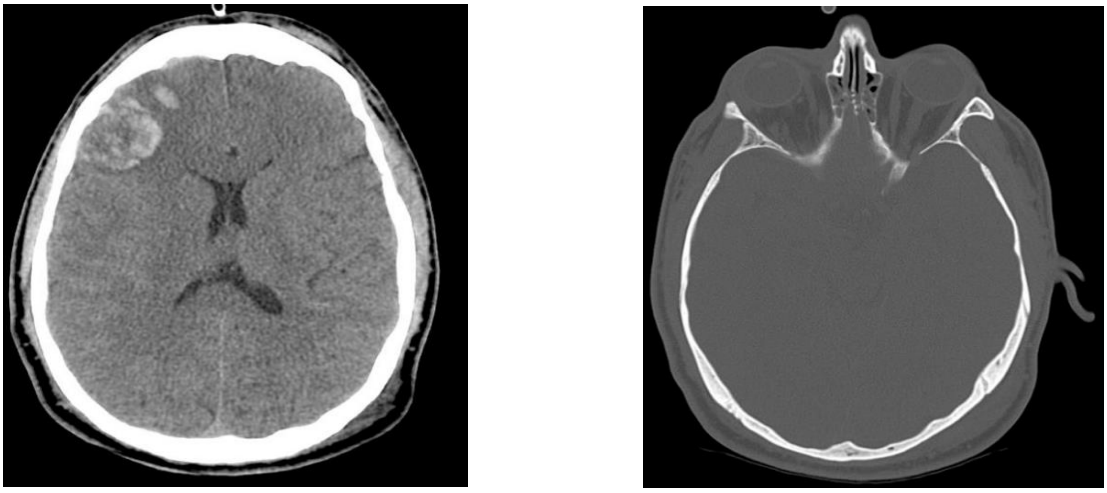

Figure (8): In this case the left parietal fracture indicate that the traumatic impact was at the left posterior aspect and consequently the right fronto-temporal hemorrhagic contusion represents a contre-coup injury

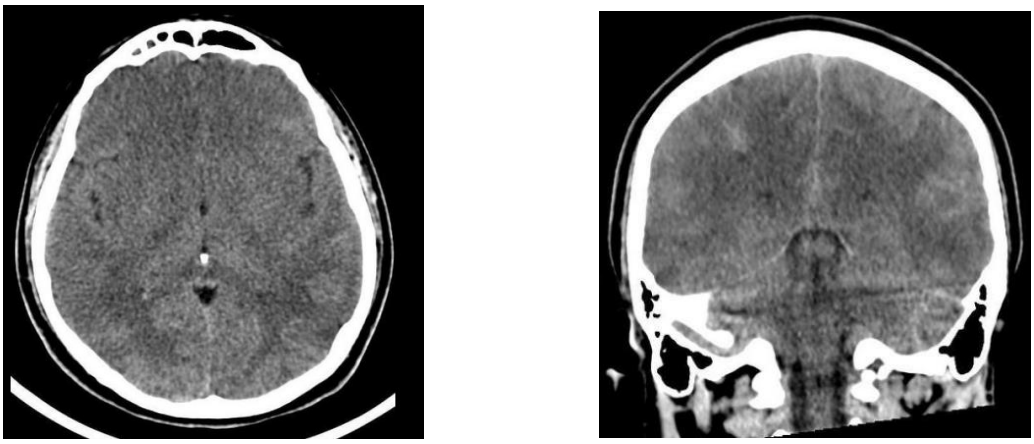

Figure (9) : 25 years old male patient with motor vehicle accident with diffuse brain edema effacing the cerebral sulci and ventricles

DISCUSSION

The present study aimed to estimate the incidence of TBI in Benha university hospital in order to create an extensive program of TBI prevention.

The findings of the present research showed that traumatic head injuries were reported in 39.7% of all cases admitted to neurosurgery department, Banha university hospital during period of study. These results are consistent with survey conducted in Zagazig, Egypt disclosed that 2124 patients admitted to their neurosurgical trauma unit with traumatic brain injury out of 9458 patients admitted to their unit for other reasons **(Taha and Barakat, 2016).**

The most commonly affected age group was children followed by adolescents while the least common is elderly above 50 years. This finding is in line with a research carried out by **Halldorsson et al. (2007)** who conducted a prospective study on traumatic head injuries in Iceland and documented that an increased risk for traumatic head injury in the age group from (0-4 year). Also, in accordance, a study done in emergency department in England, Wales by **NICE (2014)** who found that 50% of traumatic head injury cases are children aged less than 15 years. The increasing number of traumatic head injury among children may be attributed to the physical characteristics of their bodies as they have larger head-to-body weight ratio **(Halldorsson et al., 2007).** In addition, the protective

cranial vault bones are thinner in kids compared to adults. A young male's average frontal and parietal thickness is 6 to 10 mm **(Knight and Saukko, 2016).** In addition, children are the most active and more involved in outdoor activities thus becoming more vulnerable to trauma, while old aged people usually remain indoors and subsequent the risk of exposure to the outer hazardous environment is low **(Halldorsson et al., 2007)**

A controversial study was conducted in Zagazig, Egypt by Taha and Barakat, (2016) who found that the most common age group was (20-29 years). In contrast to our study **Ravikumar (2013)** a survey was performed in India and discovered that the most susceptible age groups are those of the third century 48.13%, followed by the fourth century 24.06%, as these age groups are commonly discovered on the highways and are usually reckless drivers. This is because young adults are the family's top bread earners and remain outdoors for most of the day, while children are confined to the outskirts of the residential premises only **(Gupta, 2002**). Also, conversely, research of **Maegele, et al. (2019)** in Germany, the highest incidence of head injuries among the 44 and 60 years and this may be due to work accidents, which are common in this age category.

The current study revealed that, males were prevalent constituting gender. In the same vein, **Yadav et al. (2008)** found that gender distribution of the victims of traumatic head injuries showed a male predominance (82.4%). These results also agree with a research done in Egypt by **Taha and Barakat (2016)** and study done in Pakistan by **Hassan et al. (2017).**

The predominance of young male is ascribed to the fact that males are more exposed to the outer world than females **(Hemalatha and Singh, 2013).** Young men are also more likely to engage in fights involving weapons and firearms, engage in high-risk or contact sports such as football, karate, boxing, etc., and are much more likely to be employed in occupations with some form of industrial risk, often involving heavy equipment or manual labor **(Gupta, 2002 and Yadav et al., 2008).** In addition, a reason for the male majority is that males are more exposed to outdoor activities everywhere, traveling between home and their workplace to earn for the family, while females stay primarily at home **(Yadav et al., 2008).**

In the present study, the peak incidence of traumatic head injuries was in summer (40.9%) followed by spring season while the lowest incidence was in winter (4.4%). The same result was elucidated by **Sethi et al. (2014)** research. This may be due to the beginning of the vacation from schools and colleges in addition to the overcrowding, while the winter corresponding to the time of beginning of the school.

On the other hand, **Abiona et al. (2012)** conducted a study in Southwest Nigeria and stated that the seasonal index showed that the peak number of admitted patients was observed in the last quarter of each year. This is an indication that mostly takes place during the festive periods when most individuals travel to their home to celebrate with their loved ones. **Ohakwe et al., (2011)** also noted in Southeastern Nigeria that elevated seasonal index values for the months of January, February, May, June, October, November and December.

With concerning outcome of head trauma, the present study revealed majority of patients recovered completely. These findings refer to high rates of complete resolution of head trauma cases. In agreement with study done in Karachi, Pakistan by **Umeran et al., (2014**) who showed that cases with complete recovery after head injury was 63% while 4.5% mortality rate only.

These findings may have led in a general reduction in the percentage of traumatic injuries leading to hospital admission owing to several factors. Changes in hospital admission policies, increased intracranial imaging with CT scanning and improvements in pre-hospital and acute hospital trauma treatment are likely contributing to these trends **(Bruns and Hauser, 2003).**

These findings disagreed with results of **Ramsay et al., (2005)** in the United States, the most prevalent instances of continuous disability (47.3%). Many people with mild traumatic brain injury who survive moderate and severe traumatic head injury are left with important neurobehavioral sequel in the long term. This has resulted in a substantial rise in the number of persons with long-term neurobehavioral illnesses **(Mcallister, 2008).**

In the current study, blunt trauma injuries were the most frequent (57.3%) and the least was penetrating injuries (1.1%).

These findings agreed with results of **Mohanty et al., (2005)** in India who found that blunt trauma was the most common constituting while the least common was firearm trauma representing. This may be due to higher weapon variability and blunt trauma methods. The assailants' likely think that blunt trauma to the head and penetrating trauma to the chest and abdomen is always deadly **(Ghangale et al., 2003).** Another reason for the common use of blunt weapon that they are inexpensive, readily accessible and can be claimed to be household instruments when found later **(Mohanty et al., 2005).**

In the current study, accidental infliction was the most common manner of infliction, while suicidal injury was the least.

In the same line with results of **Yadav et al., (2008)** in India, who found that, there were 92.4% victims

of accidents, 6.7% of homicides and just 0.9% suicide committed by the victim. Also, **Patil and Vaz, (2011)** in India stated that accidental manner was the most common manner in cases of head trauma, and this was in concordance with our study. Head trauma associated with homicide can be caused by dense population, poverty, elevated unemployment rates, crime, and substance abuse. The reason for the least suicidal situation is the availability of other suicide methods such as poisoning or hanging that cause a fast loss of consciousness **(Patil and Vaz, 2011)**

A significant relation between manner of infliction and seasonal variation. Accidental and homicidal manner were more common in summer while suicidal manner was more common in spring. This relation agreed with study done by **Patil and Vaz, (2011)** in India. Throughout summer holiday, there are more involvement between people, more outgoings and more outside children activities. Environmental factors have been regarded as possible arbitrator of seasonal variability in human behaviors and can thence impact suicidal behaviors. Bioclimatic factors as sunlight, temperature, pollution and biological causes may bring about suicidal behaviors in the spring **(Woo et al, 2012).**

In our study regarding relation between manner and type of head trauma where accidental manner was the most common type of manner of infliction in all type of trauma except firearm injuries all were homicidal cases. These results were found to be in aliment with results of **Binder, (2002)** in India who found that accidental manner was the most common manner in all trauma types as accidents can occur by many means.

In our research, RTA were the most prevalent cause of head injuries while the least prevalent incidence in sport related injuries. These findings may agree with **Pate et al., (2017)** survey in India and **Chelly et al. (2017)** in Malaysia who discovered that the most prevalent cause of head injury was RTA. The elevated incidence rate of traumatic head injuries caused by RTA could contribute to rapid and heavy traffic flow, as well as rapid industrialization in densely populated regions, growing number of cars, ignoring traffic rules and speed limits **(Yadav et al., 2008; Rupani et al., 2013).** RTA is also an unplanned occurrence that occurs in an unforeseen situation suddenly, and inadvertently. Also, two-wheeler motorized cars make up a big part of India's car fleet. The exponentially increasing vehicle numbers, bad to traffic laws such as not keeping lane discipline driving in zigzag patterns by the public, badly maintained and congested highways, alcohol abuse and absence of knowledge of helmets and the new generation of high-speed cars are all liable for crashes **(Ravikumar, 2013).**

Conversely, **Linnau, (2012)** stated that fall from height (31.5%) was the most prevalent cause of head injuries

in the United States, followed by motor vehicle collision and assaults.

In our study, a highly statistically significant relation was found between different causes of trauma and age groups where fall and sport related injuries were more common in age group I, while firearm injuries were common in age group III. This is due to the difference in activity between children and older people; as they can experience different causes of injuries either on the road or during playing sports while firearm weapons are of easy accessibility for adults **(Gennarelli et al., 2005).** Also, in the current research RTA was common in age group III. This result, like a previous study done in Malaysia by **Chelly et al. (2017)** who found the majority of RTA victims were mainly youth in their fruitful and innovative age. The explanation for this high prevalence due to their activity and collaboration in hazardous activities like high speed driving without wearing any protective outfit.

As regards the most liable site for head trauma, the present results declared that multiple areas were the most frequent sites and the least affected site was the basal bone. Our results were parallel to results of **Hardman, (2002)** in North America. These findings could be explained by that head areas are targets for homicidal and multiple violence attacks and because vault fractures are more common than basal fractures as it is more exposed **(Hardman, 2002; Rupani et al., 2013).**

Meanwhile, a study done by **Consunji et al., (2014)** in Philippines stated that maxillo-facial were the most common injuries recorded in a young adult male as they do not wear a motorcycle helmet and is highly likely to have driven under the influence of alcohol.

In current study a highly statistically significant relation was found between types of head trauma and site of head injuries where blunt trauma was more frequent in parietal region, while firearm injuries were frequent in multiple sites and penetrating injuries were more frequent in frontal areas. In agreement to our results, **Das et al., (2014)** found that blunt injuries were more common in parietal region. This relation may be explained as the head is the most accessible area to the assailant and may be considered for them the most fatal part of the body **(Das et al., 2014)** while the firearm shots are always multiple and may contact a multiple site in homicides **(Gennarelli et al., 2005).**

In our study, the most common mechanism of head trauma was severe blow followed by rotational movement while the least common mechanism was combined mechanism. This could be explained that kinetic energy can be transferred to the head by direct impact (impact load) when falling or assault with blunt object or inertial load energy transfer through acceleration-deceleration forces without impact (shaken baby syndrome, sudden

movements in the elderly) or combined mechanism. Heavy effect on the side or top of the head also often leads to the fracture of the vault running into the skull's base. A mixture of depressed fractures and radial fracture lines may form a' spider's-web' patter when serious local effect causes focal and general deformation, while if the focal effect is serious, the depressed fracture may happen **(David et al., 2017).**

In this study, most cases represented with vomiting. These results agree with study done by **Palchak et al (2003) and Da Dalt et al. (2007)** who stated that vomiting especially if repeated, frequently used as an indicator of traumatic brain injury. Vomiting was included in a variety of protocols as aprognostic symptom to recommen d the use of CT in head injury cases **(Da Dalt et al., 2007; Pandor et al., 2012).**

On the other hand, **Borland et al. (2018)** in Australia elucidated that, children may be vulnerable to vomiting due to personal preparedness more than the existence of head injury. The accurate mechanism of post-traumatic vomiting is unknown but contact forces (effect) are probable to be less essential in their etiology than inertial forces (impulse).

In this current study the majority of the cases presented with presence of transient loss of consciousness (53.3%). These results are in agreement with a study done by **Herman (2002)** in Pennsylvania, who said that transient loss of consciousness is the most common clinical picture among head traumatized patients. Traumatic insults usually take place over a brief period of moment and are called dynamic loading.

In the current study, the majority of cases represented without convulsions (93.1%). This result is corroborated with that obtained by previous study done in Pennsylvania by **Lovell (2009).**

In our study, the majority of cases had mild trauma as regard GCS (81.8%). These results are in coordination with study of **Hassan et al. (2017)** in Pakistan and **Lovell (2009)** in Pennsylvania who stated that most of the cases were mild with preserved motor and sensory power after traumatic head injury.

In our study, the majority of cases received conservative treatment, these results may be explained by that the most studied cases were mildly affected cases and didn't need any surgical repair. These results were in concordance with research done by **Patil and Vaz, (2011)** in India.

It is important to realize that CT is the standard gold examination for intracranial injury diagnosis as the findings will direct the follow-up management. Negative findings en courage and promote the discharge of patients, reducing family distress as w ell as the costs of health care

(**Borland et al., 2018).** In accordance to our CT scan data, the preponderance of cases had intracranial hemorrhage then subglial hematoma, and the least common was brain edema. These results are in coordination with **Yavaz et al., (2003)** in India whom studied the correlation between skull injuries and intracranial lesions and reported that cerebral hemorrhage was more prevalent. In the same vein, **Song et al. (2019)** elucidated in his study that the scalp hematoma was considered significant CT signs for minor head injury. The predominance of scalp injuries can be explained by the heavy blunt force, loose areolar space available for blood accumulation beneath scalp, minimal musculature of the scalp and the velocity of victim to fall on the ground **(Pate et al., 2017).**

On the other hand, **Carson (2009)** found that brain injuries occurred in 90% of head trauma cases. However, **Menon and Nagesh, (2005)** in India, conducted a retrospective study and showed that there were 62% skull fractures and fissure fracture was the most common then subdural, subarachnoid hemorrhage along with some cases of contusion and laceration of the brain.

With concerning skull fractures at CT findings, the present study results declared that the most common type of skull fractures was simple fissure followed by depressed fracture then comminuted fracture. These findings are ascribed to the outcomes of **Menku et al. (2004)** reporting that fissure fractures were by far the most prevalent form of fractures, and parallel to studies done by **Mohanty et al. (2005)** and **Pate et al. (2017).**

In this study, the commonest type of intracranial hemorrhage was epidural while the rarest one was subarachnoid. These results were in concordance with **Chattopadhyay and Tripathi (2010)** in India, where stated that the enhanced frequency of epidural hemorrhage and fissure fractures is due to the reality that in most instances the parietal and temporal areas were affected by blunt force, which eventually led to blood vessel tearing in the epidural space. However, **Bullock et al. (2000)** and **Maas et al. (2008)** stated highest incidence of subdural hemorrhage. These contradictory results might be due to the different types of accidents that cause prominence of other types than epidural hemorrhages.

CONCLUSION

The total number of traumatic skull fracture cases was 548. The most commonly affected age group was children (0-9 years. Males represented the majority of cases. The peak incidence of traumatic skull fractures was in summer.

The most common cause of traumatic skull fractures was road traffic accident followed by fall. Accidental infliction was the most common manner.

The most commonly affected bone was multiple sites. Most cases

received medical treatment. Most cases had full recovery.

RECOMMENDATIONS

A- Measures of prevention of head trauma

Homicidal head traumas nowadays have an escalating incidence ratio so raising public awareness about laws and high rates of mortality and morbidity for head trauma with severe punishment of criminal persons may participate in lowering of their incidence. Routine use of helmets may decrease head injury while riding a bicycle or motorcycle. Their use is also encouraged for sporting activities like skateboarding, skiing, and snowboarding. Head injuries are a consequence of motor vehicle crashes, lives can be saved by wearing seatbelts, driving cars with air bags, and by avoiding risky driving behavior

B- Measures for lowering morbidity and mortality of head trauma Great attention must be offered to the medical care at the scene of the accident, in transit, at hospital reception and emergency departments. Any clinical examinations must be done with special attention to the nervous system for any patients with head injury even if the patient was completely conscious. All the available investigations should supplied to receptions and emergency departments in large hospitals such as CT scan, MRI which are more beneficial than other investigations. Head injury patient will be cared for by a team of professionals who is specialized in the care of trauma victims through rehabilitation. Rapid referral to hospitals with neurosurgical equipment should be the gold standard where monitoring, diagnosis and timely surgical intervention may be given in the event of mass lesion identification.

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الملخص العربي

الجوانب الطبية الشرعية لإصابات الرأس في مستشفى بنها الجامعي (دراسة تحليلية مستقبلية)

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قسم الطب الشرعي و السموم الاكلينيكية كلية الطب البشري جامعة بنها

المقدمة: تعد إصابات الرأس أحد أكثر أسباب الوفاة والعجز شيوعًا في جميع أنحاء العالم. المظاهر السريرية والمرضية لإصابة الرأس ليست مفيدة فقط لتشخيصها وعلاجها ، ولكن يمكنها أيضًا المساعدة في تحليل نمط الجروح في مجال الطب الشرعي. **الأهداف:** صُممت دراستنا للتحقيق في حالات إصابات الرأس المُحالة إلى قسم جراحة المخ و الاعصاب في مستشفى بنها الجامعي خلال الفترة التي تبدأ من مارس -٢٠١٦ حتى فبراير -٢٠١٧ لوصف السمات الطبية الشرعية لهذه الحالات. **الطرق:** تم الحصول على البيانات من الملفات الطبية الخاصة بالحالات وتم تحليلها إحصائيا. **النتائج:** تم دخول ٥٤٨ حالة في قسم جراحة المخ و الاعصاب من بين ١٣٨٢ حالة تمثل ٣٩,٧ ٪. وكان معظمهم من الذكور في الفئة العمرية (٠-٩) سنوات وتم استقبالهم في الغالب في الصيف (٤٠,٩ ٪). وكانت النتيجة الأكثر شيوعا التعافي التام (٩٠,٩ ٪). كانت صدمات الرأس الرضيه أكثر أنواع الصدمات شيوعًا (٥٧,٣٪) بينما كان أكثر الاماكن اصابة هو الاماكن المتعددة (٢٤,٥٪) ، وكانت اصابات الطرق والمواصلات هي السبب الأكثر شيوعًا لإصابة الرأس (٦٦,٨٪). و كانت الاصابات العرضية هي الأكثر شيوعًا (٨٨٪). كانت الآلية الأكثر شيوعًا للإصابة في صدمات الرأس هي التأثير المباشر (٤١,٦٪). كان النزف داخل الجمجمة هو النوع الأكثر شيوعًا من آفة إصابة الرأس التي تمثل (٣٥,٤٪) ، ووفقًا لـ GCS ، فاق عدد الحالات الخفيفة (١٣-١٥) الدرجات الأخرى من الغيبوبة التي تمثل (٨١,٨٪). كان النزيف داخل الجمجمة هو الأكثر شيوعًا في الاشعة المقطعية (٣٥,٥٪) بينما كان أقلها شيوعًا وذمة الدماغ (٢,٤٪).**الخلاصة:** ان إجمالي عدد حالات إصابات الرأس ٥٤٨. وكانت الفئة العمرية الأكثر شيوعًا هي الأطفال. يمثل الذكور معظم الحالات. كانت أعلى نسبة لكسور الجمجمة في الصيف. كان السبب الأكثر شيوعًا لكسور الجمجمة هي حوادث الطرق والذي تبعه السقوط. كانت الإصابات العرضية هي الأكثر شيوعًا. معظم الحالات تم شفائها.