Factors associated with traumatic brain injury in patients presenting to intensive care unit of Hayatabad Medical Complex Peshawar, Pakistan

A thesis Submitted by

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SUPERIOR UNIVERSITY

MS ALLIED HEALTH SCIENCES

Faculty of Allied Health Sciences
The Superior University, Lahore
Year (2023-2025)

Factors Associated with Traumatic Brain Injury in Patients Presenting to Intensive Care Unit of Hayatabad Medical Complex Peshawar, Pakistan

SUPERIOR UNIVERSITY

Thesis Submitted to

The Superior University Lahore

In Partial Fulfillment of the

Requirement for the Degree of

MS Allied Health Sciences

By

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Session: 2023-2025

Faculty of Allied Health Sciences

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Supervisor Name: Dr Maham Qazi
Designation: Assistant Professor General Surgery

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No part of this thesis has been submitted anywhere else for any other degree. This thesis is submitted to the Faculty of Allied Health Sciences, The Superior University, Lahore in partial fulfillment of the requirements for the degree of Master of Philosophy in the field of "**Hayatabad Medical Complex Peshawar"** in Faculty of Allied Health Sciences at The Superior University, Lahore.

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DEDICATION

This humble research work of mine is hereby dedicated to my Parents and Supervisor, Dr. Maham Qazi. The dedication is all about their valuable drawings on my ground breaking brain, my research behavior and his very respecting, friendly dealing with me that I will never ever forget during my life Insha'Allah.

ACKNOWLEDGEMENT

In the name of Allah, the most Gracious, the most Merciful.

I am extremely thankful to Almighty ‘Allah’ Who is the entire source of knowledge and wisdom endowed to mankind, for providing me with the acumen and vision to complete this endeavor.

I would like to express my profound gratitude to my supervisor for her wise counsel and encouraging attitude towards this study. I am extremely grateful to her for immensely facilitating me during my study period by ensuring the provision of favorable circumstances and conducive environment. This project would not have been possible without his support and expert guidance.

In the end, I would like to extend my deepest gratitude to my family members. Without their encouragement, I would not have been able to complete this endeavor.

Zabih Ullah

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LIST OF ABBREVIATIONS

TBI	Traumatic Brain Injury
ICU	Intensive Care Unit
GCS	Glasgow Coma Scale
QOL	Quality of Life
EDH	Extradural Hematoma
SDH	Subdural Hematoma
SAH	Subarachnoid Hemorrhage
ICH	Intracranial Hemorrhage
WLSM	Withdrawal of life sustaining measures
BAC	Blood Alcohol Content

ABSTRACT

Introduction: Injury is one of the top five causes of death and disability around the globe, making it a serious public health concern. Around the world Traumatic brain injury (TBI) is the primary cause of mortality, disability, and cognitive disorder in young people. TBI is more common in low- and middle-income state. The increased usage of motor vehicles, especially in developing countries, is leading to raise in the incidence of traumatic brain injury (TBI), which is on the rise globally. Worldwide, traumatic brain injuries (TBIs) affect about 50 million individuals annually, and half of all people are expected to experience one or more TBIs in their lifetime. The study's objectives to determine the association of fall, motor vehicle accident, sport injuries, age, gender and occupation with Traumatic brain injury among patients which are in the Intensive Care Unit of Hayatabad Medical Complex Peshawar.

Methodology: A cross sectional study was conducted at the intensive care unit of Hayatabad Medical Complex Peshawar, Purposive Sampling Technique with Structure questionnaire was used to gather data. The test which was used Chi square to compare the kind of group (CT scan finding of TBI) with all other independent variables. SPSS version 22 was used to analyzed the data.

Result: Most of the extradural hematoma patients were male 29 (24.6%, p value 0.59) and their age was 15-29 years. Most of the extradural hematoma patients 16(33.3%, p value 0.09) were students. mostly multiple finding (subdural hematoma, extradural hematoma, subarachnoid hemorrhage and cerebral contusion) patients 26 (26.3%, p value 0.07) had household income less than 50000. Majority of extradural hematoma patients 21 (30.4%, p value 0.03) had road traffic accident while involve frontal area of the brain. Physiological variables including blood pressure in which majority of multiple finding patients 21(28.0%, p value 0.88) had low blood pressure, extradural hematoma patients 21(29.2%, p value 0.46) had normal heart rate, multiple finding participants 25(36.8%, p value 0.08) and 29(34.9% p value 0.02) had low respiratory rate and oxygen saturation respectively, while extradural hematoma individuals 33(29.2%, p value 0.34) had normal body temperature. Most of the multiple finding patients 25(30.9%, p value 0.20) had severe traumatic brain injury and their GCS score was less than 8. Pupil reactivity of the patients in which majority of extradural hematoma patients 44(32.6%, p value 0.007) had reactive pupil and they did not use alcohol prior to injury. Mostly extradural hematoma patients 45(27.3%, p value 0.02) did not use protective gear, helmet and seatbelt while 40(31.3%, p value 0.17) experienced symptoms such as headache, dizziness and vomiting after the injury. Time taken to reach hospital in which majority of the extradural hematoma patients 27(42.9%, p value 0.10) had reached in more than 90 minutes. Most of the extradural hematoma patients 26(27.1%, p value 0.009) had normal complete blood count. Majority of the multiple finding patients 33(35.9%, p value 0.009) had used invasive ventilation during hospitalization.

Conclusion: TBI was common in male who had history of road traffic accident and their CT scan finding shows that most patients had extradural Hematoma with severe traumatic brain injury.

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CHAPTER 1
INTRODUCTION

Injury is one of the top five causes of death and disability around the world, making it a serious public health concern(1).Around the world Traumatic brain injury (TBI) is the primary cause of mortality, disability, and cognitive disorder in young people(2). The term "alteration in brain function or other evidence of brain pathology, caused by an external force" refers to traumatic brain injury (TBI)(3). Traumatic brain injury (TBI) is a non-congenital brain injury caused by an external mechanical force that can affect cognitive, physical, and psychosocial abilities either permanently or temporarily. Around the world, TBI is a significant cause of mortality and disability for people of different ages. The burden of TBI is common in low- and middle-income countries (LMICs), which have high rates of exposure and poor health systems for delivering acute and long-term treatment. The increased usage of motor vehicles, especially in developing countries, is leading to in the incidence of traumatic brain injury (TBI), which is on the rise globally.

The increasing usage of motor vehicles, physical assault, and violence are contributing factors to the global rise in TBI incidence. Among young people, the common cause of mortality and disability is traumatic brain injury. The most common causes of traumatic brain injury are road traffic accidents, falls, physical attack, violence, explosion and gunshot injuries. Patients often experience altered consciousness, focal neurological impairments, headaches, nausea, and confusion right after a traumatic brain injury. Long-term TBI patients report cognitive impairment as well as neuropsychological symptoms such altered behavior and personality, sadness and thoughts of suicide, aberrant speech and gait, and behavioral and personality changes. The American Congress of Rehabilitation Medicine defines TBI as any mental state change that occurs during an accident. After studying wounded troops in World War II, Alexander Luria focused his rehabilitation efforts on focal brain injury and its effects on language, motor skills, and cognition(4). Primary and secondary brain injuries are the two distinct but connected categories used to describe traumatic brain injury (TBI). Trauma originating directly by outside mechanical forces transferred to inside the brain contents causes primary brain damage. These comprise a mix of cerebral edema and swelling, shearing of white matter tracts (diffuse axonal damage), and focal contusions and hematoma (SDH, EDH, etc.). The most common type of lesions are focal brain contusions. If not stopped, a series of chemical mechanisms that cause secondary brain injury can continue for hours or days after the initial point of contact. The most frequent causes of secondary brain injury include pyrexia, elevated intracranial pressure, hypotension, and hypoxia. Historically, TBI has been categorized using damage severity scores, the most commonly used scale is Glasgow Coma Scale. A traumatic brain injury is classified as mild, moderate and severe if the GCS score is between 13 and 15, as moderate if it is between 9 and 12, and as severe if it is 8 or lower. A mild TBI is characterized by altered or loss of consciousness for 30 minutes following the event, confusion or disorientation within 24 hours of the injury, CT scans revealed normal structural brain imaging, as well as a concussion-related Glasgow Coma Scale score of 13 to 15. A traumatically caused physiological impairment in brain function, indicated by either a loss of consciousness lasting longer than 30 minutes, an initial GCS of 12 or below after 30 minutes, or post-traumatic amnesia lasting longer than 24 hours, is what is referred to as a moderate/severe traumatic brain injury (TBI)(4).

According to studies, preventing traumatic brain injury (TBI) at an early age can decrease disability, save lives, and save healthcare expenditures. Among these, preventing secondary brain injury is crucial for lowering mortality, which is a prevalent cause of secondary brain injury. Increased intracranial pressure (ICP) is a sign of cerebral injury. If the right medications are not started soon enough to keep the ICP level below normal limits, brain herniation may result, which can be fatal(5). Brain injury that is both heterogeneous and diffuse is caused by traumatic brain injury (TBI), which has diverse and diffuse pathophysiological effects. Injuries are most common in the frontal, temporal, limbic, corpus callosum, basal ganglia, midbrain, and cerebellar areas. About 25% of patients with traumatic brain injuries who are hospitalized to hospitals pass away within six months of the accident. A wide spectrum of changes in motor, sensory, cognitive and behavioral functions is experienced by those who survive.

Symptoms include problem in memory, focus, slow judgment, word finding, planning and problem solving, initiative, tiredness, irritated, controlling one's anger, self-centeredness, headaches, vertigo, disturbed sleep, balance and coordination, anxiety, and depression. Even though these symptoms gradually resolve in the months and even years after the damage, they can persist for up to 30 years. In some cases, this duration exceeds 10 years. Outcome refers to the effects or consequences of these modifications. The result of a traumatic brain injury (TBI) had been evaluated in difference ways, including the injured person's initial survival rate, the symptoms they experienced, the effect they had on their ability to function independently in daily activities, work, education, social and recreational activities, and relationships, as well as their emotional health and quality of life. It has been evaluated from the perspective of the injured individual. Additionally, it has been evaluated throughout a range of time periods, from a month to thirty years after the injury. While a tiny percentage of people with TBI need ongoing assistance with daily living activities, a significant number have diminished ability to engage in social, occupational, and leisure activities. Reliance on family for assistance is growing while the quantity and quality of relationships decrease. Growing social isolation, a drop in self-worth, and elevated rates of depression and anxiety are all present(6).

Early TBI treatment and resuscitation are critical steps which influence morbidity and death. According to Advanced Trauma Life Support guidelines, early management is needed. The essential factors influencing the result are specifically the timely diagnosis and evacuation of an increasing cerebral hemorrhage, as well as the prevention of additional brain damage through the treatment of hypoxemia and hypotension. The complicated nature of TBI necessitates a step-by-step, coordinated approach to the provision of general intensive care support and therapies that are specifically aimed to the wounded brain. The cornerstones of care for mild traumatic brain injury include rest, monitoring for a minimum of twenty-four hours, and focused therapy of the clinical symptoms. Patients with GCS<15, seizures, focal neurological impairment, abnormal CT findings, suspected or confirmed depressed/skull base fractures, and co-morbid coagulopathy should be admitted to the hospital. Patients exhibiting progressive neurological impairment as a result of substantial or growing Extradural hematoma, Subdural hematoma, obstructive hydrocephalus, or depressed skull fractures should consider surgical intervention. The aim of treatment for moderate/severe TBI without surgical evidence is to prevent hypoxia and hypotension after the trauma, both of them significantly raise death and disease ratio. This is achieved by keeping blood pressure (systolic >90 mm Hg) and oxygen level (PaO2 >60 mm Hg) high in the intensive care unit(4).

Problem Statements:

Worldwide, traumatic brain injuries (TBIs) affect about 50 million individuals annually, and half of all people are expected to experience one or more TBIs in their lifetime. Over 1.39 billion people china had at of the end of 2017, making up about 18% of the global population. China has more TBI patients than the majority of other countries, which is extremely burdensome for families and society as a whole. In China, car accidents are the leading cause of traumatic brain injuries. But over the last thirty years, a number of road traffic safety initiatives have been put into place, which has led to a decrease in the cases of traffic-related traumatic brain injury. Furthermore, since the 1980s, better brain monitoring tools, the implementation of revised TBI management standards, and more neurosurgical training programs have all contributed to a significant improvement in the patients care who were presented with traumatic brain injuries. Further improving the care of patients with TBI are more resources (e.g., government funding) and contemporary facilities (e.g., trauma centers with neurosurgical critical care units, monitoring of intracranial pressure, Computed Tomography, Magnetic Resonance Imaging, digital subtraction angiography, and electroencephalography(7).

In the US, the leading cause of mortality and disability is TBI. Men experience TBI at a ratio of 2:1 more than that of women. It usually happens when a person is older than 75 years old and falls frequently or between the ages of fifteen and twenty-four, when taking risks is more common. An estimated 1.5 million persons experience traumatic brain injuries (TBIs) yearly in the United States alone. The number of people who survive TBIs has increased, while the death and morbidity rates following TBIs have reduced due to advancements in medical technology.

Around 80,000 to 90,000 survivors will develop serious, lifelong deficits annually in the US in terms of physical, cognitive, emotional, and/or behavioral performance which will ultimately affect their quality of life (QOL). There's evidence linking the quality of life (QOL) of TBI survivors to demographic variables such as age, marital status, and occupational status. A new study that included 337 adult TBI patients looked at community integration and quality of life from one to more than twenty years following the injury. The association between employment and perceived quality of life was found to be significant(8). There is a growing need for healthcare services due to the rise in TBI incidence. An estimated 1.5 million TBI patients in the European Union need to be admitted to hospitals. In the UK, it is suggested that every patient who has traumatic brain injury (TBI) and has Glasgow Coma Scale score of 8 or lower be moved to a neurosurgical center(3).

WHO Statement:

According to the World Health Organization's (WHO) the burden of injury estimates, injuries are one of the top 10 causes of death worldwide. among them, TBI is responsible for about 30% of injury-related fatalities and is the main cause of mortality and disability. According to current estimates, trauma causes 4.48 million fatalities worldwide, accounting for 8% of all deaths and 38% more than the total number of fatality from HIV/AIDS, tuberculosis, and malaria. Of these, TBI was thought to be the cause of 2 million deaths, with LMICs bearing the brunt of this burden since they had less approach to modern life-sustaining managements following trauma. More than 2.8 million TBI cases were reported annually, with a 2% fatality rate. TBI is a hidden epidemic in Africa, where poor outcomes affect one-third of brain injury patients, Patients with major brain injuries had roughly twice the fatality risk of those in high-income countries(5). Over the past forty years, advancements in intensive care unit (ICU) and prehospital resuscitation have reduced mortality by 12% and raised positive outcomes by 6%, respectively(2).

Research published between 2015 and 2020, According to epidemiological population-based study the age-adjusted incidence of all TBI severities varied from 476 per 100,000 people in South Korea to 787 per 100,000 people in United State. These incidence researches may still be underestimating the actual scope of the issue, though. The yearly incidence rate of concussions, a subtype of mild traumatic brain injury, was shown to be higher in Canada, at 1153 per 100,000 people. Small regional or single-center analysis found that the incidence of TBI dropped during COVID-19 lockdowns, which may have been caused by a decline in mobility, a decline in engagement in sports and leisure activities, or a reluctance to find medical attention for less serious traumas. The inaugural Lancet Neurology Commission on TBI emphasized the massive public health burden caused by TBI. In New Zealand and North America, population-based incidence rates ranged from 811 to 979 per

100,000 people per year. In the EU, discharge rates from the hospital were 287·2 per 100,000 persons per year, with significant change among Member States. We emphasized the necessity for standardized epidemiological monitoring and international agreement on definitions and methodologies, and we showed how methodological differences complicate comparisons of TBI epidemiology patterns across areas, nations, and continents(9). Regularly admitting patients with mTBI to the intensive care unit consumes a substantial amount of healthcare resources, and the advantages are questionable in many situations. In fact, rates of clinical worsening or death among individuals with GCS $\geq$ 13 were found to be 11% and 1.4%, respectively, in a meta-analysis of 49 studies, indicating that most of these individuals do not need such close observation. According to a retrospective study carried out at eight level 1 trauma centers in the western United States, patients were admitted to ICU were only 5% and their GCS score were 15 and they had mild TBI. These patients were needed neurosurgical management, inotropic support, invasive blood pressure maintenance, artificial ventilation, or transfusion of blood(10). Age shouldn't be a limiting factor in therapy, despite a study showing that becoming older is linked to worse results after traumatic brain injury. However, compared to patients injured with vehicle accident which is high-energy penetration power and falls injury which has low energy power (who are primarily old people) are roughly 50% less likely to get ICU care or immediate resuscitation. The majority of TBI cases (over 90%) that present to hospitals have mild TBI, and their GCS score is between 13-15. Six months after their injury, over 50% of adult patients with mild traumatic brain injury who first arrive at the hospital do not regain their pre-injury state of health. In Europe, follow-up is currently provided to less than 10% of patients who are discharged from emergency departments after suffering a traumatic brain injury. It is compulsory to conduct urgent research to determine whether patients with mild brain injury are prone for incomplete recovery, and structured follow-up following mild TBI should be considered as best practice. In cases of mild TBI, choosing which patients to send for CT is a crucial triage choice because it enables the early detection of lesions that may require hospitalization or potentially life-saving surgery. The current process for selecting a CT scan is wasteful; 95–99% of scanned individuals do not exhibit any intracranial injury, yet they have just the risk to expose to radiation (9). To identify the most common associated factors of head injuries such as fall, sport injury and car accident to inform prevention strategies and to reduce the relevant disease burden in the community.

AIM AND OBJECTIVES

- To determine the association of fall, motor vehicle accident and sport injuries with Traumatic brain injury among patients in Critical Care Unit of Hayatabad Medical Complex Peshawar
- To find the association of age with Traumatic brain injury among patients in Critical Care Unit of Hayatabad Medical Complex Peshawar
- To identify the association of gender and occupation with Traumatic brain injury among patients presenting to Critical Care Unit of Hayatabad Medical Complex Peshawar

CHAPTER 2
LITERATURE REVIEW

A study conducted in which 1512 patients who were enrolled in the ENIO trial, 286 (17%) and 9 (0.6%) were dropped because there was not enough information available to calculate MP or because the patients were in spontaneous breathing mode on HD1. investigation comprised 1217 individuals from 18 countries at 62 sites; the average age was 51 years, with 66% of patients being male (n = 805) and a mean BMI of 26.3. The majority of patients (69%, n =845) were from Europe/Central Asia, and 19%, n = 236 were from Latin America/the Caribbean. ICH (31%, n = 382), SAH (18%, n = 218), and TBI (48%, n = 588) were the most commonly seen underlying diagnosis. Out of the 937 patients, 77% had an initial GCS of ≤ 8 prior to intubation, and 288 patients (n = 338) experienced an episode of while in the hospital(11). At roughly three years after the injury, 25 interviews were performed with nine TBI participants and sixteen closes-others (CO) of TBI participants (note: These close relatives of 16 other TBI participants were their spouses or other family members). 36.96 years was the average age at injury, with 72% of the subjects being male. The primary leading factor for injury was car accident (40%) and was followed by falls (16%), pedestrian collisions (16%), motorcycle crashes (12%), assaults (12%), and other sources (4%). 60% were entitled for benefits under injury insurance plans such as Work safe, Transport Accident Commission (TAC). For anyone hurt on Victorian roadways or at work, Hospital, long-term care and medical expense reimbursement is provided by the no-fault injury insurers Transport Accident Commission and Work Safe Victoria (12).

Study was conducted on 1776 out of the 2589 individuals in the BRAIN-PROTECT database who had suspected severe traumatic brain damage. Those who were not included were those who were transported to a trauma center that did not participate (n = 472), those who underwent pre hospital cardiac resuscitation (n = 290), and those who did not receive pre hospital advanced airway care (n = 51). The majority of the patients who suited for additional analysis were male (70%) on arrival GCS of 4 and a median age of 45 years. Thirty days following their injuries, 40.6% of patients were still alive (GOS 4 & 5) of those, 40.6% had made adequate recovery at the time of discharge. A total of 2649 CO2 measurement findings were available for additional analysis (n = 1354 prior to arriving at the participating hospitals emergency departments, and n = 1295 following initial stabilization and advanced airway treatment). There was a poor association between the initial in-hospital PaO2 and the last ETCO2 measurement, and there was a moderate correlation between the measures at these two time points. Few patients had a coniotomy or supraglottic airway device, and the majority of patients were intubated with an endotracheal tube of the patients (n = 941) whose ventilation after airway management was documented, 61.4% were ventilated mechanically using a respirator and 35.4% required manual bag self-inflation ventilation (13). In the NTDB dataset, a study found 1,869,614 patients with at least one TBI ICD-9-CM diagnostic code. Of these, 948,436 experienced a mild isolated traumatic brain injury (TBI), which was characterized by maximum AIS score of two or less in any part of the body other than the head and a GCS of 13 or higher. 595,171 patients made up the final group after those who were sent straight from the ED to surgery and those who had just been diagnosed with concussions as a TBI were removed. An ICU was visited by 44.7% (n = 265,857) of the resulting cohort. More than 90% of these individuals never needed mechanical ventilation, and over 95% of them never had neurosurgical intervention. Over two-thirds of patients were sent straight to their homes following their hospital stay, with a minority of patients having critical care stay of one day or less and a total hospital stay of two days or less. Out of all patients admitted to the ICU, 17.3% (n = 45,953) fulfilled the requirements for overtriage (10).

Study in which 311 people were admitted as possible organ donors in a research involving 28,674 individuals who did not fit one of the other exclusion criteria and were receiving treatment in a university hospital with on-site neurosurgery services. 6,162 (22%) of the 28,363 patients that remained were admitted with a neurosurgical condition. Compared to patients with a non-neurosurgical diagnosis, Patients diagnosed with neurosurgery case had lower GCS scores, lower SAPS II scores, high extended TISS scores, and lengthy stay in the intensive care unit. They had a reduced hospital mortality rate (9.3% vs. 13.0%) and were more frequently admitted to the hospital following surgery while maintaining a normal premorbid functional level. Non-traumatic ICH accounted for 41% of all neurosurgical diagnoses; it was followed by isolated TBI (24%), SAH (23%), and multi traumatic TBI (13%). The youngest category of patients consisted with multi trauma TBI, while the oldest patient group was made up of individuals with non-traumatic ICH. Within SAH, women constituted an excessive proportion. The distribution of SAPS II scores was equal among the diagnostic categories. Compared to the other groups, patients with SAH and multi trauma TBI had longer length of stay periods and higher TISS scores (14).

Demographic Variables:

There is evidence linking the quality of life (QOL) of TBI survivors to demographic variables such as age, marital status, and occupational status. A new study that included 337 adult TBI patients looked at community integration and quality of life from one to more than twenty years following the injury. The findings showed a strong connection between perceived QOL and employment. Individuals with full- or part-time employment reported greater quality of life scores than those without employment. Similarly, in a review of the correlation between QOL and variables such as racial background, health insurance coverage, work position, job status, self-blame, familial support, residual limitations, changes in functional independence, and rehabilitation, the largest factor in improving QOL for adults two years after traumatic brain injury (TBI) was employment. Additionally, married individuals and those with jobs reported much better levels of life satisfaction, according to a study that looked at 175 TBI patients. QOL has also been linked to age, with younger TBI patients generally reporting better QOL outcomes. On the other hand, a study conducted that perceived quality of life was unrelated to demographic parameters such as age, gender, age at injury, and education level(8). Frequency of Study Participants of Neurological and Medical ICU Complications, 71% (149/213) experienced minimum one neurological ICU complication, and 95% (202/213) had at least one medical ICU problem. When neurological and health issues are combined, a minimum of one ICU complication was experienced by 96% (205/213) of the study group during their index stay. The frequency of neurological and medical ICU problems that were looked at the most common medical ICU complication was hyperglycemia (79%), which was followed by fever (62%), SIRS (60%), and low blood pressure necessitating the use of vasopressors (42%). Among those assessed, cerebral herniation accounted for 39% of all neurological ICU complications, followed by rebleeding (39%) and cerebral edema necessitating osmotherapy (37%). Sixty-two out of the sixty-two patients who had an ICP monitor had an ICP crisis as their most frequent complication (15). Anomalies in the brain

Microbleeds were found in considerably more ICU patients (61%, 60/99) than in non-ICU patients (32%, 32/99; $p < 0.001$). In the corpus callosum of ICU patients, microbleeds were more frequent (53%, 31/58) than in non-ICU patients (16%, 5/31, $p < 0.001$). Symptoms like muscle weakness accounting for the most common complaints (48%, 87/183), followed by pain (34%, 63/183) and paresthesia (33%, 62/187). overall, 122 out of 196 (62%), had at least three cognitive problems. 12% (24/194) of the patients had clinically significant symptoms after traumatic stress, clinically significant anxiety scores belonged to 19% (36/193) and clinically relevant depression scores to 15% (28/193) of respondents. 51% (99/195) and 28% (54/194) respectively experienced severe exhaustion and sleeplessness(16).

Mode of Transportation of TBI patients:

Study conducted in which 354 patients noted the method of hospital transportation. A total of 149 patients (42.1%) arrived by taxi, making up the majority of the patient population. The remaining 147 patients (41.5%) arrived by ambulance, 35 patients (10%) arrived by private vehicle, and 15 patients (4.2%) arrived on foot. Two patients (0.6%) arrived with attendants, while six (1.7%) were transported by police vehicle. The majority of hospital-referred patients arrived in ambulances, then in taxis. 133 (49.3%) of the 270 patients who were come from setups and whose mode of arrival was documented arrived by ambulance. The next most popular means of transportation from other hospitals was a cab, which was used by 110 patients (40.7%). A record of the mechanism of injury was kept for 329 individuals. Among the 329 patients, attack with a stick accounted for 124 cases, or 37.7% of all injuries. 64 patients (19.5%) suffered from falls, whereas 103 patients (31.3%) had head injuries as a result of RTAs. Of the victims of RTAs, 24 (23.3%) were car occupants and 46 (44.7%) were pedestrians. In Addis Ababa, the capital, the common cause of trauma was accidents on the road, which affected 43 patients (30.7%). Fall accidents and stick injuries affected 41 patients (29.5%) and 40 patients (286.6%), respectively. In the district regions outside of Addis, stick injuries accounted for the majority of injuries (84 out of 189 patients, or 44.4%).

Arrival Vital Signs and Severity of TBI Patients:

Patients' vital signs were evaluated in accordance to how they arrived. 50 (34.7%) of the 144 patients who arrived by ambulance and had documented vital signs had hypotension or low oxygen saturation level. While 14 of 135 patients (10.4%) had low oxygen saturation, 23 (16%) of 141 people with a documented blood pressure was low who came by taxis. There was no significant correlation found between the patients' oxygen saturation state and their mode of hospital entrance (P 0.234). 269 of the patients transferred from district hospitals had their oxygen saturation and blood pressure measured. There were 39 patients (14.5%) with low blood pressure and 27 patients (10%) with low saturation. Six patients (2.2%) had hypotension and oxygen levels. Recorded information of 369 individuals about the severity of a brain injury was obtained. Out of these patients, 57 (14.6%) had severe, 65 (16.7%) had moderate (GCS 9-13) and 247 (63.3%) had mild head injury (GCS14-15). all the trauma mechanisms, falls accounted for the biggest percentage of serious head injuries with 14 out of 61 patients (23%) while accident on road accounted for 19 out of 101 patients (18.8%) of severe head injuries. This demonstrated a strong correlation (P 0.016) between the mechanism of trauma and the severity of head injury. There was a significant difference (P 0.002) in the mean GCS of patients between the various trauma mechanisms. While the mean GCS for assault victims was 13.4, the mean GCS for RTA victims was 12.1. Out of the 54 patients who had their oxygen saturation levels recorded, 22 (40.7%) had serious head injuries and had low oxygen saturation levels; of the 55 patients (27.3%) who had their blood pressure recorded, 15 had low blood pressure. When patients with head injuries were brought into the emergency room, their blood pressure (P 0.015) and oxygen saturation level (P 0.000) were both significantly associated with the severity of their injuries.

CT Scan finding of TBI Patients:

From the patient charts, CT scan results for 320 individuals were obtained. The primary finding from which the patients' treatment goals were developed was the basis for recording the CT findings. In most cases, depressed skull vault fractures (DSFs) were noticed. 51(15.9%) patients developed acute epidural hematoma (AEDH), while 94 patients (29.4%) had DSFs. 42 patients (13.1%) had a chronic subdural hematoma. 12 individuals (3.8%) experienced an acute subdural hematoma. Of the patients, 38 (11.9%) had contusions. Of the patients, 24 (7.5%) had a basal skull fracture, while 10 (3.1%) had a linear fracture. Of all patients, 49 (15.3%) had a normal CT finding. Stick injuries were most frequently the cause of DSFs and AEDH. Stick injuries occurred in 31 (38.3%) of the 81 patients with DSF and a recognized process of injury and in 24 (54.5%) of the 44 patients with AEDH. There is a strong correlation (P 0.000) between the mode of injury and the findings of a head injury on CT(17).

China CENTER-TBI Study:

The China CENTER-TBI registry included 13627 TBI patients from 56 centers. Of them, 489 (4%) patients did not have the required clinical information, such as pupillary light reflex, GCS score, or discharge status. After meeting the eligibility criteria, data from 13 138 (96%) patients from 52 centers spread across 22 provinces in China were examined. Among the sick people, 8317 (63%) were in the level of admission to the hospital, 4747 (36%) to the ICU stratum, and 74 (1%) had no information on their stratum. There were 137 patients enrolled on average per center. Geographical and socioeconomic characteristics of the recruiting centers varied; altitude levels ranged from 2 to 1892 m, and GDP per capita varied from ¥28 000 to 129 000 (US$4142–18 749). baseline and clinical features of the enrolled individuals, the majority of patients (9782; 74%), with a median age of 48, were male. The TBI severeness was defined as GCS score 3–8 was considered severe in 2804 (21%) cases, moderate (GCS score 9–12) in 2930 (22%) cases, and mild (GCS 13–15) in 7404 (56%) cases. The average GCS score was 13. The ICU and admission strata differed in terms of clinical severity. Upon arrival, ICU patients had greater hypotension and hypoxia than general ward patients. They also had low GCS scores, a higher ratio of severe TBI, a higher ISS, more serious extra cranial injuries, and more pupillary abnormalities. The majority of injuries (n = 6548; 50% of patients) were caused by road traffic accidents. Incidental falls (n = 4363; 33%); and other injury causes (n = 1714; 13%). There were falls from height in 2042 (16%) and falls from ground level in 2321 (18%). Province-to-province variations in the causes of injuries were observed. Age-related differences in injury causes have been identified. While increase in age increase the ratio of ground level falls, road traffic events happened most frequently in patients between the ages of 18 and 65 and declined as patients aged. Between the ages of 18 and 30, other injury causes mostly violence and suicide attempts. The majority of TBI-causing injuries happened between 0900 and 2300 hours, peaking at 1000 hours (n=1165 [9%]). Similar patterns were seen in the times at which patients arrived. Injury causes differed according to arrival times. Even though road traffic accidents accounted for the majority of events during a 24-hour period, the percentage was relatively low during the day. On the other hand, from 0900 to 1900 hours, the proportion of incidental falls that is, falls from height and ground level falls. The research center received 3882 patients (30%) from another hospital; the percentage of secondary referrals varied significantly throughout the provinces. Patients in the ICU stratum had a higher percentage of secondary referrals (n = 1691 [36%]) than patients in the admission stratum (n = 2173 [26%]). 2656 patients (20%) required emergency intubations; 154 (6%) of these patients underwent intubation before hospital arrived, and 2502 (94%) of these patients underwent intubation in the ER department before they admitted to critical care unit or any ward of the hospital. There was significant variation between provinces and centers in the number of patients who underwent intracranial pressure monitoring (1509; 11%), external ventricular drainage (774; 6%), craniotomy (2079; 20%), and decompressive craniotomy (2170; 17%). Only 208 individuals (2%) in total underwent extra cranial surgery(18).

A study in which 387 of the 403 patients who had suffered traumatic brain injuries answered to the research, providing 96.03% response rate. Nine individuals (2.23%) withdrew to take part, while seven cases (1.74%) were dropped due to their medical expenses for serious unrelated illnesses. There were 301 men (76.78%) in the majority. 55 (40.1%) of the individuals were farmers. 135 (34.6%) only completed elementary school. Among those between the ages of 15 and 30, nearly half (193 or 49.9%) were married. A monthly revenue of 3901 ± (2503.59 ETB SD) was the average. Before visiting Gondar University Specialized Hospital, a total of 101 study participants (26.1%) had visited another medical facility. Car crashes accounted for 192 (49.5%) of THIs, with violence accounting for 157 (40.56%). The majority of the accidents happened between midday and midnight. There were 281 (72.6%) patients with mild THI, 79 (20.41%) with moderate injuries, and 27 (6.98%) with severe injuries, according to the GCS. Out of all the participants, 7 (1.81%) died in the emergency department, 80 (20.7%) were discharged in less than 24 hours, and 300 (77.5%) were hospitalized as inpatients(1). During the study period, 375 individuals received treatment for traumatic brain injury.

Factors associated with TBI:

There are several known causes of traumatic brain injury. Notably, 62 people (32%) fell from their motorcycles, and 54 people (27·8 percent) were hit by motorcycles; 33 more people (17·0 percent) were hit by other motor vehicles. Of the patients with TBI, 37 (19·1%) had experienced an assault, and 8 (4·1%) had fallen from a height. Approximately 161 patients (83·0%) were male, and 129 patients (66·5%) belonged to the reproductive age group. In total, 155 patients, or 79% of the total, were younger than 40 years old. Every injury was blunt rather than penetrating. Patients with brain injuries arrived at the accident and emergency room with different GCS scores and different amounts of time after their injuries. The GCS score varied from 3 to 15. Out of the total patients, 149 out of 588 or 94.33% arrived at the hospital after more than 24 hours from the time of the injury. Thirty-eight patients (30.9%) had moderate TBI, sixty (30.9%) had severe TBI, and seventy-four patients (38.1%) had mild TBI. Twenty-four patients (12·4%) had bilaterally dilated pupils upon admission, while 35 patients (18·0%) had anisocoria. Thirty-two patients (16·5%) experienced seizure episodes, while 18 of the 185 patients (9·7%) had hypoxia at admission. Both surgical and conservative treatments were provided. Approximately 94.8 percent of the 184 patients received conservative treatment, 3.5 percent had burr-holes, 2.1 percent underwent craniotomies, and 3.5 percent had their skulls elevated. The rate of death was 33.0% (64 of 194), with 56 patients of 88 % death were in male. Out of the 184 patients, 57 (or 31%) were conservative treated, and seven of the 10 patients who received surgical treatment passed away. The three patients who underwent burr-hole procedures all passed away(19).

Overview on alcohol and without alcohol use of TBI Patients:

The procedure for selecting cases, which led to 425 cases being included. All patients' baseline characteristics are shown, along with a comparison between the groups with and without alcohol involvement. Out of 425 cases, 97 were found. alcohol-related incidents were 22.8%, whereas alcohol-free incidents were 328/425, or 77.2%. When comparing the groups' initial demographics, men comprised 75.3% of the alcohol group (73/97) and 54.7% of the no alcohol group (179/327). Ages 18 to 30 made up 42.3% (41/97) of the alcohol group and 51/328, or 15.5%, of the non-alcohol group. Among those in the alcohol group, 55/97 (56.7%) identified as NZ European and 25/97 (25.8%) as Maori, compared to 222/328 (67.7%) and 34/328

(10.4%), respectively, in the no alcohol group. There was statistical significance (P < 0.05) for all of these differences. The percentage of patients used alcohol reduces with age; however, in the preliminary analysis, alcohol consumption was noted across all age categories. In both groups, the most prevalent injury mechanism was falls (42.3% and 62.6%, respectively). However, patients in alcohol used group were reported assault as the mechanism of TBI more frequently (19.6% vs. 5.2%, P < 0.05). At presentation, alcohol used group had a higher likelihood of reporting >1 vomit (18.6% vs. 8.8%, P < 0.05) or amnesia (26.8% vs. 13.1%, P < 0.05). In accordance with GCS, they were also more likely to have moderate 13.5% vs 3.5%, P < 0.05) to severe 5.6% vs 3.2%, P < 0.05) TBI and to have signs of damage above the clavicles (71.1% vs. 53.4%, P < 0.05). Data on arrival times by day of the week versus weekend. A weekend begins on Friday at 17:00 and ends on Monday at 08:00. Patient presentations were place during an AM shift from 8:00 to 17:00, a PM shift from 17:00 to 23:00, and a night shift from 23:00 to 8:00. This correlates with the ED doctors' rostered shift times. Compared to weekdays (42.1% vs. 63.0%, P < 0.005), weekend presentations were more common for patients in the alcohol group (57.9% vs. 37.0%, P < 0.05). During AM shifts, the percentage of TBI patients affected by alcohol reached to 27/236 (11.4%), during PM shifts to 41/122 (33.6%), and during night shifts to 29/67 (43.3%). Following their head injury, those in the alcohol used group were more likely to present later (3.4 h vs. 2.8 h, P < 0.05). CT scan data of 425 patients analyzed, 41 (or 9.6%) showed evidence of a clinically significant intracranial damage. no significant difference was found in the percentage of patients with intracranial injury between the groups (7/97, 7.2% vs 34/325, 10.4%). The most common pathology seen was intracranial bleeding, which was followed by skull fractures. Regarding the type of injury, there were no differences between the two EDs or between the group who used alcohol and who did not use alcohol. Overall, the admission and discharge rates was same there was no significant difference, ICU admission, or neurosurgical intervention between the alcohol and non-alcohol groups. Patients with alcohol use disorders had a higher likelihood of being admitted to the EDOU (38.1 % vs. 19.5%, P <0.05) than patients without alcohol use disorders(20).

Total 2022 patients who were in age of 16 years or older were admitted to the ICU. The ICU discharge status (dead or alive) was known for 99% of the 1998 patients.

13% of ICU patients died (n = 267). 229 (86%) of these patients passed away following Withdrawal of life sustaining measures (WLSM). In patients who did not make it out of the intensive care unit, the rate of WLSM ranged from 0% in Eastern Europe to 96% in Northern Europe. 117 patients (51%) had their LSM withdrawn early (less than 72 hours after injury), and 112 patients (49%) had their LSM withdrawn later (more than 72 hours after injury) of the 229 patients who passed away after starting WLSM. 10 patients (4%) had WLSM missing time imputed. The WLSM date and time that were absent were imputed for 44 individuals (19%). Organ donation was the next step for 29 patients (25%) in the early group and 14 patients (13%) in the latter group after WLSM. The early WLSM group had a median age of 61, while the latter WLSM group had a median age of 60. Pre-hospital hypoxia and hypotension (27% versus 17% and 29% versus 17%, respectively), an acute subdural hematoma (68% versus 52%, respectively), and a GCS motor score of 1 (74% versus 55%, respectively) were more common in the early WLSM group. 69 hours was the average time between the WLSM and injury. The median time was 24 hours in the early WLSM group and 214 hours in the later WLSM group(21). In the DTCW region's level-1 trauma centers, 6061 TBI patients were admitted during the study period. Of those, 51 were not included because of incomplete or inconsistent data, 216 were not included due to these patients were moved between hospitals after their primary presentation. Of the 5794 patients who were left, 2,686 (44.3%) had blood alcohol content (BAC) data. Among these 2,686 individuals, 685 (26%) had moderate BACs, 173 (6%) had low BACs, 708 (26%) had normal BACs and 1,120 (42%) had high BACs. Compared to patients in the other BAC groupings, patients with high BACs were younger, primarily male, and had lower ISS and AIS-head scores. There were significant differences in GCS between the BAC groups: GCS < 8 was seen in 10.8% of patients with a normal BAC and 4.6% in patients with the highest BAC ($p < 0.0001$). Compared to individuals with normal BACs, patients with TBI and greater BACs had significantly fewer linked serious injury (AIS > 3) in structural regions apart from head. Additionally, as BACs increased, the proportion of patients with associated severe injuries dropped significantly, from 20.2% in the low BAC group to 8.1% in the high BAC group. Thoracic injuries, which include contusions in the lung parenchyma and fractures of ribs, were the most commonly identified serious related injuries across all groups. The second most frequent injuries were to the lower limbs (mostly fractures of femur) in those patients who were normal BAC group, and facial injuries (primarily orbital injuries) in those with moderate and high BACs. Within the entire group, the median stay in hospital was two days, group with normal BACs had the longest hospital stay. Furthermore, patients with normal BACs had the longest ICU stays and rates of admission. Patients with moderate and high blood alcohol content (BAC) had a significantly lower probability of ICU admission than patients with normal BACs, after controlling for age, sex, AIS head, and the occurrence of accompanying severe injuries. Patients with normal blood alcohol concentration had highest in-hospital mortality rates. After confounding variables were taken into account, the correlation between alcohol intoxication and in-hospital mortality weakened, but individuals with high blood alcohol content still had a decreased adjusted risk of death following hospital admission(22).

A study conducted in which 100 patients were eligible for the final analysis out of the 136 TBI patients who were admitted to the ICU throughout the study period since 36 of them had an incomplete or absent Neurological Pupil Index (NPi) assessment at the time of admission. The study population's characteristics included a median GCS of 11 (6–15) at admission and a median age of 48 (34–69). A total of 6 (3–17) days were spent in the ICU; 27 (27%) patients died there, and 49 (49%) patients had poor neurological outcomes when they were discharged from the hospital(23). In this study, 107 patients (74.8%) had head injuries from traffic accidents, 16 from falls (11.2%), 14 from attacks (9.8%), and 6 from other causes. Pedestrians were involved in 49 cases (72%) of the 107 cases under the category of traffic accidents, which included motor vehicle accidents in 68 cases. The remaining 39 occurrences were motor cycle accidents, with pedestrians being involved in 40% of them. A total of 38 cases (26.6%) were transferred straight from the accident scene to the neurosurgical unit. Prior to being referred to the neurosurgical service, the remaining 105 patients first visited other hospitals, which included other tertiary/university hospitals (8 patients), district general hospitals (34 patients), and private hospitals (63 patients). We were unable to determine the course of treatment in over 80% of the cases (89 individuals) at these additional health facilities. Merely 10 percent of the cases were transported from the accident site to the relevant medical facility via a staffed ambulance. The remaining individuals were transported there either private automobiles (36 cases, 25%) or commercial public transportation

(93 cases, 65%). Patients who had initially presented to other healthcare facilities experienced a wait time of at least thirty-three hours on average between the trauma and their arrival in the unit. There were 32 (22%) severe, 26 (18%) moderate, and 85 (60%) mild cases of Head Injury. 37 cases (or 25.8%) involved damage to other systemic areas, 20 including the pelvis and femur bones. There was sign of discharge from the ear, nostrils, and throat in 47 cases (about 33%). CT brain was advised to 104 patients but it was performed in 40 (39%) of them. Nine cases had surgical wounds found in them; five of those cases had craniotomies that were successful in removing cerebral mass lesions. None of these could have postoperative CT. Following surgery, clinical examination was used to monitor neurological development. Due to two cases of permission refusal and two cases of unstable, poor surgical candidates, the remaining four could not undergo surgery. At the time of the study, the hospital had no facility of specialized neurosurgical critical care unit. Also, there was no devices to monitor the intracranial pressure (ICP) in any of the moderate and severe victims in which this was clinically and radiologically warranted. At the time of death or upon hospital discharge, the acute care's effectiveness was evaluated. Out of the total patients, 115 survived and 28 patients (19.58%) died. Fifty-five patients were discharged to their homes in a normal, functionally independent state, while the remaining 52 patients had a little impairment that did not prevent them from engaging in their regular daily activities. Thus, all 107 cases, or 74.82%, get positive results on the dichotomized GOS. Out of the 28 patients with a bad prognosis, 4 were in a permanent vegetative state and 4 had a significant deficit. The results were broken down by the severity of the head injury: 2.3% of the mild HI group had a poor outcome (one death from a related systemic injury), while 97.7% of the group had a good outcome; 19.3% of the moderate HI group had a poor outcome and 80.7% had a good outcome; and 90.5 and 9.5% of the severe HI group had poor and good outcome rates, respectively. Throughout the entire period, the majority of deaths occurred in cases of severe HI, accounting for 72% of deaths. The mode of injury and changes in systemic blood pressure (hypo- or hypertension) were found to be strongly correlated with the outcome, according to statistical analysis. On the dichotomized GOS, motor vehicle accidents were most likely to result in a poor outcome ($p = 0.039$). The mechanism of trauma also had an impact on the mortality rate (although not statistically significant, $p = 0.074$); car crashes accounted for the majority of deaths. The

outcome and death rates were worse when hypo- or hypertension was present ($p < 0.001$ in each case)(24).

A research conducted in which 209 consecutive patients with moderate to severe traumatic brain injury were admitted to ICU. 16 patients were excluded: one due to a lack of outcome at follow-up, and the other 15 for missing or overlapping data. 193 samples met the requirements for admission. The majority of patients (75.6%) were male, and the average age at arrival was 49 years. The majority of patients (58%) had severe TBI on presentation(2). Another study was conducted, where in all severe isolated TBI patients from the 2008–2012 NTDB (n = 118,152) were initially identified. Patients who had an AIS score of 6 (n = 219) and those who had been hospitalized for less than 48 hours (n = 42,444) they were not included in the research. additionally, excluded patients (n = 33,899) who were moved into or out of their facility. In the final cohort, 41,590 patients participated in the study. The patient cohort's demographics comprised information on age, gender, race, and socioeconomic status. The sample had a mean age more than 60 years (61.1 ± 21.3 years) with a predominantly of male patients (64%). White patients were in majority 41.2% of the sample, while smaller amount of Asian and African-American patients made up 1.8% and 6.3% of the sample, respectively. Compared to patients with private insurance (20.5%), the majority of sample members had public insurance (51.9%). In this group, falls accounted for the majority of severe isolated traumatic brain injuries (71.0%). The patient cohort's initial physiologic features comprised assessments of lung and heart function, the severity of the injury, and the degree of neurologic deterioration. The sample had a wide range of pulse rates (0–260 bpm) and systolic blood pressures (12–299 mmHg), although the mean heart rate (86 bpm) and systolic blood pressure (147 mmHg) were both within the normal physiological range. The cohort's mean injury severity was high (ISS score 15.9), but the mean GCS 12.6 indicated that the clinical neurologic severity was only moderate. Patients in the sample, nearly one-fourth (24.6%) either had a respiratory failure that required intubation and mechanical ventilation while they were hospitalized, or they arrived at the hospital already intubated. Patients who were admitted for more than 48 hours experienced in-hospital mortality were 4228 patients, resulting in a cumulative mortality rate of 10.2%. Calculated cumulative death based on clinical, facility-level, and demographic factors. When comparing patients over 80 years old to patients between the ages of 18 and 44, the percentage of elderly patients who died in the hospital was greater (12.6 versus 7.5%). When comparing patients with ISS < 9 to patients with ISS > 16, higher levels of injury severity and worse early neurologic grade (34.7 versus 5.5% when comparing patients with a GCS ≤ 8 to patients with a GCS ≥ 13) were linked to higher fatality rates (13 versus 3.3%). Both patients who had hypotension upon admission (30.2 versus 10.5%) and those who had breathing problems i.e bradypnea necessitating intubation and ventilator (28.6 versus 4.1%) had higher mortality rates. The cumulative death rate was greater for patients in university/teaching hospitals (11.3 versus 9.4%) and large hospitals (10.5 versus 8.7% at small hospitals). The rates of death at trauma hospitals and non-trauma hospitals were similar (10.2 and 10.3%, respectively)(25).

A study that evaluated the medical records of 106 patients with significant head injuries. patients mean (+SD) age was 24.74+15.84 years. Age groups under 15 years old (29.2%) and between 15 and 29 years old (36.8%) comprised the majority of head injury patients. Rural areas accounted for 55.7% of their origins. Among patients with head injuries, men predominated (71.7%). A public health facility provided referrals for 58 (54.7%) patients. Severity of traumatic brain injury among hospitalized head injury patients: Of the 106 patients with head injuries, 34 had serious head injuries, or 32.1% of the total. Males made up the majority (82.4%) of these patients. The majority (52.8%) had mild head injuries, whereas the remaining 15.1% had moderate head injuries. Patients older than 45 years old had more developed severe brain injuries 10(34.4%), followed by patients less than 15 years old 9(26.5%). Mechanisms and features of severe head injuries: The primary cause of severe head injuries (44.1%) was road accidents. After an injury, patients took, on average, 9.50 hours (with a range of 1–48 hours) to arrive at the hospital. About 61.8 % of the patients with serious head injuries had blunt skull trauma, and the majority of these individuals (35.5%) had delayed their trauma for more than 24 hours. Treatment and results for patients with serious head injuries: Of all cases, 33 (31.1%) were diagnosed with a basal skull fracture, of which 12 (36.4%) were patients with severe head injuries. Of the patients with severe head injuries, 61.8% were treated conservatively, 38.2% had surgery, and roughly 47.1% (n=16) spent five to ten days in the hospital. Patients stayed for an average of five days, but the range was 1-19 days. Compared to all cases (113% per 1000 population, n = 106), patients with serious head injuries had a higher mortality rate (235% per 1000 people, n = 34). Factors linked to a serious head injury in patients with admitted head injuries: The bivariate analysis revealed significant relationships between serious head injury and the age of the respondents, the cause of transfer, alcohol intake prior to injury, the period of the injury, the breathing and heart rate on arrival, and the time spend inside the hospital after the trauma. In order to determine the independent predictors of serious head injury, variables that found to be significant ($p < 0.05$) at the bivariate analysis stage were subsequently included in a multivariate model. According to adjusted analysis, patients over 45 are more likely than those under 15 to have severe head injuries. Prior to trauma, individuals who drank alcohol were four times more likely than non-drinkers to suffer a severe head injury. There is a significant chance of suffering a severe brain injury if patient present after more than 24 hours of the incident and stay for more than five days. A significant association was also seen between a respiratory rate on arrival which was more than 30 breaths per minute and severe head damage. In multivariate analysis, other variables such as the reason of transfer, heart rate at presentation, and the presence of a head trauma complication had no association with severe head damage(26).

Sociodemographic features and other factors related to TBI:

Another study was undertaken in which sociodemographic characteristics, prevalence, and factors associated to head injury of research participants: The study included 260 trauma victims, accounting for 100% of the sample. Of the total participants, 101 (38.8%) were between the ages of 25 and 44years. Men accounted for 185 (71.2%) of the respondents, while women made up 75 (28.8%). This study found that 105 surgical emergency department visits (or 40.5%) involved a head injury. Of these, 49 (46.7%) were the result of assaults or fights with other people. Sixty-seven patients (63.8%) had an open head injury, and 56 (53.3%) had a minor head injury. Regarding the personal behavioral characteristics of head injury patients who were fifteen years and older, it was found that the most common alcohol consumed was the local beverage Tela. Additionally, two people (1.9%) each showed that chewing Khat and smoking cigarettes were the same and seventeen people (16.2%) older than fifteen years of age drank alcohol prior to the injury, and fourteen of them (82.4%) drank it five hours before the injury occurred. In the multivariate analysis, the following factors continued to be significant for the injury: sex, occupation, unemployment, human intent, and education(27). For TBI, 260,033 critical care visits were made by people of 65 years and older. A significant trend ($p < 0.001$) was found in the overall rate of these visits, which grew by 78% during this time period, from 689.51 per 100,000 (95% CI 676.5–702.8) to 1229 per 100,000 (95% CI 1215–1243). Unspecified head injuries accounted for 51% which is the most common injuries that manifest with TBI with open brain wounds coming in second at 30% and intracranial injuries in 16%. Eighty% of the patients were sent home, sixteen% were admitted to the reporting hospitals, and three% were moved to other acute care facilities. The rates of admission to reporting hospitals, transfers to acute care institutions, and discharges to homes all showed a marked upward trend ($p < 0.001$), respectively. The study group was 39% male, and 61% was female. For both sexes, the total rate of critical care visits for fall-related TBI increased considerably during the course of the research. However, during the course of the study, males consistently suffered a lower incidence rate than the overall incidence rate and females consistently experienced a greater incidence rate than the overall incidence rate. When it came to the percentage change in incidence rate, older men showed a substantial increase (87% increase for males vs 73% for females) compared to older females. Over the course of the study, the incidence rate increased with age, with the oldest age groups (90+ and 85–89 years) experiencing the highest rates of fall-related traumatic brain injury. During the course of the trial, the incidence rate of TBI due to falls increased significantly across all age categories. All age categories saw an increase in TBI rates, with the three age groups with the largest percentage changes in TBI incidence rates—65–69 years old, 90+ years old, and 70–74 years old—exhibiting increases of 78.42%, 76.47%, and 72.92%, respectively, for both sexes. However, the age category of 90 years and older, in both sexes, had the highest incidence rates as well as the second-highest overall rise, rising from 2296.42 per 100,000 (95% CI 2168–2432) to 4052.52 per 100,000 (95% CI 3939–4166) ($p < 0.001$). Rate among Male and female also increased with age, with the oldest patients (those aged 90 years or older) having the greatest rate and the youngest patients (those aged 65 to 69) having the lowest incidence for each year of the research. For the duration of the study, the percentages of each sex by age group remained constant(28).

Data gathered more than ten years ago, that mostly the TBI patients in critical care unit were young and had severe cases (GCS ≤8). Research was beginning to show that the demographics of TBI had changed even at the time of the 2017 Commission, and extensive observational studies have supported these findings. In the ICU stratum of CENTER-TBI, the median age was 49 years, whereas in the IMPACT studies it was 30 years. Additionally, 26% of patients were above 65 years old. Given that aging can reduce physiological reserve and that many older patients are receiving treatment for more than one disease, which can affect the course and outcome of their diseases, this shift in the patient population is significant. More than a third of patients with mild TBI (GCS 13–15) and less than half of patients with severe TBI in HICs are admitted to the ICU. Factors other than the severeness of the TBI frequently lead to the ICU admission of patients with mild TBI, especially serious extracranial injuries (abbreviated injury scale ≥3 in any extracranial body area), which accounted for 55% of TBI-related ICU admissions. Surgical interventions were frequently required (29%), with the chest (35%), spine (18%), and extremities (17%) being the most common sites of these extracranial injuries. Some mildly injured patients, however, were admitted to critical care unit due to a perceived danger of worsening clinical and neurological conditions. While a US research found that 17% of these hospitalizations were the result of costly over-triage, others may have been suitably prudent.

A comparative effectiveness study investigation for participants with a large traumatic intracerebral hemorrhage (n=367) did not demonstrate a clear overall advantage from early surgery. However, early surgery improved the prognosis for subgroups with isolated traumatic intracranial hemorrhage or moderate traumatic brain injury (GCS 9–12) compared to continued conservative therapy. On the other hand, individuals with moderate traumatic brain injury (TBI) and those with a smaller traumatic intracerebral hemorrhage (<33 cc) tended to respond good to conservative therapy. These outcomes align with the findings of the STITCH(Trauma) trial, which randomized 170 TBI patients with traumatic intraparenchymal hemorrhage to either early surgery or conservative management. Due to limited recruitment, the study's findings were inconclusive, which caused the funder to terminate the project prematurely. Therefore, it appears that surgery has no consistent impact on traumatic cerebral hemorrhage or acute subdural hemorrhage.

Meta analyses of the STITCH(Trauma), TRACK-TBI, and CENTER-TBI data may offer more conclusive proof to support recommendations. The advantages of a decompressive craniectomy, a treatment that involves partial skull excision to reduce the symptoms of elevated intracranial pressure, are likewise unclear. Removing a hematoma during a decompressive craniectomy can be done as a primary procedure or as a later procedure to decompress the brain. 320 (13·7%) of the 2336 patients in the population of TBI patients in the ICU who were recruited for the CENTER-TBI and the harmonized Australian OzENTER project underwent a decompressive craniectomy, with craniectomy serving as the primary surgery in 81% of these 320 patients(9). A study conducted in which 1706 (63%) of the 2697 participants in the TRACK-TBI study were not included in the current analysis due to their age, a GCS score of less than 15, a positive CT scan result for acute intracranial traumatic damage, or an unclear GCS or CT result. 991 patients (or 37% of the total) with a GCS score of 15 and no CT scan indications of an intracranial damage were included in the analysis. 659 (66%) and 751, (76%) of these participants finished the 6-month follow-up GOS-E assessments and the 2-week follow-up GOS-E assessments. The average age of the participants was 38.5 (15.8) years; 631 of them were men (64%) and 360 were women (36%). Over half of the participants (535 [54%]) identified as non-Hispanic or Latinx White. Twelve (12–16) years was the median (IQR) years of education; 229 individuals (23%) had a history of mental illness, and 198 participants (21%) had no insurance. Regarding presentation, 95 participants (13%) did not suffer loss of consciousness, while 589 persons (82%) experienced a loss of consciousness lasting shorter than 30 minutes. Furthermore, of the subjects, 328 (49%) experienced posttraumatic amnesia lasting less than half an hour, 182 (27%) experienced it lasting half an hour or longer, and 166 (25%) did not. Participants with functional recovery at 2 weeks after the injury had a median (IQR) RPQ score of 4 (0-10) at 2 weeks and 0 (0-8) at 6 months after the injury, with respect to the secondary outcome of mild TBI-related symptoms. At two weeks, the median (IQR) RPQ score for those with a GOS-E score of 7 was 12 (6-21), and at six months, it was 6 (0-16). At two weeks, those with a GOS-E score of 6 had a median (IQR) RPQ score of 21 (10-34) and at six months, it was 10 (2-28). At two weeks, the median (IQR) RPQ score for those with a GOS-E score of 1 to 5 was 31 (17-42) and at six months, it was 19 (8-34). The majority of individuals who did not fully recover stated that they were not back to their pre-injury or baseline lives

(88% [479 of 546]; 95% CI, 85%-90%). Participants with a GOS-E score of 8 had a mean RPQ score that was 16 (95% CI, 14-18; P<.001) points lower at 2 weeks (7 vs 23) and 18 (95% CI, 16-20; P<.001) points lower at 6 months (4 vs 22) when compared to those with a GOS-E score less than 8. In this cohort study of patients with symptoms suggestive of brain trauma who came to level I trauma centers in the US, only 27% of patients with a GCS score of 15 who did not have intracranial injury found on a head CT scan returned to baseline levels two weeks after the injury, and only 44% of patients reported functional recovery six months later. Inability to resume baseline or preinjury lives, problems resuming extracurricular activities, and disturbances in family and interpersonal relationships were among the symptoms reported by participants who had not made a full recovery at six months. Participants with similar domain concerns were those who had not totally recovered two weeks following the accident. The results obtained at two weeks were related to those obtained at six months: individuals who showed functional recovery (GOS-E score <8) at two weeks were more likely to have preserved their functional recovery at six months, while individuals who showed incomplete recovery (GOS-E score of 8) at two weeks were more likely to show incomplete recovery there(29).

A study conducted, in which 675 TBI patients in total were examined. 3.01 percent of patients receiving emergency and casualty care have a head injury. Among patients with head injuries, the incidence of traumatic brain damage was 47.03%. TBI was shown to be highly prevalent in young adults (43.7%), who were seen in the 21–30 age group. The majority of these persons are male (66.55%), and TBI is the primary cause of death and disability among the young and productive population. According to Maas and Roozenbeek's research, TBI affected 25% and 29% of young adults. The most frequent cause of traumatic brain injury was road traffic accidents (50.05%), which were associated with military vehicle movement and the movement of armed forces personnel and their families in both civil areas and cantonments. Thirty percent of the patients had associated injuries, such as maxillofacial, limb, or chest traumas, which significantly impacted the patient's prognosis. Subdural hemorrhage (SDH) accounted for 35% of TBI cases, making it the most frequent pathophysiological cause. The next most frequent causes are cerebral contusion (14%), EDH (27%), DAI (6%) and SAH (3%). A dedicated neuro critical center provided conservative treatment to the majority of the 45% of patients in this study who had mild traumatic brain injury. Surgery was necessary for SDH, EDH, or depressed skull fractures in 45% of TBI patients, and these procedures significantly improved the patients' prognosis. In terms of surgeries performed most frequently, craniotomy and craniectomy were done. The course of a patient with a traumatic brain injury (TBI) is determined by a number of factors, such as the patient's age, the severity of the initial injury (GCS at admission), the presence or absence of other major injuries, the effectiveness of initial resuscitation, the length of time it takes to receive definitive interventions (which is significantly impacted by travel time or distance to a hospital), the availability of facilities and expertise for diagnosis and treatment, and the availability of neuro critical supportive care. In this study, 51% of TBI patients recovered, 25% of patients had moderate disability, 3% of patients went into a permanent vegetative state, 12% of patients developed severe disability, which accounted for a poor outcome (23%) and 77% of patients had a good outcome. In a survey conducted in 18 studies, researchers examined 547 TBI patients at a tertiary teaching hospital in India, with a mortality rate of 6.40%. The results indicated that patients with older ages, severe primary insults (defined initially by low GCS at admission; <8), loss of unconsciousness lasting longer than 24 hours, amnesia lasting longer than 7 days, and findings from CT scans, as well as those who received delayed resuscitation and interventions because of travel time to a trauma center (the amount of time elapsed between trauma and hospitalization) were associated with a poorer prognosis. Patients with severe TBI (GCS <8 at admission) had a higher rate of mortality (46% and 51%, respectively), according to a study by Andriessen TM and Darnoux E. Studies have also demonstrated a link between a patient's age, the degree of their traumatic brain injury, and the manner in which they were transferred with the bad prognosis of TBI patients. A rehabilitation program was key in enhancing the quality of life for those who Survived(4).

According to the respondents' behavioral traits, 9 (2.4%) of the participants have a history of cigarette smoking. Thirty minutes prior to the occurrence, a history of alcohol drinking was reported by 192, 51.9% of trauma sufferers; of them, 113, 58.9% were aged between 25 and 44. The most popular beverage was beer (107, 55.7%), which was followed by tela (a local beverage), at 39, 20.3%. It was found that 112, 30.3%, of the respondents had consumed khat or other psychoactive substances. a clinical characteristic in which only three patients, or 0.8% of the total, were delayed for longer than 24 hours before seeking medical attention, and nearly two-thirds (64.9%) of trauma patients stayed for the full hour before making their first medical contact. The majority of trauma patients (274, 74.1%) were found to have a normal level of consciousness, while 56, 15.1%, had minimal injuries, according to the study's analysis of the patients' consciousness. patients who arrived at SED, 104 (38.9%) had been treated as outpatients. When it comes to the mechanism of injury in all trauma patients, assault (interpersonal conflict) accounted for the majority of injury cases (152, 41.1%), followed by road traffic accidents (RTAs) (145, 39.2%) and fall-down accidents (73, 19.7%). 39.7%, 95% CI (34.9–44.9%), of trauma patients visiting the DTTRH emergency room had a head injury. The study also revealed that 124 patients, or 33.5% of those with head injuries, had blunt head injuries. The bivariate analysis revealed that there was a significant correlation between head injury and the respondents' age, place of residence, sex, alcohol intake, history of any comorbidities, mechanism of injury, and kind of alcohol used. In the multiple logistic regression study, age, alcohol intake, sex, and place of residence all continued to be strongly correlated with head injury. The likelihood of diagnosing a head injury was 1.2 times higher in patients aged 20–24 than in those over 65. The likelihood of a brain injury was about twice as high in male trauma patients as in female patients. Trauma patients from rural areas had a brain injury 1.4 times more frequently than those from metropolitan areas. Patients who had alcohol consumption prior to the incident had a brain injury risk that was almost six times higher than that of patients who had no prior alcohol exposure(30).

A study conducted in which 7497 patients were included in the analysis since they fulfilled the research requirements. Within 24 hours of arriving at the hospital, 140 people (1.9%) passed away. The majority of patients who were injured (85.0%) and those who died (90.7%) were men. Male patient death was 2.0% vs 1.2%, which was non significantly higher than female patient mortality. The most frequent mechanism, accounting for 4002 (53.4%) was road traffic injuries, followed by falls (1776 (23.7%) and railway injuries 398 (5.3%). Although only 5.3% of the registry patients had railway-related injuries, only one of the four centers recorded such injuries, and the early mortality rate was significant (7.5%). Compared to non-survivors, survivors had greater SBP, higher SpO2, higher GCS, lower RR, and lower HR. The variations in injury severity scores and age between the groups were not statistically significant. in univariable analysis GCS and vital signs showed statistically significant relationships with 24-hour mortality. These correlations persisted in multivariable analysis, with HR, SpO2, RR, and GCS and SBP having the strongest connections with mortality. At first, the ISS was included in the multivariable analysis as a potential confounder. However, the model produced implausible findings, indicating that severe injury was protective against death within 24 hours. As a result, the model was rerun without ISS. Compared to patients with low GCS scores, those with moderate (odds ratio 4.6) and severe (odds ratio 7.7) GCS scores had greater odds of 24-hour mortality ($p < 0.001$). Compared to patients who did not have hypotension upon arrival (SBP < 90 mm Hg), hypotensive patients had nearly five times increased risks of dying within 24 hours. Individuals who experienced bradycardia (HR < 60 bpm) with an odds ratio of 3.8 and compensating HR (> 100 bpm) with an odds ratio of 1.8 were more likely to die within 24 hours than those who had normal HR (61-100 bpm). 24-hour mortality was increased in patients with tachypnea (RR > 20) (odds ratio 1.8). Likewise, there was a considerable correlation observed between individuals with hypoxia (SpO2 < 90%) and 24-hour mortality, with an odds ratio of 1.7. Significantly greater odds of 24-hour death were also shown by the patients with missing values for SBP, HR, and RR(31). 1191 patients were hospitalized that met the pre-hospital SI (≥0.62) and age (≥18) requirements to be included in the ONPOINT study. For this subgroup analysis, 219 patients fulfilled additional criteria, and 191 of the cases had sufficient data for analysis. It was discovered that 17% of patients (n = 33/191) had shown neurological decline. Radiographic deterioration occurred in 25 cases (13%), and clinical ND occurred in 19 cases (10%). Just one ND event was included in the final analysis out of the 11 (6%) individuals who experienced both clinical and radiographic deterioration. ND was linked to increased rates of patient death ($P < 0.001$), admission to the intensive care unit ($P < 0.001$), and longer hospital duration of stay ($P < 0.001$)(32).

Study Conducted in Pakistan:

A study conducted in Karachi in which 127 TBI patients participated. The mean age was 30.9 ± 13.6 years. There were 116 (91.3%) males and 11 (8.7%) females. Motorcycle accidents were the leading cause of TBI 78 (61.4%). Different diseases were found in 17 (13.4%) individuals. Contusions were the most common type of

TBI on CT imaging, accounting for 55 (43.3%), followed by extradural hemorrhage (EDH) 48 (37.7%), subdural hemorrhage (SDH) 46 (36.2%), skull fracture 33 (26.0%), subarachnoid hemorrhage (SAH) 30 (23.6%), intracranial (IC) bleed 14 (11.0%), intraventricular hemorrhage (IVH) 8 (6.3%), and diffuse axonal injury (DAI) 8 (6.3%). According to GCS, 73 (57.3%) TBI patients had serious brain injuries, the remaining 54 (42.5%) had mild to moderate TBI. Mostly patients (106, 83.4%) had no CSF leak on arrival. The average Intensive care unit stay was 16.9 ± 11.0 days, and the average emergency department stay was 1.7 ± 3.36 days. CNS infection occurred in 72 patients (56.7%). Out of these 72 patients, 29 (40.3%) had positive CSF cultures (28 out of 29 had MDR Acinetobacter species spp. with colistin sensitivity), while 43 (59.7%) had negative CSF cultures. The most common concomitant incision site infections were pseudomonas aeruginosa 06 (30.0%) and Klebsiella spp. 07 (35.0%). Colistin intravenous with meropenem antimicrobial therapy was taken in most of patients (63, 87.5%). The fatality rate among patients with CNS infection was 39 (54. 2%).When CNS infection was compared to baseline and clinical features, there was a significant correlation with age (p-value 0.047), CSF leak at presentation (p-value 0.045), kind of operation (p-value 0.001), and duration of ER stay (p-value 0.047). The mortality rate among TBI patients was 83 (65.4%). Mortality was significantly associated with GCS at presentation (p-value 0.031), CSF leak at presentation (p-value <0.001), IVH type of TBI (p-value <0.001), polytrauma (p-value 0.003), CNS infection (p-value <0.001), and duration of ER stay (p-value 0.009).

Over the course of a year, the trial comprised 5047 patients. An average of 13 individuals per day were brought to the Accident and Emergency Department. Out of 5047 patients, 3689 (73.1%) were male and 1358 (26.9%) were female. The mean age was 25.9 + 3.7 years, and the majority were under the age of 40. Road traffic accidents (RTAs) were the leading cause of injury (38.8%, n=1960), followed by falls (32.7%, n=1649), Gunshot (0.15%, n=7) and other 28.4%, n= 1431. According to the GCS score, most (93.6%, n=4710) of the TBIs were mild with a GCS of 13-15. (4.6%, n=231) were moderate with GCS score 8-12 and (2.1%, n=108) were severe with GCS score 3-7. A study revealed that mild TBI (MTBI) is more common than moderate or severe TBI. The World Health Organization's systematic assessment indicated that 70-90% of all treated brain injuries are minor.

Furthermore, adolescents aged 16 to 20 showed a higher risk of MTBI than other age groups. Although region-specific data from Asia is not available, The Global Burden of Disease (GBD) study sheds light on TBI-related consequences in India, China, and other Asian nations. This finding also indicate that falls are the second leading cause of TBI. In comparison to other places in GBD where RTA accounted for a majority of TBI cases, falls are a key cause of TBI in Asia, but individual country data suggests that RTA is the leading cause of TBI in India and China, accounting for roughly 45-60% and 61% of cases, respectively. There is a lack of literature on the epidemiology of TBI in Pakistan. A survey was undertaken in Pakistan to assess the demographics of head and spinal injuries treated in public hospitals. The annual incidence of TBI in Pakistan is estimated to be 50/100,000 of the population. The study also identified RTA as the leading cause of TBI(33).

CHAPTER 3
METHODOLOGY

1. Research Design

Cross Sectional Study

2. Clinical Settings

Intensive Treatment Unit of Hayatabad Medical Complex Peshawar

3. Sample Size

With an anticipated frequency of 13% and a confidence interval of 95%, the sample size of 174 was calculated using OpenEpi, an online tool for sample size calculations.

4. Sampling Technique

Purposive Sampling Technique

5. Duration of Study

01 Year

6. Selection Criteria

6.1. Inclusion Criteria

- Patient admitted to Intensive Care Unit with diagnosis of traumatic brain injury
- Age $\geq$ 15 years

6.2. Exclusion Criteria

- Patient with non-traumatic brain injury (such as an infection or stroke)
- Patient with isolated spinal card injury without brain injury

7. Ethical Consideration

The Board of Study (BOS) at Superior University Lahore granted ethical approval for collecting data. The research board of the Hayatabad Medical Complex provided the approval letter and NOC, and data collection was begun once the patient's attendant has signed the consent form.

8. Data Collection Procedure

A structured questionnaire was used to gather data.

The patient was admitted to Hayatabad Medical Complex Peshawar's intensive care unit (ICU). The attendant was asked to provide both written and verbal approval. They have received guidance regarding the purpose of the study and data confidentiality. To prevent biases, inclusion and exclusion criteria was strictly followed.

9. Data Analysis

SPSS version 22 was used to analyze the data. The mean and standard deviation was used to describe numerical variables, while frequency and percentages was used to represent categorical variables. The Chi square test was applied to determine the statistical significance of categorical variables. P values < 0.05 was taken as significant.

CHAPTER 4
RESULTS

Demographic and other characteristics of Participants:

Out of total 174 Traumatic Brain Injury participants, Majority of the patients 46% (N=80) were in the age of 15-29 years, 33.9 (N= 59) were in the age of 30-44 years, 12.6% (N=22) were in the age of 45-59 years, 6.9% (N=12) were in the age of 60-74 years, 0.6% (N=01) were in the age of more than 74 years,67.8% (N=118) were male, 31% (N= 54) were female while 1.1% (N=2) were Transgender. Occupation wise the majority of the patients 27.6% (N=48) were students, 24.1% (N=42) were Housewife, 19.5% (N=34) were Labors, 13.2% (N= 23) were businessman, 7.5% (N=13) were teachers while 4% (N=7) were healthcare workers and others. Total Household income was divided into four categories in which majority of the patients 56.9% (N= 99) had <50000 income per month, 37.9% (N=66) had 50000-100000 income per month, 2.3% (N= 4) had 101000-150000 income per month while 2.9% (N=5) had income more than 150000 per month.

Look to the injury occurred to the patient, majority of the patients 39.7% (N= 69) had history road traffic accident, 28.2% (N= 49) had history of fall, 9.2% (N= 16) had sport injury, 8.6% (N=15) had history of assault, 8.6% (N=15) were being stuck by an object, 1.1% (N=2) had blast injury due to explosion while 4.6% (N= 8) had other causes of injury including firearm injury. Location of injury in the head in which majority of the patients 26.4% (N=46) had multiple injury in the brain including frontal, parietal, occipital and temporal site. 25.3% (N=44) had frontal injury, 19.5% (N= 34) had occipital injury, 15.5% (N= 27) had temporal injury while 13.2 % (N= 23) had parietal injury. Physiological variables of the patient including blood pressure, heart rate, respiratory rate, oxygen saturation and temperature. The majority of the patients 43.1% (N=75) had low blood pressure, 34.5% (N= 60) had normal blood pressure while 22.4% (N=39) had high blood pressure. Heart rate of the patients in which most of the patients had 41.4% (N=72) had normal heart rate, 30.5% (N=53) had low heart rate while 28.2% (N=49) had high heart rate. Respiratory rate of the patients in which most of the patients 39.1% (N=68) had low respiratory rate, 33.3% (N= 58) had normal respiratory rate while 27.6% (N= 48) had high respiratory rate. Oxygen saturation of the patients in which majority of the patients 52.3% (N= 91) had normal oxygen saturation while 47.7% (N=83) had low oxygen saturation. Temperature record of the patients in which most of the patients 64.9% (N= 113) had normal temperature, 17.8 % (N= 31) had low temperature while 17.2% (N= 30) had high temperature.

CT scan finding of the patients in which majority of the patients 26.4% (N=46) had extradural Hematoma, 21.3% (N= 37) patients had Cerebral contusion, 13.8% (N=24) had subdural hematoma, 13.2% (N= 23) had subarachnoid hemorrhage while 25.3% (N=44) had multiple finding on CT scan including extradural hematoma, cerebral contusion, subdural hematoma, subarachnoid hemorrhage. GCS score of the TBI patients was assessed in which majority of the patients 46.6% (N= 81) had severe TBI, 40.8% (N=71) had moderate while 12.6% (N=22) had mid TBI. Pupil reactivity in which majority of the TBI patients 77.6% (N=135) had reactive pupil while 22.4% (N=39) had non-reactive pupil. Alcohol use prior to TBI in which majority of the patients 96% (N=167) had not used alcohol while 4% (N= 7) had used alcohol prior to injury. The use of protective gear, helmet and seatbelt at the time of injury in which most of the patients 94.8% (N= 165) had not used while 5.2% (N= 9) had used protective gear, helmet and seatbelt at the time of injury. Symptoms experienced at the time of injury such as headache, dizziness and vomiting in which majority of the patients 73.6 % (N= 128) had experienced such symptoms at the time of injury while 26.4% (N= 46) had absent such symptoms. Time taken to reach the initial health care setting after the injury in which, 31.6% (N=55) had reached within 30 minutes, 31% (N=54) had reached within 60 minutes, 1.1% (N= 2) had reached within 90 minutes while majority of the patients 36.2% (N= 63) had reached more than 90 minutes. Complete blood count level of the TBI patients was checked in which most of the patients 55.2% (N=96) had normal complete blood count level, 22.4 (N=39) had low while 22.4% (N=39) had high complete blood count level. Use of invasive ventilation in TBI patients during hospitalization in which majority of the patients 52.9% (N=92) had used invasive ventilation while 47.1 % (N= 82) had not used invasive ventilation during hospitalization.

Descriptive statistics for continues variables:

Mean age of the participants were 32.86 ±14.1, mean total household income per month in PKR were 52040.23 ±40064.3 while mean time to reach the initial health care setting after the injury were 159.41±263.1.

Table 4.1
Descriptive statistic of categorical variable

Variable	Categories	Frequency	Percentages
Age of the patient in categories	15-29	80	46
	30-44	59	33.9
	45-59	22	12.6
	60-74	12	6.9
	>74	01	0.6
Gender	Male	118	67.8
	Female	54	31
	Transgender	02	1.1
Occupation	Housewife	42	24.1
	Teacher	13	7.5
	Student	48	27.6
	Healthcare worker	07	4.0
	Labor	34	19.5
	Business	27	13.2
	Other	07	4.0
Household income in category	<50000	99	56.9
	50000-100000	66	37.9
	101000-150000	04	2.3
	>150000	05	2.9
Injury pattern	Road traffic accident	69	39.7
	History of fall	49	28.2
	Sport injury	16	9.2
	Blast injury	02	1.1
	Assault	15	8.6
	Being stuck by object	15	8.6
	Other	08	4.6
Location of injury	Frontal	44	25.3
	Temporal	27	15.5
	Parietal	23	13.2
	Occipital	34	19.5
	Multiple location	46	26.4
Physiological Variable Blood Pressure	Normal	60	34.5
	Low	75	43.1
	High	39	22.4
Heart Rate	Normal	72	41.4
	Low	53	30.5
	High	39	28.2
Respiratory rate	Normal	58	33.3
	Low	68	39.1
	High	48	27.6
Oxygen saturation	Normal	91	52.3
	Low	83	47.7
Temperature	Normal	113	64.9
	Low	31	17.8
	High	30	17.2
CT scan finding of TBI	Subdural Hematoma	24	13.8

	Extradural Hematoma	46	26.4
	Subarachnoid Hemorrhage	23	13.2
	Cerebral Contusion	37	21.3
	Multiple finding	44	25.3
GCS score or Severity of injury	Mild	22	12.6
	Moderate	71	40.8
	Severe	81	46.6
Pupil reactivity	Reactive	135	77.6
	Non-reactive	39	22.4
Alcohol use prior to injury	Yes	07	4.0
	No	167	96
Use of Protective gear, helmet or seatbelt at time of injury	Yes	09	5.2
	No	165	94.8
Symptoms experienced after injury i.e headache, dizziness and vomiting	Yes	128	73.6
	No	46	26.4
Time taken to reach hospital after injury	Within 30 minutes	55	31.6
	Within 60 minutes	54	31
	Within 90 minutes	02	1.1
	>90 minutes	63	36.2
Complete blood count level	Normal	96	55.2
	Low	39	22.4
	High	39	22.4
Invasive ventilation used during hospitalization	Yes	92	52.9
	No	82	47.1

Table 4.2
Descriptive tables for continuous variable

Variable	Mean	Standard deviation	Min-Max
Age in years	32.86	14.11	15-75
Total house hold income	52040.23	40064.30	10000-300000
Time taken to reach initial health care setting after injury	159.41	263.19	5-2040

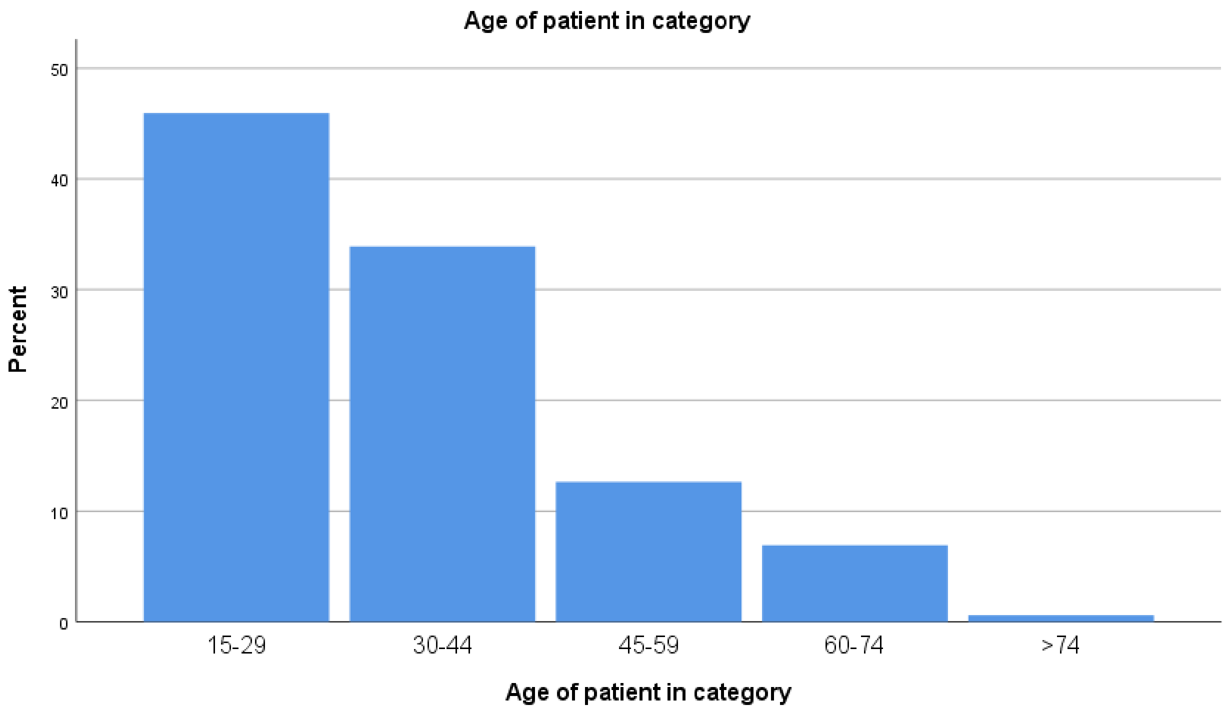

Figure: 4.1
<u>Age of the patients in categories</u>

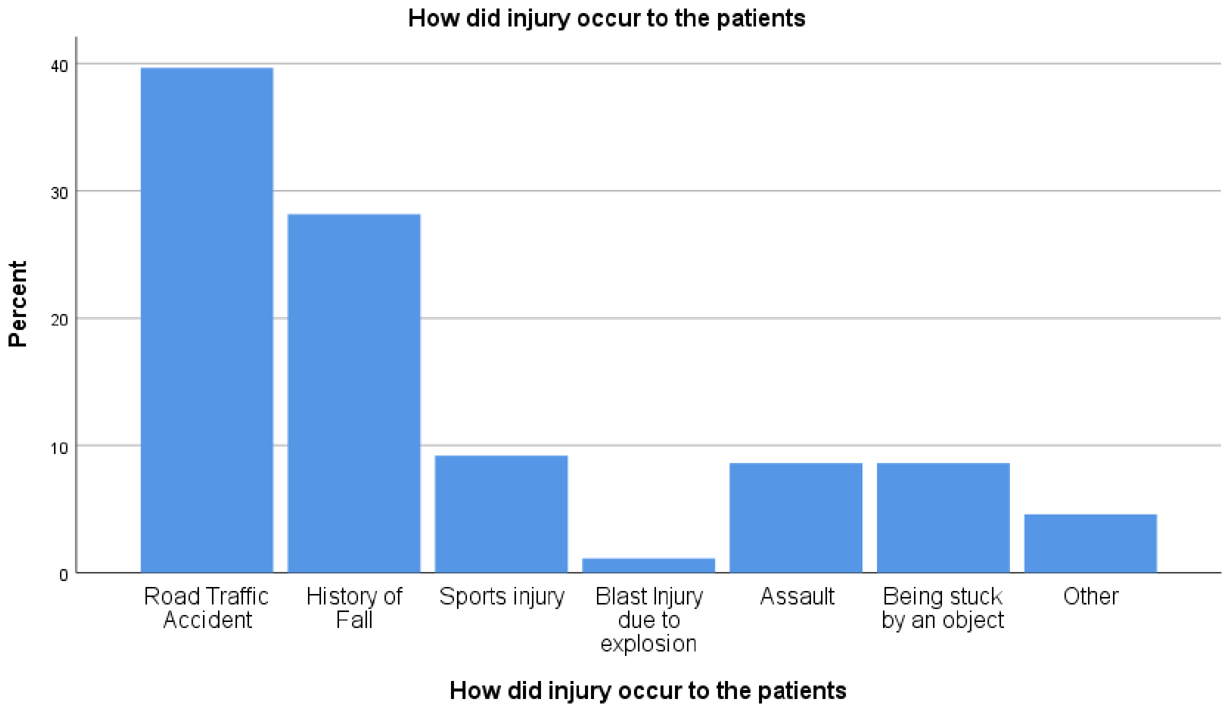

Figure: 4.2
Injury Pattern in TBI patients

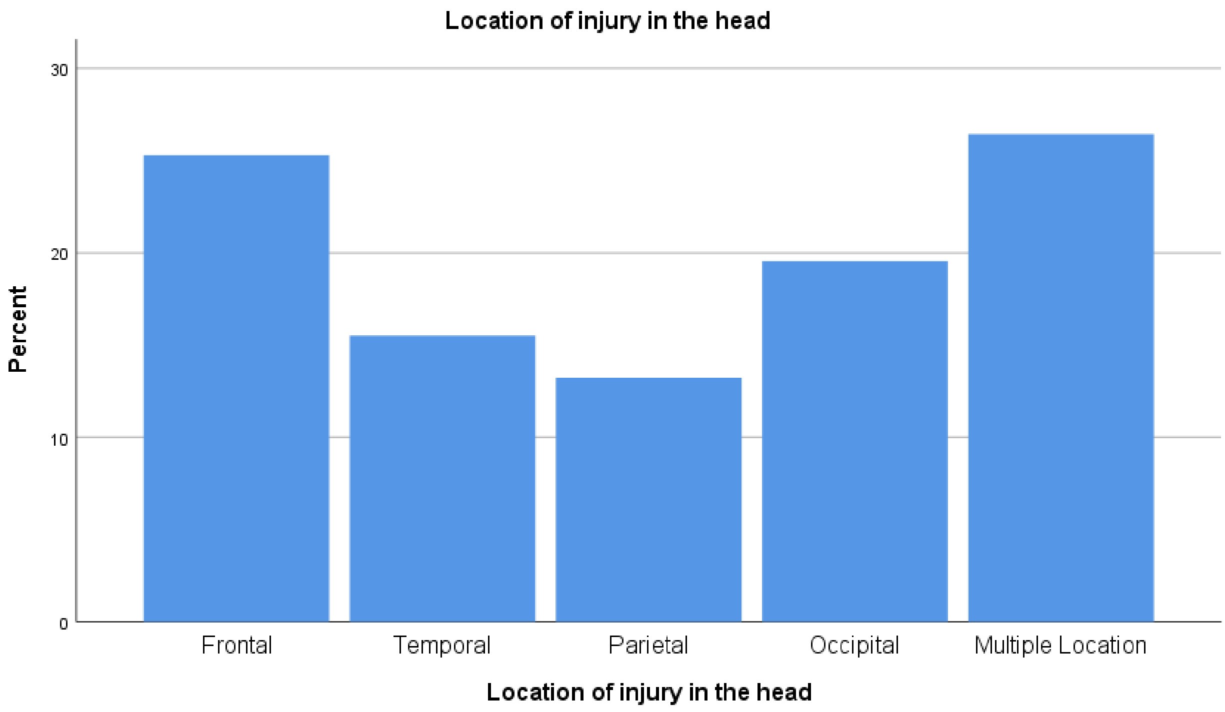

Figure: 4.3
Location of injury in TBI patients

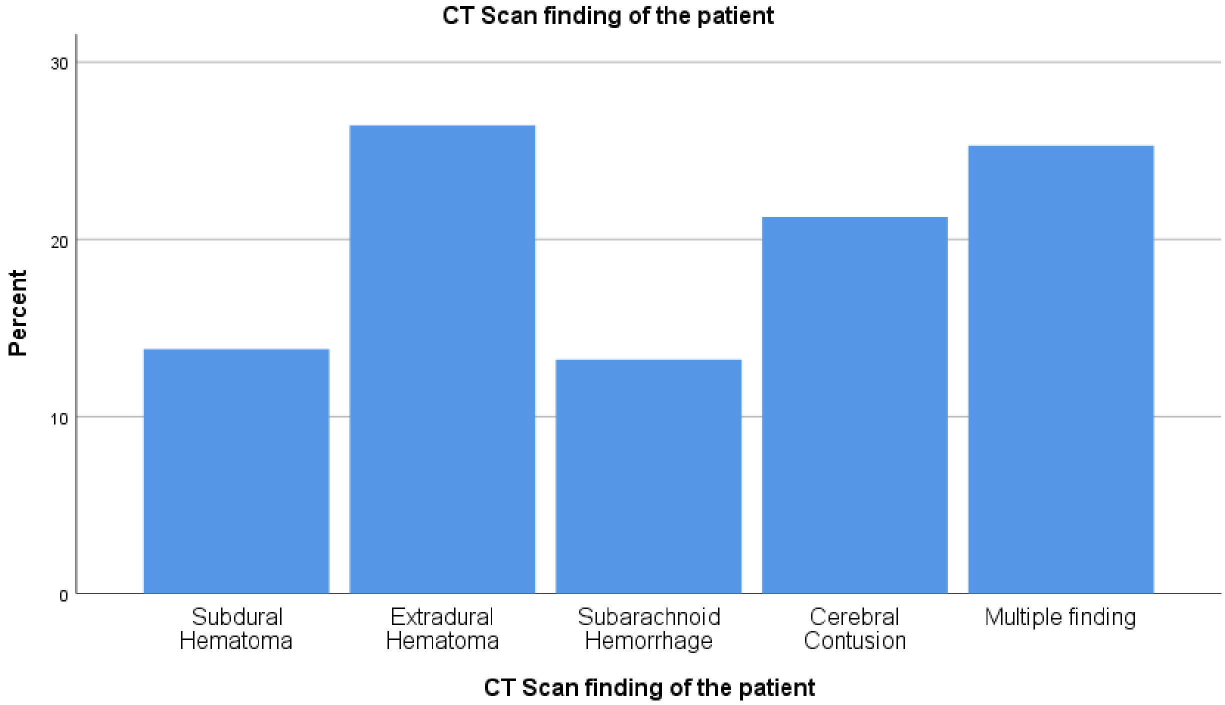

Figure: 4.4
CT scan finding of TBI patients

Comparison of different CT scan finding of TBI with other associated factors:

We applied chi square test to see the distribution of our dependent variable (CT Scan finding of TBI) among other variables.

Majority of the participants 30% 24 had extradural hematoma. 23.8% 19 participants had cerebral contusion and same participants had multiple finding on their CT scan (subdural hematoma, extradural hematoma, subarachnoid hemorrhage and cerebral contusion), 13.8% 11 participants had subdural hematoma while 8.8% 7 participants had subarachnoid hemorrhage in their age was between 15-29 years. The association between different age groups and TBI was found statistically insignificant (p value 0.69). Majority of the extradural hematoma 29 24.6% patients were male and had multiple finding on their CT scan followed by 17 31.5% were female and had extradural hematoma while 01 50% was transgender and had subdural hematoma and its (p value 0.59). Most of the patients had extradural hematoma 16 33.3% and 12 28.6 were students and housewife respectively, followed by 8 participants 23.5% were labor and had subdural hematoma, 6 participants 26.1% were businessman and had extradural hematoma, 05 participants 38.5% were teacher and had subarachnoid hemorrhage while 05 participants 71.4% were health care workers and had multiple finding on their CT scan and its (p value 0.90). Household income was categorized into four categories in which majority of the multiple finding patient 26 26.3% had household income was less than 50000, followed by 19 patients 28.8% and 3 patients 75% had extradural hematoma and their income was 50000-100000 and 101000-150000 respectively, while 3 patients 60%had subdural hematoma and their household income was more than 150000 and its (p value 0.07). Majority of the extradural hematoma patients 21 30.4% had Road traffic accident, followed by extradural hematoma 18 36.7% with history of fall, multiple finding (Subdural hematoma, extradural hematoma, subarachnoid hemorrhage and cerebral contusion) 07 43.8%, 05 33.3 and 05 33.3% had sport injury, assault and being stuck by object respectively, while cerebral contusion 05 patients 62.5% had other cause of traumatic brain injury and its (p value 0.03). Majority of the multiple finding patients 20 43.5% had multiple location injury in their brain (frontal, parietal, occipital and temporal site) followed by extradural hematoma 14 patients 31.8% and

10 patients 37% had frontal and temporal injury, multiple finding 07 patients 20.6% had occipital injury while extradural hematoma 07 patients 30.4% had parietal injury and its (p value, 0.13).

Physiological variables of the patients in which most of the multiple finding (Subdural hematoma, extradural hematoma, subarachnoid hemorrhage and cerebral contusion) patients 21 28% had low blood pressure, followed by extradural hematoma 20 33.3% had normal blood pressure while multiple finding on CT scan 11 28.2% had high blood pressure and (its p value 0.88). Majority of the extradural hematoma patients 21 29.2% had normal heart rate, followed by multiple finding on CT scan 16 30.2% and 14 28.6% had low and high heart rate respectively and its (p value 0.47). Most of the multiple finding (Subdural hematoma, extradural hematoma, subarachnoid hemorrhage and cerebral contusion) patients 25 36.8% had low respiratory rate followed by cerebral contusion 18 31% had normal respiratory rate while extradural hematoma 13 27.1% had high respiratory rate and its (p value 0.87). Most of the multiple finding (Subdural hematoma, extradural hematoma, subarachnoid hemorrhage and cerebral contusion) patients 29 34.9% had low oxygen saturation while extradural hematomata 24 26.4% had normal oxygen saturation and its (p value 0.02). Majority of the extradural hematoma patients 33 29.2% had normal body temperature followed by multiple finding 12 38.7% and 10 33.3% had low and high body temperature respectively and it (p value 0.34).

Severity of TBI in which most of the multiple finding (Subdural hematoma, extradural hematoma, subarachnoid hemorrhage and cerebral contusion) patients 25 30.9% p had severe traumatic brain injury, followed by extradural hematoma 21 29.6%, and 8 36.4 p value 0.34) had moderate and mild traumatic brain injury respectively and its (p value 0.34). Pupil reactivity of the patients in which most of the extradural hematoma patients 44 32.6% had reactive pupil while majority of the multiple finding (Subdural hematoma, extradural hematoma, subarachnoid hemorrhage and cerebral contusion) patients 15 38.5% had non-reactive pupil and its (p value 0.007). Use of alcohol prior to injury in which mostly extradural hematoma patients 44 26.3% did not used alcohol prior to injury while multiple finding individuals 3 42.9% had used alcohol prior to injury and its (p value 0.33). Use of proactive gear, helmet and seatbelt in which majority of the extradural hematoma patients 45 27.3% did not use protective gear, helmet and seatbelt while multiple finding 6 66.7% had used protective gear, helmet and seatbelt and its (p value 0.02). Majority of the extradural hematoma patients 40 31.3% had experienced symptoms such headache, dizziness and vomiting while multiple finding patients 15 32.6% did not have such symptoms and its (p value 0.17). Time taken to reach initial health care setting in which most of the extradural hematoma patients 27 42.9% had reached to initial health care setting in more than 90 minutes while majority of the multiple finding (Subdural hematoma, extradural hematoma, subarachnoid hemorrhage and cerebral contusion) patients 15 27.8% and 14 25.5 % had reached to initial health care setting within 60 and 30 minutes respectively and its (p value 0.10). Most of the extradural hematoma patients 26 27.1% had normal complete blood count followed by multiple finding patients 18 46.2% had low complete blood count while cerebral contusion patients 11 28.2% had high complete blood count and its (p value 0.009). Most of multiple finding patients 33 35.9% had use invasive ventilation during hospitalization while majority of extradural hematoma patients 33 40.2% did not use invasive ventilation during hospitalization and its (p value 0.00). The association between traumatic brain injury with the following variables shown statistical significant association i.e mechanism of injury of TBI such road traffic accident, history of fall, sport injury, blast injury, assault and being stuck by object (P value 0.03), oxygen saturation (P value 0.02), pupil reactivity (P value 0.007), use of protective gear, helmet and seatbelt (P value 0.02), complete blood count (P value 0.009) and use of invasive ventilation during hospitalization (P value 0.000) while the remaining statistical analysis yielded non-significant p-values.

Table 4.3:
Comparison of different CT scan finding of TBI with other associated factors

Variable	Categories	Subdural Hematoma	Extradural Hematoma	Subarachnoid Hemorrhage	Cerebral contusion	Multiple finding	P Value
Age	15-29	11(13.8%)	24(30.0%)	07(8.8%)	19(23.8%)	19(23.8%)	0.69
	30-44	08(13.6%)	14(23.7%)	08(13.6%)	11(18.6%)	18(30.5%)	
	45-59	02(9.1%)	07(31.8%)	05(22.7%)	04(18.2%)	04(18.2%)	
	60-74	03(25.0%)	01(08.3%)	03(25.0%)	03(25.0%)	02(16.7%)	
	>74	0(00.0%)	0(00.0%)	0(00.0%)	0(00.0%)	01(100.0%)	
Gender	Male	16(13.6%)	29(24.6%)	19(16.1%)	25(21.2%)	29(24.6%)	0.59
	Female	07(13.0%)	17(31.5%)	04(07.4%)	12(22.2%)	14(25.9%)	
	Transgender	01(50.0%)	0(00.0%)	0(00.0%)	0(00.0%)	01(50.0%)	
Occupation	Housewife	08(19.0%)	12(28.6%)	03(07.1%)	07(16.7%)	12(28.6%)	0.09
	Teacher	0(00.0%)	03(23.1%)	05(38.5%)	01(7.7%)	04(30.8%)	
	Student	05(10.4%)	16(33.3%)	03(6.3%)	14(29.2%)	10(20.8%)	
	Healthcare worker	0(00.0%)	01(14.3%)	0(00.0%)	01(14.3%)	05(71.4%)	
	Labor	08(23.5%)	07(20.6%)	07(20.6%)	07(20.6%)	05(14.7%)	
	Businessman	03(13.0%)	06(26.1%)	04(17.4%)	05(21.7%)	05(21.7%)	
	Other	0(00.0%)	01(14.3%)	01(14.3%)	02(28.6%)	03(42.9%)	
Total household income	<50000	16(16.2%)	24(24.2%)	11(11.1%)	22(22.2%)	26(26.3%)	0.07
	50000-100000	05(7.6%)	19(28.8%)	12(18.2%)	14(21.2%)	16(24.2%)	
	101000-150000	0(00.0%)	03(75.0%)	0(00.0%)	0(00.0%)	01(25.0%)	
	>150000	03(60.0%)	0(00.0%)	0(00.0%)	01(20.0%)	01(20.0%)	
How did injury occurred	RTA	08(11.6%)	21(30.4%)	07(10.1%)	14(20.3%)	19(27.5%)	0.03
	History of fall	07(14.3%)	18(36.7%	07(14.3%)	09(18.4%)	08(16.3%)	
	Sport injury	03(18.8%)	02(12.5%)	01(6.3%)	03(18.8%)	07(43.8%)	
	Blast injury due to explosion	01(50.0%)	0(00.0%)	01(50.0%)	0(00.0%)	0(00.0%)	
	Assault	04(26.7%)	0(00.0%)	01(6.7%)	05(33.3%)	05(33.3%)	
	Being stuck by object	01(6.7%)	04(26.7%)	04(26.7%)	01(6.7%)	05(33.3%)	
	Other	0(00.0%)	01(12.5%)	02(25.0%)	05(62.5%)	0(00.0%)	
Location of injury	Frontal	06(13.6%)	14(31.8%)	03(6.8%)	13(29.5%)	08(18.2%)	0.13
	Temporal	05(18.5%)	10(37.0%)	04(14.8%)	02(7.4%)	06(22.2%)	
	Parietal	04(17.4%)	07(30.4%)	04(17.4%)	05(21.7%)	03(13.0%)	
	Occipital	06(17.6%)	07(20.6%)	07(20.6%)	07(20.6%)	07(20.6%)	
	Multiple location	03(6.5%)	08(17.4%)	05(10.9%)	10(21.7%)	20(43.5%)	
Blood pressure	Normal	08(13.3%)	20(33.3%)	07(11.7%)	13(21.7%)	12(20.0%)	0.88
	Low	11(14.7%)	18(24.0%)	11(14.7%)	14(18.7%)	21(28.0%)	
	High	05(12.8%)	08(20.5%)	05(12.8%)	10(25.6%)	11(28.2%)	
Heart rate	Normal	12(16.7%)	21(29.2%)	08(11.1%)	17(23.6%)	14(19.4%)	0.46
	Low	05(9.4%)	16(30.2%)	05(9.4%)	11(20.8%)	16(30.2%)	
	High	07(14.3%)	09(18.4%)	10(20.4%)	09(18.4%)	14(28.6%)	
Respiratory rate	Normal	09(15.5%)	17(29.3%)	07(12.1%)	18(31.0%)	07(12.1%)	0.08
	Low	10(14.7%)	16(23.5%)	08(11.8%)	09(13.2%)	25(36.8%)	
	High	05(10.4%)	13(27.1%)	08(16.7%)	10(20.8%)	12(25.0%)	
Oxygen saturation	Normal	14(15.4%)	24(26.4%)	17(18.7%)	21(23.1%)	15(16.5%)	0.02
	Low	10(12.0%)	22(26.5%)	06(7.2%)	16(19.3%)	29(34.9%)	
Temperature	Normal	19(16.8%)	33(29.2%)	14(12.4%)	25(22.1%)	22(19.5%)	0.34
	Low	02(6.5%)	08(25.8%)	04(12.9%)	05(16.1%)	12(38.7%)	
	High	03(10.0%)	05(16.7%)	05(16.7%)	07(23.3%)	10(33.3%)	
Severity of	Mild	05(22.7%)	08(36.4%)	02(9.1%)	06(27.3%)	01(4.5%)	0.20

TBI (GCS) score	Moderate	10(14.1%)	21(29.6%)	11(15.5%)	11(15.5%)	18(25.4%)	
	Severe	09(11.1%)	17(21.0%)	10(12.3%)	20(24.7%)	25(30.9%)	
Pupil reactivity	Reactive	18(13.3%)	44(32.6%)	15(11.1%)	29(21.5%)	29(21.5%)	0.007
	Non-reactive	06(15.4%)	02(5.1%)	08(20.5%)	08(20.5%)	15(38.5%)	
Use of alcohol prior to injury	Yes	2(28.6%)	02(28.6%)	0(00.0%)	0(00.0%)	03(42.9%)	0.33
	No	22(13.2%)	44(26.3%)	23(13.8%)	37(22.2%)	41(24.6%)	
Use of protective gear, helmet and seatbelt	Yes	0(00.0%)	01(11.1%)	02(22.2%)	0(00.0%)	06(66.7%)	0.02
	No	24(14.5%)	45(27.3%)	21(12.7%)	37(22.4%)	38(23.0%)	
Symptoms experienced such as headache, dizziness and vomiting	Yes	17(13.3%)	40(31.3%)	17(13.3%)	25(19.5%)	29(22.7%)	0.17
	No	07(15.2%)	06(13.0%)	06(13.0%)	12(26.1%)	15(32.6%)	
Time taken to reach hospital after injury	Within 30 Minutes	11(20.0%)	09(16.4%)	09(16.4%)	12(21.8%)	14(25.5%)	0.10
	Within 60 Minutes	09(16.7%)	10(18.5%)	08(14.8%)	12(22.2%)	15(27.8%)	
	Within 90 Minutes	0(00.0%)	0(00.0%)	0(00.0%)	01(50.0%)	01(50.0%)	
	>90 Minutes	04(6.3%)	27(42.9%)	06(9.5%)	12(19.0%)	14(22.2%)	
Complete blood count	Normal	20(20.8%)	26(27.1%)	11(11.5%)	20(20.8%)	19(19.8%)	0.009
	Low	01(2.6%)	10(25.6%)	04(10.3%)	06(15.4%)	18(46.2%)	
	High	03(7.7%)	10(25.6%)	08(20.5%)	11(28.2%)	07(17.9%)	
Use of invasive ventilation during hospitalizatio n	Yes	13(14.1%)	13(14.1%)	12(13.0%)	21(22.8%)	33(35.9%)	0.000
	No	11(13.4%)	33(40.2%)	11(13.4%)	16(19.5%)	11(13.4%)	

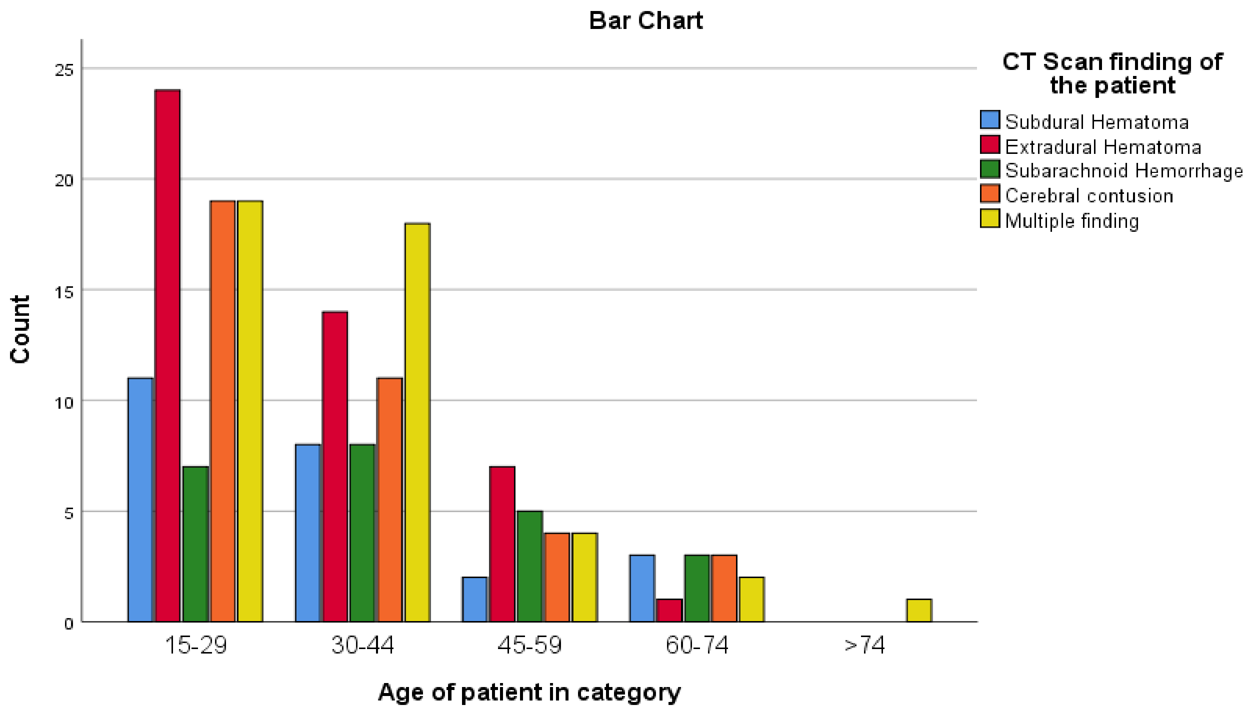

Figure: 4.5
<u>Comparison of age categories of the patients with Traumatic brain injury</u>

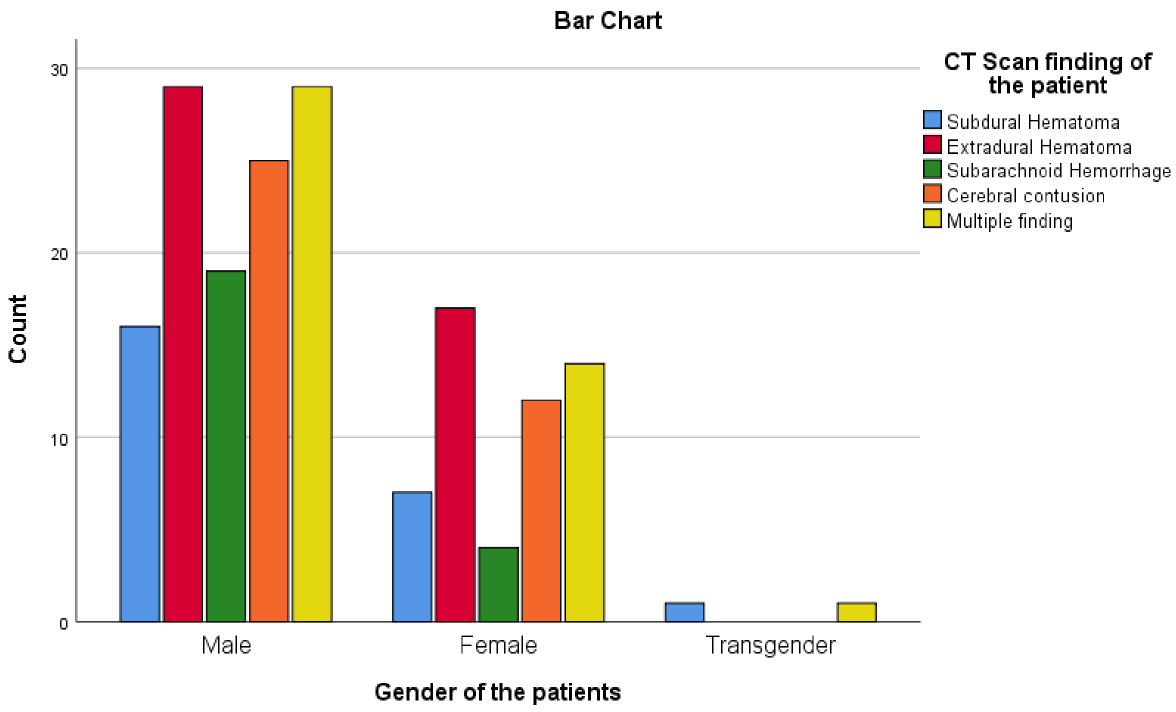

Figure: 4.6
<u>Comparison of Gender of the patients with Traumatic brain injury</u>

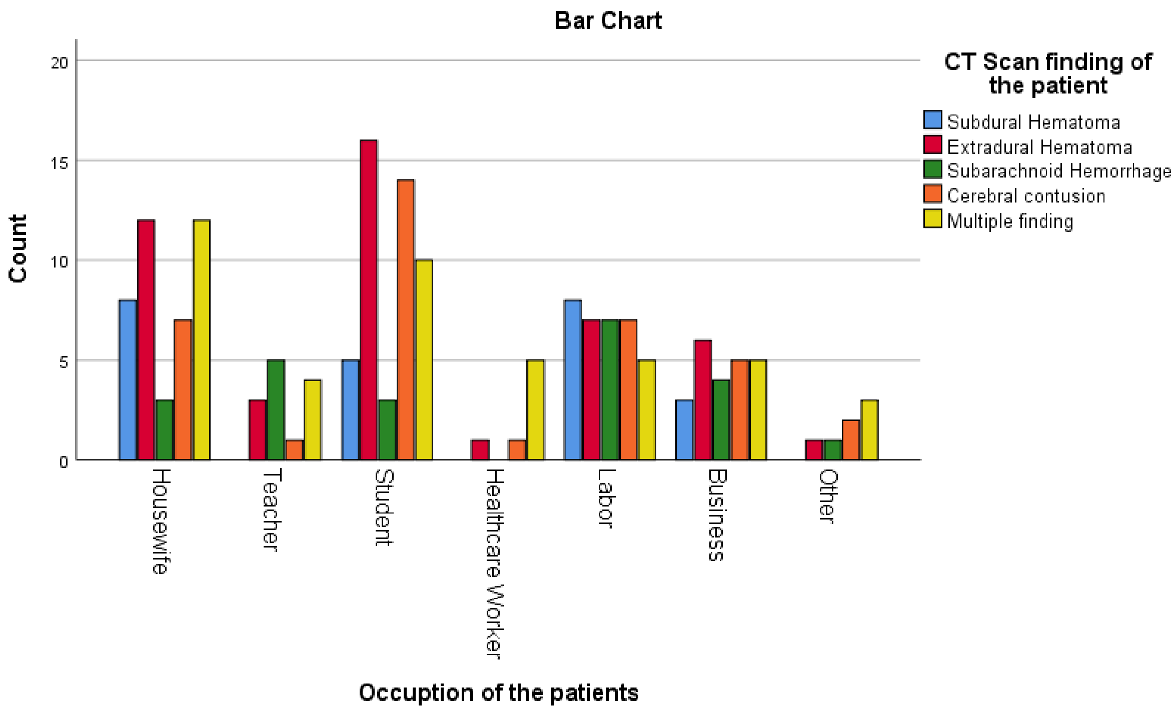

Figure: 4.7

Comparison of occupation of the patients with Traumatic brain injury

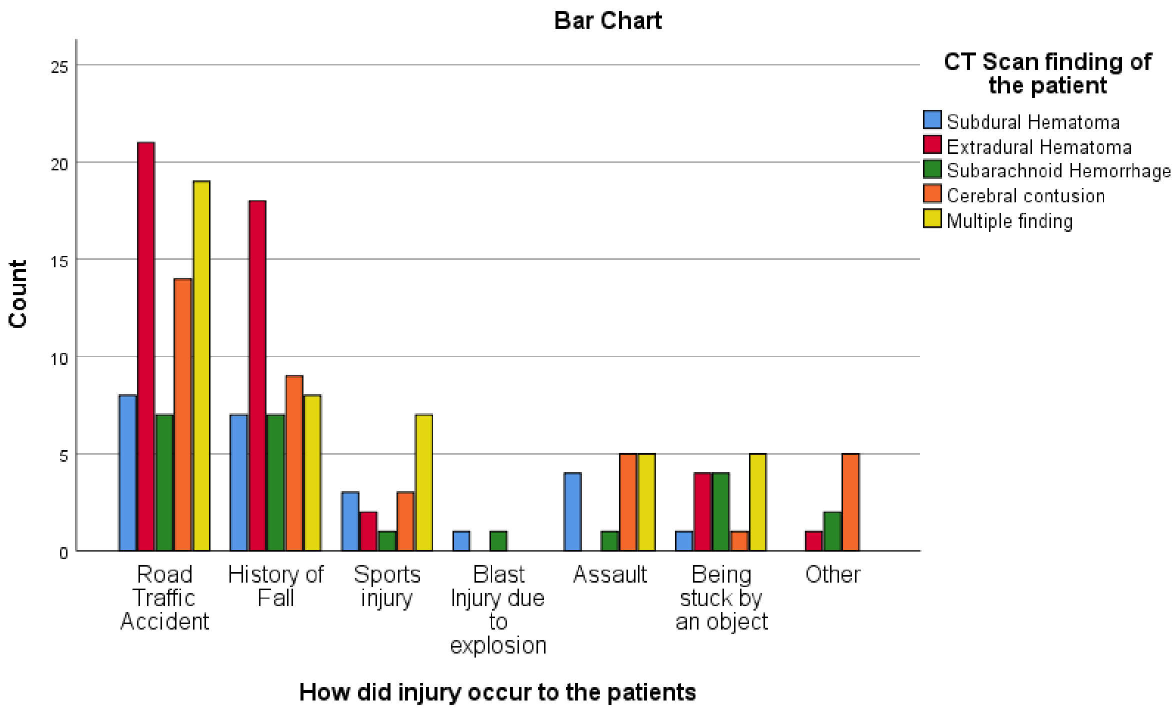

Figure: 4.8

<u>Comparison of mechanism of injury to the patients with Traumatic brain injury</u>

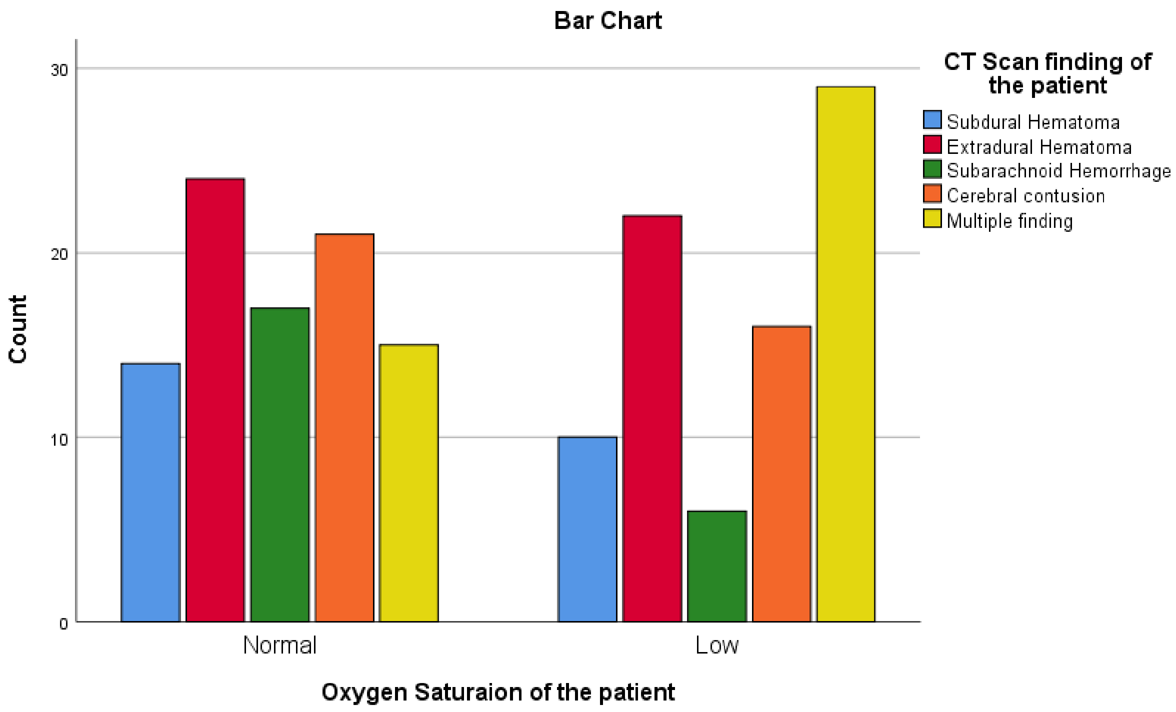

Figure: 4.9
Comparison of oxygen saturation of the patients with Traumatic brain injury

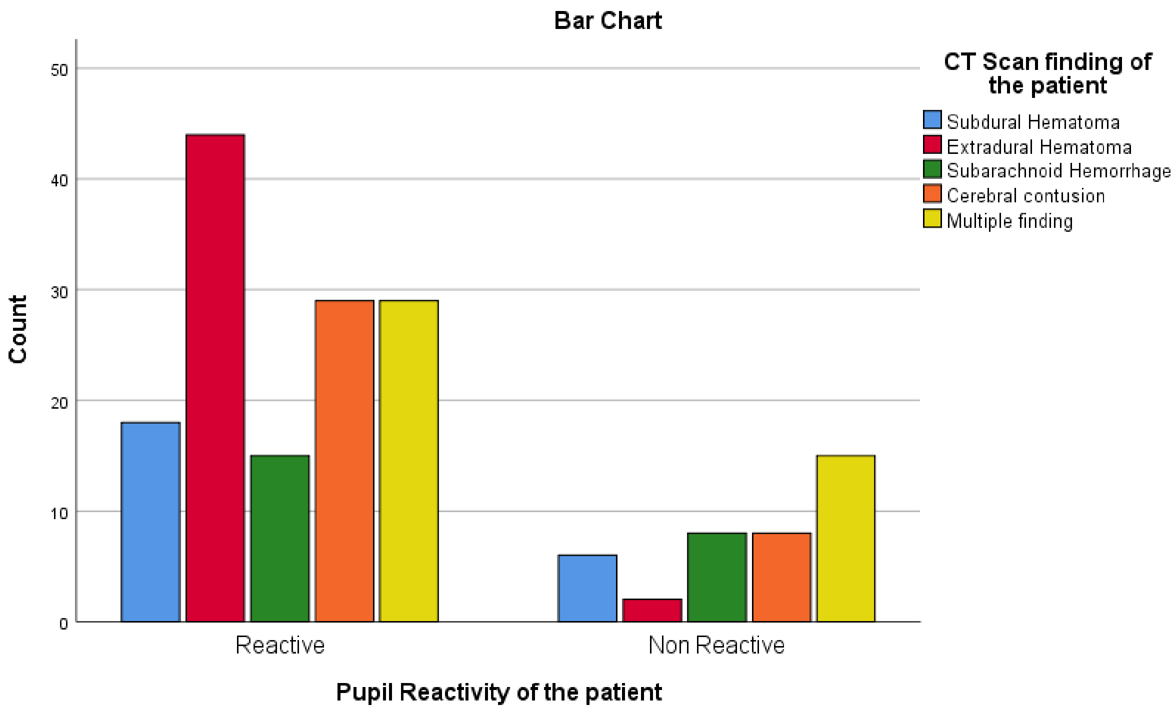

Figure: 4.10
<u>Comparison of pupil reactivity of the patients with Traumatic brain injury</u>

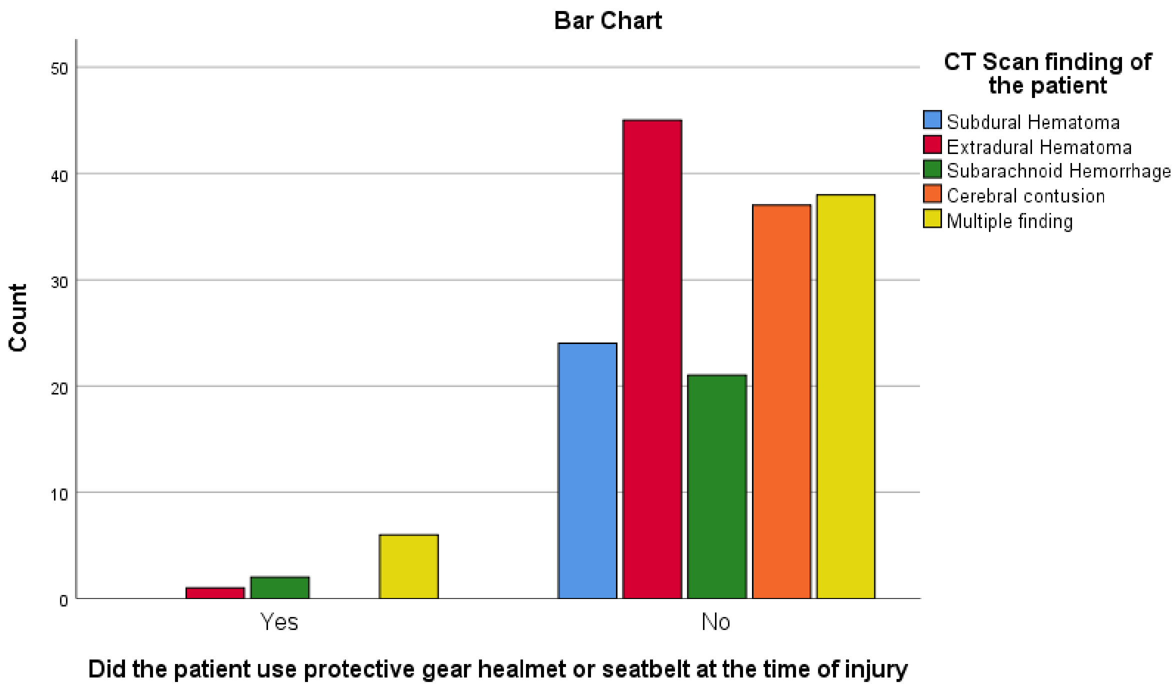

Figure: 4.11

Comparison of use of protective gear, helmet and seat belt with Traumatic brain injury

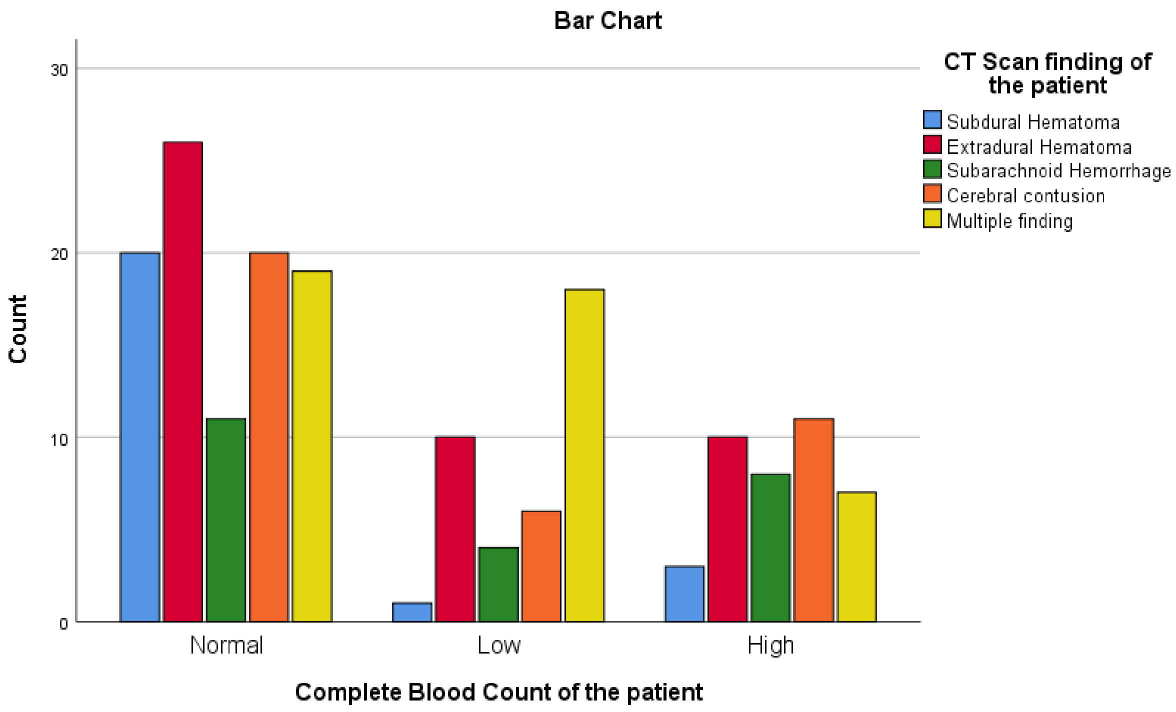

Figure: 4.12
Comparison of Complete blood count of the patients with Traumatic brain injury

CHAPTER 5
DISCUSSION

Objective of the study is to determine the association of fall, motor vehicle accident and sport injuries with Traumatic brain injury, to find the association of age with Traumatic brain injury and to identify the association of gender and occupation with Traumatic brain injury. Majority of the extradural hematoma patients were male 29 (24.6%) and their age was 15-29 years. Most of the extradural hematoma patients 16(33.3%) were students. mostly multiple finding (subdural hematoma, extradural hematoma, subarachnoid hemorrhage and cerebral contusion) patients 26 (26.3%) had household income less than 50000. Majority of extradural hematoma patients 21 (30.4%) had road traffic accident while involve frontal area of the brain. Physiological variables including blood pressure in which majority of multiple finding patients 21(28.0%) had low blood pressure, extradural hematoma patients 21(29.2%) had normal heart rate, multiple finding participants 25(36.8%) and 29(34.9%)had low respiratory rate and oxygen saturation respectively, while extradural hematoma individuals 33(29.2%) had normal body temperature. Most of the multiple finding patients 25(30.9%) had severe traumatic brain injury and their GCS score was less than 8. Pupil reactivity of the patients in which majority of extradural hematoma patients 44(32.6%) had reactive pupil and they did not use alcohol prior to injury. Mostly extradural hematoma patients 45(27.3%) did not use protective gear, helmet and seatbelt while 40(31.3%) experienced symptoms such as headache, dizziness and vomiting after the injury. Time taken to reach hospital in which majority of the extradural hematoma patients 27(42.9%) had reached in more than 90 minutes. Most of the extradural hematoma patients 26(27.1%) had normal complete blood count. Use of invasive ventilation during hospitalization in intensive care unit in which majority of the multiple finding (subdural hematoma, extradural hematoma, subarachnoid hemorrhage and cerebral contusion) patients 33(35.9%) had used invasive ventilation during hospitalization while most of the extradural hematoma patients 33(40.2%) did not use invasive ventilation during hospitalization.

Our findings revealed that the majority of TBI patients 69 (39.7%) had Road traffic accident, 49 (28.2%) had history of fall, 16 (9.2%) had assault, 15 (8.6%) had blast injury. Similarly, a study conducted in Addis Ababa, the capital of Ethiopia, the most common cause of trauma was road traffic accidents (RTA), which affected 43 patients (30.7%), Fall accidents and stick injuries affected 41 patients (29.5%) and 40 patients (286.6%), respectively. Road traffic accident was the common cause of traumatic brain injury (TBI). In our study RTA was higher due to not use of protective gear, helmet and seatbelt(17). In our study majority of the patients 118 (67.8%) were male, 54 (31%) were female while 02 (1.1%) were transgender. age distribution in our study in which majority of the patients 80 (46%) were in the age of 15-29 years. similarly, a study was carried out in St Mary's Hospital, Lacor, northern Uganda which161 patients (83·0%) were male, and 129 patients (66·5%) belonged to the reproductive age group. In total, 155 patients, or 79% of the total, were younger than 40 years old. Both the study shows that majority of male involve in traumatic brain injury and their ages was less than 40 years(19).

In our study we found that CT scan finding of TBI in which majority of the TBI patients 46 (26.4%) had extradural hematoma, 44 (25.3%) had multiple finding (subdural hematoma, extradural hematoma, subarachnoid hemorrhage and cerebral contusion), 37 (21.3%) had cerebral contusion, 24 (13.8) has subdural hematoma and 23 (13.2) had subarachnoid hemorrhage. A study conducted in Ethiopia, in which computed tomography (CT) results for 320 individuals were obtained. The primary finding from which the patients treatment plans were developed was the basis for recording the CT findings. In most cases, depressed skull vault fractures (DSFs) were noticed. 51 patients (15.9%) developed acute extradural hematoma, while 94 patients (29.4%) had DSFs. 42 patients (13.1%) had a chronic subdural hematoma. 12 individuals (3.8%) experienced an acute subdural hematoma. 38 (11.9%) had contusions, 24 (7.5%) had a basal skull fracture, while 10 (3.1%) had a linear fracture. In our study majority of TBI patients had extradural hematoma due to road traffic accident and had no protective gear, helmet and seatbelt. There is a strong correlation (P 0.03) between the mode of injury and the findings of a head injury on CT(17). In our study majority of the TBI patients 46 (26.4%) had extradural hematoma. Similarly, a study conducted in Karachi in which 127 TBI patients participated. There were 116 (91.3%) men and 11 (8.7%) women. Motorcycle accidents were accounted for the majority of the TBI cases 78 (61.4%). Contusions on CT imaging were the most common type of TBI, accounting for 55 (43.3%), followed by extradural hemorrhage (EDH) 48 (37.7%), subdural hemorrhage (SDH) 46 (36.2%), skull fracture 33 (26.0%), subarachnoid hemorrhage (SAH) 30 (23.6%), intracranial (IC) bleed 14 (11.0%), intraventricular hemorrhage (IVH) 8 (6.3%), and diffuse axonal injury (DAI) 8 (6.3%). In both the study there is no significant differences in extradural hematoma patients which lead to TBI. In majority of the extradural hematoma patients RTA is one of the common cause which lead to TBI(34). Physiological variables of the patient in which majority of the patients 75 (43.1) had low blood pressure while majority of the patients 91 (52.3%) had normal oxygen saturation. Similarly, a study conducted in which Patients vital signs were evaluated in accordance to how they arrived. 50 (34.7%) of the 144 patients who arrived by ambulance and had documented vital signs had hypotension or low oxygen saturation level. While 14 of 135 patients (10.4%) with a recorded saturation level had a low oxygen level, 23 (16%) of the 141 patients with a recorded blood pressure who used taxis had low blood pressure. 269 of the patients who were transferred from district hospitals had their oxygen saturation and blood pressure measured. There were 39 patients (14.5%) with low blood pressure and 27 patients (10%) with low saturation. Both the study shows that patients in both studies had low blood pressure but oxygen saturation in majority of the patients had normal in our study due to use of proper oxygen while in this study patients had low oxygen saturation due to use of taxis for transportation.

GCS score and severity of the traumatic brain injury in our study was recorded in which majority of the patients 81 (46.6%) has severe TBI, 71 (40.8%) had moderate while 22 (12.6%) has mild TBI. similarly, another study conducted in which recorded information of 369 individuals about the severity of a head injury was obtained. Out of these patients, 65 (16.7%) had moderate head injury (GCS score was 9 to13), 247 (63.3%) had mild head injury (GCS was 14 and 15), and the remaining 57 (14.6%) had severe brain injury. Our study shows majority of severe traumatic brain injury patients GCS level 3-8 had lack of awareness to adopt the protective measurements to prevent head injury due to road traffic accident(17). In our study majority of the patients 63 (36.2%) had reached initial health care setting in more than 90 minutes similarly, a study conducted in St Mary’s Hospital, Lacor, northern Uganda in which majority of the patients 149 out of 588 (25.3%) arrived at the hospital after more than 24 hours from the time of the injury. Both the study shows that majority of TBI patients had taken maximum time to reach the hospital(19). Alcohol use prior to injury in which majority of the patients 167 (96%) in our study did not use alcohol while 7 (4%) had use alcohol prior to injury. Similarly, a study conducted in New Zealand in which the procedure for selecting cases, which led to 425 cases being included. All patients baseline characteristics are shown, along with a comparison between the groups with and without alcohol involvement. Out of 425 cases, 97 were found. alcohol-related incidents were 22.8%, whereas alcohol-free incidents were 328/425, or 77.2%. both the studies shows that majority of the participants did not use alcohol use prior to injury(20).

CONCLUSIONS/RECOMMENDATION

Out of total 174 participants, our result shows that majority of the patients 46% (N=80) were in the age of 15-29 years, TBI was common in male than female, students 48 (27.6%) experienced more TBI than other occupation group, majority of the patients 39.7% (N= 69) had history road traffic accident, CT scan finding of the patients shows that majority of the patients 26.4% (N=46) had extradural Hematoma, GCS score of the TBI patients was recoded in which most of the patients 46.6% (N= 81) had severe traumatic brain injury. Thus our result indicates in the study that traumatic brain injury is common in young male students having road traffic accident which lead to traumatic brain injury mainly extradural hematoma.

Targeted prevention: Focus on road traffic accident prevention among young males.

Road safety initiatives: Implement and enforce stricter traffic regulations.

Public awareness campaigns: Educate the public on TBI risks and prevention.

Healthcare resource allocation: Prioritize TBI care and rehabilitation services.

Research funding: Allocate resources for TBI research and prevention programs

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APPENDICES

ENGLISH CONSENT FORM

The study you are about to participate is a Cross Sectional Study titled as;

"**Factors associated with traumatic brain injury in patients presenting to intensive care unit of Hayatabad medical complex peshawar, pakistan**"

The study has no potential harm to participants. All data collected from you will be coded in order to protect your identity, and should not be disclosed to anyone. Following the study there will be no way to connect your name with your data. Your answers to the questions will not affect the quality of education given to you. Any additional information about the study results will be provided to you at its conclusion, upon your request.

You are free to withdraw from the study at any time. You agree to participate, indicating that you have read and understood the nature of the study, and that all your inquiries concerning the activities have been answered to your satisfaction.

NAME __________________________
SIGNATURE_____________________

DATE______________________________

URDU CONSENT FORM

میں____________ تصدیق کرتا/ کرتی ہوں کہ **محترمہ (YOUR NAME IN URDU)**نے اپنی اس تحقیق

"YOU TITLE"

.زیرنگرانی **(YOUR SUPERVISOR NAME)**کے متعلق بتا دیا ہے۔ مجھے اس تحقیق کی
نوعیت، مقاصد، احداف، توقعات، فوائد اور خطرات کے متعلق ، ۔ساری معلومات فراہم کر دی گئی ہیں
اس تحقیق کے دوران ساری معلومات صیغۃ راز میں رہیں گی اور مریض کا نام اور دیگر معلومات
صرف تحقیق کے لیے استعمال ہوں گی۔مجھے یہ بھی بتا دیا گیا ہے کہ میں اس تحقیق سے متعلقہ ہر قسم
کے سوال پوچھنے کا مجاز ہوں اور یہ تحقیق صرف ایک شخص ک مفاد میں نہیں ہے بلکہ بحسثیت
مجموعی انسانیت کا مفاد اس سے وابسطہ ہے۔ تمام تفصیلات جاننے کے بعد یس تحقیق میں شامل ہونے یا
نہ ہونے پر کسی کا قائل نہیں ہوں۔ اس تحقیق سے کسی بھی وقت علیحدہ ہونے پر مجھ پر کوئی پابندی
نہیں ہو گی۔ میں بذاتِ خود بقائمی حوش و حواس
۔اور رضا مندی سے اس تحقیقاتی عمل میں شامل ہوتی/ ہوتا ہوں

دستخط محقق --------------------------

دستخط شرکت کار --------------------------

تاریخ ---------------------------

Demographics Form & Questionnaires

FACTORS ASSOCIATED WITH TRAUMATIC BRAIN INJURY IN PATIENT PRESENTING TO INTENSIVE CARE UNIT OF HAYATABAD MEDICAL COPMLEX PESHAWAR, PAKISTAN

Patient Demographic **Patient ID: ____________________**

1) **Age ____________________ years**

2) **Gender**
- Male
- Female

3) **Occupation**
- Housewife
- Teacher
- Student
- Healthcare worker
- Labor
- Business
- Other ____________________

4) **Household Income in PKR**

-

Injury related Variables

5) **How did the Injury Occur?**
- Road Traffic Accident (RTA)
- History of Fall
- Sports Injury
- Blast injury due to explosion
- Assault
- Being Stuck by an Object
- Other ________________

6) **Location of Injury**
- Frontal

- Temporal
- Parietal
- Occipital
- Multiple Location

Physiological Variables

7) Blood Pressure

- Normal (90/60mmHg to120/80 mmHg)
- Low (lower than 90/60 mmHg)
- High (More than 120/80 mmHg

8) Heart Rate

- Normal (60-100 bpm)
- Low (less than 60 bpm)
- High (more than 100 bpm)

9) Respiratory Rate

- Normal (12-18 per minute)
- Low (Less than 12 per minute)
- High (More than 18 per minute)

10) Oxygen Saturation

- Normal (≥94%)
- Low (Less than 94%)

11) Temperature

- Normal (98.6 F)
- Low (Less than 98.6 F)
- High (More than 98.6 F)

Imaging Variable

12) Imaging Modality Findings (CT scan)

- Subdural Hematoma
- Extradural Hematoma
- Subarachnoid Hemorrhage
- Cerebral Contusion
- Multiple Finding

Clinical Variables

13) Glasgow coma scale or Severity of Injury

- Severe (GCS Score 3-8)
- Moderate (GCS Score 9-12)
- Mild (GCS Score 13-15)

14) Pupil Reactivity

- Reactive
- Non-reactive

15) Did the patient use alcohol or drugs at the time of injury?

- Yes
- No

16) Did the patient use Protective gear helmet, or seat belt?

- Yes
- No

17) Has the patient experienced any symptoms such as headache, dizziness and vomiting since the injury?

- Yes
- No

18) How long did reaching the hospital after the injury take?

-

19) Complete Blood count

- Normal
- Low
- High

20) Invasive Ventilation used during hospitalization

- Yes
- No