

Assessment of Traumatic Brain Injury and its findings using Computed Tomography scan in a tertiary care Hospital, Peshawar

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Abstract

Introduction: Traumatic Brain Injury (TBI) is the leading cause of morbidity and mortality and a significant cause of death and disability all over the world.

Objectives: This study aimed to assess the role of CT scan in evaluation of traumatic brain injury from Tertiary Care Hospital Peshawar.

Methodology: A cross sectional study was designed from March to July 2023. Data was collected from the two tertiary care hospitals in Peshawar. The sample size was 350, including both genders of all ages. Self-structured Questionnaire was made to collect data with informed consent. Glasgow Coma Scale (GCS) was used for TBI severity. SPSS was used to find any statistical significance of the data.

Results: In majority of cases 73% were from male, then females with 27%. The incidence of TBI was highest (27%) in the age group of 11-20 years, followed by 21-30 years at 23%. Road traffic accidents (RTA) were the main cause of TBI with 54%, followed by falls at 38%. The

majority of cases were mild TBI with 60%, and severe TBI was found in 16% of cases. Subdural hematoma was dominant in 36%, followed by epidural hematoma (33%), and subarachnoid hematomas in 11% of cases.

Conclusion: Mostly head injuries were in the age of 11-20 years in male having TBI due to RTA. Mild TBI and subdural hematoma was more prevalent. Strict policies were employed by the government to minimize the rates of RTA.

Keywords: Traumatic brain injury, computed tomography, road traffic accident, Glasgow coma scale

Introduction

Traumatic brain injuries (TBIs) are the disturbance of brain functioning due to sudden, unusual, and extreme physical force. Nature of this injury can be telling of either "contusion" or "concussion".¹ Globally, TBI is a major public health problem with high prevalence and deaths in low as well as in middle income countries (LMICs). A high index of thought for high number of TBI and an understanding of the exposure agent, ultimately symptoms that are most likely to require surgical treatment leads to long-lasting neurocognitive diseases are the base of TBI care in the emergency unit.² Additionally, the TBI is classified into three categories such as closed head, open head and explosive blast. Clinically TBI is appeared in the form of coma, headache, nausea and behavioral change such as anxiety.^{3,4}

TBI is categorized into primary, secondary, focal, or diffuse. Primary insult is developed at the time of injury and secondary insult occurs later. Focal injuries due to TBI are cerebral contusions, hemorrhages while diffuse injuries are traumatic axonal injury, which occur ischemic insults. But sometimes the subarachnoid hemorrhage is also detected on computed tomography and may be related with focal or diffuse trauma. Extradural hematoma is most frequent at the ages of 2 and 40 years patients because the dura is less adherent to the skull. In all the admitted traumatic brain injury it accounts for around 1.5%⁵ mostly observed in male patients.

Most of the skull is fractured due to which mainly rupture the middle meningeal artery.⁶ 80% of patients have a lucid interval observe by rapid fall of consciousness and the dilated pupil patients have 60% this hematoma and 89% of cases have ipsilateral in nature.⁷ Most of the hematoma

with a volume of above 150 ml gives poor diagnosis⁸ and surgery will be performed within 4 hours of trauma.⁹ Although this target was achieved in only 32% of cases¹⁰ and systematic protocols for local transfer are need to reduce treatment.¹¹ Rapid acceleration or deceleration of the brain can lead to diffuse traumatic axonal injury, which is differentiated by petechial hemorrhages at the interface of grey and white matter, corpus callosum, and rostral brainstem,^{12,13} because of the deposition of Beta-amyloid precursor protein (Beta-APP). CT diagnoses are often important,¹⁴ and the clinical evaluation, especially with a Glasgow Coma Scale (GCS) less than 8, plays an important role in prognosis, with commonly poor prognosis.¹³ Traumatic trauma considered as the leading cause of mortality between peoples aged 15 to 44 years, leaving a huge effect on their lives.¹⁵ Annually, road traffic accidents (RTAs) cause 1.2 million lives and result in traumas to approximately 50 million people globally.¹⁶ The global occurrence of TBI reaches approximately 69 million patients each year, with the high rates seen in the USA and Canada, where TBI occurs up to 29% of all RTAs, while 34% occurring in Southeast Asia.¹⁷

Studies have shown that RTAs are mainly high in low and middle-income countries,¹⁸ including Pakistan, where these incidents highly contribute to the mortality rate.¹⁹ This can be attributed to the increasing number of motor vehicles in the country, coupled with a lack of usual safety practices such as helmet and seatbelt use. Clearly, the shortage of footpath, traffic lights, and safety roles for pedestrians and cyclists also commit to the high prevalence of RTAs and subsequent TBIs in Pakistan.²⁰ Limited studies available regarding TBI from Pakistan, therefore we design a study to assess the role of CT scan in the evaluation of traumatic brain injury from Tertiary Care Hospital Peshawar.

Methodology:

This was a retrospective cross-sectional study conducted from February to July 2023, in different tertiary care hospitals. The sample size for this study was 350 patients according to the formula previously described by,²¹ visited the selected hospital and met with the supervisor of the Radiology department. The correspondents were randomly selected because of their availability. All the Patients sustaining head injury presenting in the emergency room were included in this study with both gender and various groups to evaluate the TBI patients. Severity of TBI was

assessed through Glasgow Coma Scale (GCS). Diagnosis of TBI as the hematoma was analyzed using CT. All the patients were excluded using the criteria of Known hypertensive, Patients receiving anticoagulant drugs, Patients with history of previous cerebrovascular accidents and Patients with known bleeding disorders. After confirming consent form data will be collected by researchers with the help of data collection tools. Questionnaire and data sheet data were collected according to the variable of the data sheet. The patient history and the other variables such as gender, age, and type of TBI were also evaluated.

Results:

A total 350 patients were processed in the current study during 6 months of duration from March to July 2023.

Patients demographic details

According to gender distribution the TBI cases were found more in male 257 (73%) as compared to female n=93 (27%) were female. The most predominant patients were seen at the age of 11-20 years 93(27%), followed by 21-30, 80 (23%) while the rest of the details are shown in the (Table 1).

Table 1: shows the patients determine several age groups

	Number	%age	Valid %age	Total %age
0-10	51	14.6	14.6	14.6
11-20	93	26.6	26.6	41.1
21-30	80	22.9	22.9	64.0
31-40	60	17.1	17.1	81.1
41-50	27	7.7	7.7	88.9
51-60	23	6.6	6.6	95.4
61 to on wards	16	4.6	4.6	100.0
Total	350	100.0	100.0	

Patient etiology

Out of all determined etiologies, RTA was found the most predominant cause of TBI 189 (54%) followed by fall 133(38%) and other causes 28 (8%) (Table 2).

Table 2. Shows the etiologies of the patients

	Number	%age	Valid %age	Total %age
RTA	189	54.0	54.0	54.0
HOF	133	38.0	38.0	92.0
Other Causes	28	8.0	8.0	100.0
Total	350	100.0	100.0	

TBI Severity on the basis of GCS

Severity of TBI on the basis of GCS was examined, the most common were mild TBI 209 (60%), followed by 84 (24%) were moderate traumatic brain injury and then the severe 57 (16%) TBI patients are shown in Table. 3.

Table 3. Shows the Severity of TBI

	Number	%age	Valid %age	Total %age
Mild	209	59.7	59.7	59.7
Moderate	84	24.0	24.0	83.7
Severe	57	16.3	16.3	100.0
Total	350	100.0	100.0	

Diagnosis of TBI

During the diagnosis of 350 TBI patients the most dominant hematoma was observed subdural hematoma 127 (36%) which shows in (Figure1 (A), Table 4), followed by epidural hematoma 115 (33%) which revealed in figure 1 (B), intracerebral hematoma 69 (20%) which revealed in figure 1 (C) and subarachnoid hematoma 39 (11%) which revealed in figure 1 (D).

Table 4. Shows frequency/percentages of the Hematoma Diagnosis

	Number	Percent	Valid Percent	Total Percent
Subdural Hematoma	127	36.3	36.3	36.3
Epidural Hematoma	115	32.9	32.9	69.1
Intracerebral Hematoma	69	19.7	19.7	88.9
Subarachnoid Hematoma	39	11.1	11.1	100.0
Total	350	100.0	100.0	

Figure 1 (A)

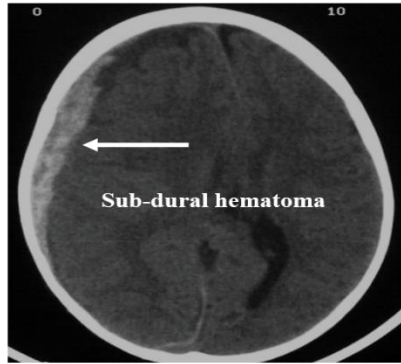


Figure 1 (B)

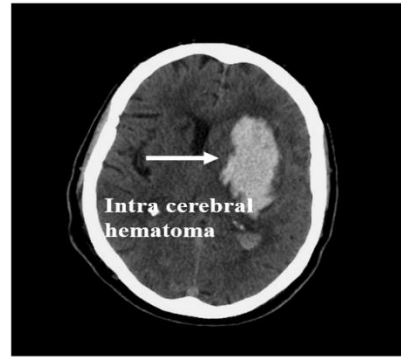


Figure 1 (C)

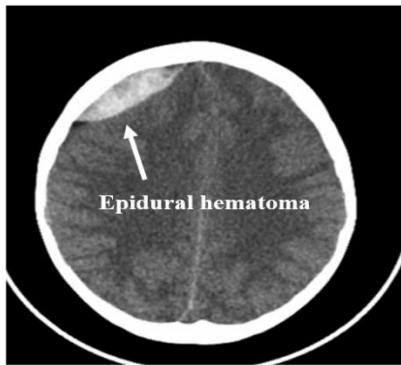


Figure 1 (D)

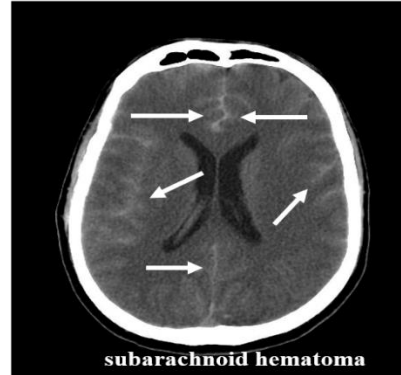


Figure 1: Diagnosis of Hematoma, Figure 1 (A) shows the representative image of subdural hematoma, (B) intra cerebral hematoma, (C) epidural hematoma, and (D) represents the subarachnoid hematoma.

Discussion

As in Pakistan the most abundant cause of Traumatic Brain Injury (TBI) is Road Traffic Accidents (RTA). Traumatic Brain Injury (TBI) caused by trauma is a significant public health issue and can result from various incidents. TBI is considered a really worrying socio-economic health problem and a significant explanation for death and injury for year 2020.²² In this study, we observed that 73.4% of patients were male while 93 were female (27%). Another report from Pakistan also reported that TBI was more in males with a similar percentage (73%)²³ as in the current study. Similar observations from Pakistan by Umar et al. Haque et al. and Javeed et al. noticed that the majority of patients were from male 66%,79%, and 84.6% respectively having TBI.²⁴⁻²⁶ Another research conducted on TBI concluded that the most common injury was observed in male with 77.4% of cases.²⁷ The main affected age group in the current investigation was from 11-20 years, accounting for 27% of the cases, followed by 21-30 years (23%), almost closed findings was also observed by²³, in which mean age of the participants was 35.9 years, with the youngest being 16 and the oldest were 60, and Asare *et al* that the mainly affected group was 21-30 years (26.4%) followed by 31-40 years (15.1%).²⁷ While a report from Karachi, Pakistan noticed the RTA in age group of 31-50 years in 61.8% of cases.²⁸ Another report from Bangladesh also observed that most of cases was in age group of 1-14 years.²⁹ As in Pakistan the most abundant cause of TBI is RTA followed by fall, gunshot injury and assault although rates of brain injuries head trauma rates increasing due to fall have been reported.^{30,31} In terms of the causes of TBI by²⁴ found that road traffic accidents (RTAs) were the predominant cause with 55% of cases, followed by falls at 38%. In this study, the same observation was observed that RTA was the dominant cause of TBI, in 54% of cases, followed by falls with 38%. RTA was also found predominant form Pakistan in 38.8%, 60.9% and 86.2% of cases, respectively.^{23, 25, 26} while a recent study from Bangladesh noticed that 63.95% of patients fell from height while 36.05% had RTA,²⁹ this study results are not similar with our current findings. Furthermore, in our neighboring countries most of the TBI was due to RTA in India 45-60 % and China (61%).³² The reason for high TBI might be due to a variety of risk factors for brain injuries, including terrorism, political unrest, domestic violence, and sexual assault. Umar et al., (2021) diagnosed the subdural hematoma was the most frequently observed in 33% individuals, Similar results were observed in the current study, as subdural hematoma was the most predominant one (36%), another report from Karachi reported the same findings.²⁸ While a recent report from Bangladesh

noticed subdural hematoma with low incidence in 13.61% of cases.²⁹ TBI severity was evaluated by using the Glasgow Coma Scale (GCS). In our current study, most common category was mild TBI with 60%, similar findings from Pakistan reported that 93% of patients have mild TBI.²³ A shortage of resources in the form of clinicians with specialized training, medical equipment, a capacity for research, educational initiatives, and a general understanding of dementia and TBI.

According to the etiology of TBI Asare *et al.* reported the most common cause was RTA 34% followed by fall 1.9% and 3.8% were assaults.²⁷ In the current study, RTA were also the main cause of TBI, with 54%, followed by falls with 38% of cases. Subdural hematoma was the most prevalent type, accounting for 11.4%, followed by intracerebral hematoma at the same percentage, epidural hematoma was 5.7%, and subarachnoid hematoma were 2.9% cases.²⁷ In our study, subdural hematoma in 36% followed by epidural hematoma 33%, intracerebral hematoma in 20%, and subarachnoid hematoma in 11% was recorded. Another report from Pakistan also noticed the subdural hematoma the most dominant in 8.2% of cases.³³ The more TBI in Pakistani population might be over growing population, lack of safety measures, and frequent acts of terrorism. TBI cases are rising quickly in Pakistan. However, the infrastructure that is already available for diagnosis, treatment provision, and follow-up care is inadequate. There are several causes for this dearth of facilities, but the main ones are a shortage of resources, particularly highly skilled medical personnel and cutting-edge medical equipment.

Conclusion: TBI was mostly observed in younger age groups of 11-20 years, predominantly in male individuals. RTA was the main cause for TBI, and its severity measure based upon the GCS, in which mild TBI was found in 60% of cases. The most predominant hematoma was observed subdural hematoma in 36% of individuals.

Limitations of the study: The study was conducted in a single hospital, with small sample size and limited time duration, because of that it cannot represent the picture of the whole community. A large-scale study should be conducted to take a large number of samples and as well as the data from all tertiary care hospitals in Peshawar region to evaluate the Traumatic Brain Injury and its findings using Computed Tomography scan.

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Consent for Publication: Not applicable

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