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Original Research Article

EVALUATING ASSOCIATION OF TRAUMATIC BRAIN INJURIES IN PATIENTS PRESENTING WITH MAXILLOFACIAL FRACTURES: AN INSIGHT FROM LADY READING HOSPITAL, KPK

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Abstract: *WHO recognized Traumatic brain injury (TBI) is a major global contributor to mortality, impacting over 50 million people annually.2 Traumatic brain injuries often accompany maxillofacial fractures due to their close proximity and may present with or without neurological symptoms.* ***Objective:*** *This study aims to evaluate indicators of traumatic brain injury and its severity in conjunction with maxillofacial fractures.* ***Methods:*** *This descriptive study was conducted at Oral and Maxillofacial Surgical Department of Lady Reading Hospital, KPK. A non-probability, consecutive sampling technique was used to gather a sample of 184 participants (95% confidence interval and a 5% margin of error, population 0.8).8 Patient's aged 10-60 who presented with traumatic brain injury along with maxillofacial fractures were included in study. Patients with pre-existing neurological disorders were excluded from the study. Data was collected in a specified Performa and was analyzed using SPSS 22.* ***Results:*** *The mean age group recorded was 21.46 ±13.2. The ratio of males to females was 3:1. The most common traumatic brain injury was amnesia (38%), followed by an altered level of consciousness (37. 1%).The most common mechanism of trauma was Road Traffic Accidents (70.6%) followed by falls (16. 8%).combination of ZMC, Mid-facial and mandibular fractures (panfacial) was most common type of maxillofacial trauma (55%). There was a statistically significant association for TBI along with Facial fractures (P=0.001).* ***Conclusion:*** *Traumatic brain injuries in patients with maxillofacial trauma are life-threatening, requiring early detection to enhance survival and recovery. A multidisciplinary approach, involving maxillofacial surgeons and neurosurgeons, is essential for effective management.*

Keywords: Traumatic Brain Injury, Maxillofacial Fracture, Amnesia

Introduction

Traumatic brain injury (TBI) is caused by an external mechanical force, causing acquired brain damage that can lead to temporary or permanent impairment or death. TBIs may occur alone or in combination with other injuries. The severity of these injuries, whether isolated or combined, determines the morbidity or mortality of affected individuals. Patients who experience severe traumatic brain injuries and have low Glasgow coma scores are at a heightened risk of losing their lives (1). That is why early recognition and early intervention of such serious damage to brain calvarium and its tissues is imperative. Traumatic brain injuries (TBIs) often coincide with maxillofacial fractures due to their proximity. Maxillofacial traumas can result in various fracture patterns involving facial bones (mandible, maxilla, nose, naso-orbitoethmoidal complex, zygomatic maxillary complex, and frontal bone). These fractures, when combined with TBIs, can result in both aesthetic changes and significant functional impairment.

WHO identified TBI (traumatic brain injury) as a significant global cause of mortality in 20202, affecting over 50 million individuals annually following accidents, with 3 million experiencing long-term disability, including severe limb paralysis. Studies on the link between TBIs and maxillofacial fractures yield conflicting results, with reported incidence rates ranging widely from 8.1% to 86.6%. Moreover, research on the features of TBIs associated with maxillofacial fractures is limited and predominantly from developed nations, underscoring the necessity for more localized studies to enhance understanding in this area (3, 4, 5).

In patients with a Glasgow Coma Scale of 15, maxillofacial fractures are typically expected to occur without neurological damage following trauma. However, intracranial hemorrhage may initially go unnoticed, particularly in cases resulting from high-velocity impacts, which account for 2.8% of affected individuals (6). Also maxillofacial injuries are sometimes overlooked due to high consideration to neurological injuries. The trauma team must remain vigilant and act promptly to identify the extent and nature of injuries to ensure appropriate referral to relevant departments and timely management. Patients with concurrent maxillofacial trauma and TBI require supervision by both a neurosurgeon and a maxillofacial surgeon, along with close follow-up, even in the absence of evident neurological symptoms (7, 8) such measures would enhance patient safety, improve treatment outcomes, and reduce both morbidity and mortality rates (9).

This study aimed to identify the pattern of TBI/ traumatic brain injury in patients presenting with maxillofacial fractures. This study will guide the surgeons in designing a strategic plan for managing such complex combination fractures and improving the quality of treatment and care for such patients. This study aims to evaluate indicators of traumatic brain injury and its severity in conjunction with maxillofacial fractures.

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Methodology

This descriptive study was conducted at the Oral and Maxillofacial Surgical Department of Lady Reading Hospital KPK from 01-03- 2024 to 01-08-2024. A non-probability, consecutive sampling method was employed to gather a sample of 184 participants. (Calculated by Rao soft software with a 95% confidence interval and 5% margin of error), according to the population proportion of 0.8. 8

The age group was from 10-60 years reporting TBI (hemorrhage/hematoma, pneumocephalus, concussion, cerebral edema, Glasgow Coma Scale/GCS below 13) with maxillofacial fractures (maxilla, mandible, zygomatic maxillary complex, frontal bone, and Naso-orbitoethmoidal fractures).

The patients with co-existing neurological disorders **(Bell's** palsy, Stroke, Multiple Sclerosis (MS), and Cerebral Palsy etc.**)** with or without morbidity in the maxillofacial region (weakness, numbness, facial asymmetry) are excluded from the study.

Data collection was done after proper informed consent was obtained from the patient's guardians, keeping the patient's privacy confidential. After collecting biographic data (age, gender, address and occupation), a validated questionnaire was used to collect data about the mode of injury, type of maxillofacial fracture and TBI. The data obtained was analyzed by SPSS version 22. The frequency distribution was determined for both genders, cause of trauma, TBI and types of associated facial fractures. The Chi-square test was used to determine the significant association between the TBI and facial fractures with P≤0.005. All the results were presented in the form of graphs and tables.

TABLE 1: TRAUMATIC BRAIN INJURY SEVERITY 10

Criteria	Mild	Moderate	severe
Structural imaging	Normal	Normal/abnormal	Normal/abnormal
Loss of consciousness/	0-30mins	>30 min and <24 h	>24hrs
altered mental status	Up to 24hrs	>24hrs	>24hrs
Post traumatic amnesia	0-1day	>1day-<7days	>7days-<9days
GCS score	13-15	12-9	<9
Alteration of mental status is immediately related to the trauma sustained to the head. 11			

Results

The mean age group recorded for both genders with TBI and associated maxillofacial fractures was 21.46 ±13.2 (MAX 70 - MIN 4). The Chi-square value calculated was 1.498 with 1 degree of freedom and a p-value of 0.001, indicating a significant association between age and TBI with facial trauma. The male-to-female ratio was 3:1. The incidence of TBI in coherence with maxillofacial fracture in males was 83 % and 16% among females. The relation was also found to be significant with the P-value of 0.001 (x 2 value of 83.565/Df=1) for TBI and Facial trauma. Figure I shows the traumatic brain injury and maxillofacial fractures reported to the Maxillofacial Trauma Center of LRH among both genders indicating the most common TBI was amnesia, followed by an altered level of consciousness. The least common TBI types were hematoma and skull fractures.

The most common cause of TBI with Facial Fractures was Road Traffic Accidents followed by falls as shown in Table 2. The distribution of Maxillofacial fractures in coherence with TBI, among both genders is displayed in Table 3 The most common type of maxillofacial trauma was a combination of ZMC, Mid-facial and mandibular fractures (Panfacial). The fractures of maxillary bone especially le-fort III are in the lowest proportion compared to other fractures. A statistically significant association was found between TBI and facial fractures in both genders, with a p-value of 0.001. Table 3

TABLE 2: MECHANISM OF TBI WITH MAXILLOFACIAL TRAUMA

Cause of Trauma	Frequency (percentage)
RTA	130 , 70.65%
Fall	31, 16.84%
FAI	14, 7.60%
Assault	9, 4.89%
TOTAL	184 (100%)

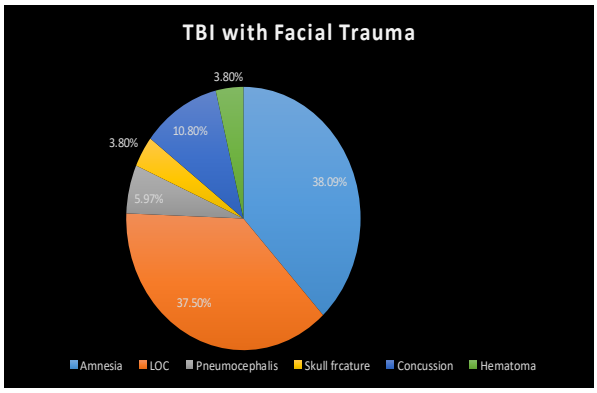

Figure 1: The Distribution of Traumatic Brain Injury (TBI) in Patients with Maxillofacial Trauma.

TABLE 3: TYPE OF MAXILLOFACIAL TRAUMA IN PATIENTS WITH TBI

Type of facial fractures	Frequency(Percentage)	P-Value
Combined Fractures/Panfacial	101, 54.89%	X 2=168.348
Frontal bone Fracture	22, 11.95%	Df=1
Maxillary bone Fracture	32, 17.39%	0.01
Le-Fort I		
Le-Fort II		
Le-Fort III	1,0.5%	

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Zygomatic bone Fracture	11, 5.97%	
Mandibular Fracture	10, 5.43%	
Naso-orbitoethmoid Fracture	7, 3.80%	
TOTAL	184, 100%	

X 2 chi- square value, Df Degree of Freedom, P value ≤ 0.05 is statistically significant value

Discussion

Head traumas in people with maxillofacial trauma are life-threatening. Early detection of brain injury in these patients is crucial for improving survival and rehabilitation outcomes. The current study was also able to highlight the association of TBI or head trauma with facial fractures in patients reporting to one of the renowned tertiary care centers of Peshawar KPK.

The study carried out by Joshi et al 12 has shown the age range of 1-75 years with a mean age of 31.14±10 years. The calculated Chi-square value was 8.37 (greater than 7.81 for p = 0.05), indicating a significant association between age and head injuries. This is in contrast to our findings. The mean age recorded was 21±13 years in the current study showed the demographic and regional variation for occurrence of both injuries together in the population of KPK. Although there was a significant association between the incidence of TBI and facial trauma and age in the present study, which was found to be similar to the above study conducted by Joshi et al (12). This correlates to the other studies reported by Rajandrum, 13 Gwyn 14 and Grant (15). However, it does not align with the study done by Zandi et al. 16, which found no significant link of head injuries and age.

Males comprised the majority of patients accounting for 91 %, with females only 9 % in the study of Joshi et al (12). This notable gender distribution appears to align well with the current study, in which M: F ratio is 3:1. This correlates with the study who reported it to be 9:117. Although the ratio seems too high than the current findings, but can be defined in the light that male has more outdoor activities than women in both regions.

In our study, the most common TBI was amnesia and an altered level of consciousness is closely associated with facial fractures. The survey of Hassan et al (18). Showed that concussions with closed head injuries were more frequently associated with facial fractures, found to be similar to our findings. In a different study by Arabian et al,19 concussions (38%) was identified as the most common type of head injury associated with maxillofacial trauma, which contrasts with the findings of the present study.

The study of Joshi et al (12). Has revealed mandibular fractures were mostly associated with concussion contradicting the findings in this study. Similarly, the facts represented by Follmar et al (20). Reported zygomatico-maxillary complex (ZMC) fractures at 18.9%, maxillary fractures at 17.55%, and frontal bone fractures at 14.18%. All these findings are not coherent to the outcomes recorded in our study, where Panfacial fractures were more closely associated with TBI. The statistically significant association was also found in current study. This can be attributed to increased urbanization, which has led to a rise in severe trauma in our region.

The major causes of TBI with facial fractures were falls and RTA, according to Rajandrum, 13 was homogenous to our analysis. Similarly, many other studies conducted by Hassan 17 and Arabion et al, 20 likewise revealed the similar findings.

Conclusion

Traumatic brain injuries in patients with maxillofacial trauma can be life-threatening, highlighting the importance of timely detection to improve survival and recovery outcomes. The study's findings provide valuable insights for a multidisciplinary approach, particularly for maxillofacial surgeons and neurosurgeons, in developing effective treatment and follow-up plans for patients with combined head and facial injuries.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate
Approved by the department Concerned. (IRBEC-LRHP-03331/23)

Consent for publication
Approved

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Not applicable

Conflict of interest

The authors declared absence of conflict of interest.

Author Contribution

HINA AFSAR (REGSITRAR)
Coordination of collaborative efforts.
Study Design, Review of Literature.
MUSKA HAYAT (RESIDENT ORAL)
Conception of Study, Development of Research Methodology Design, Study Design,, Review of manuscript, final approval of manuscript.
Conception of Study, Final approval of manuscript.
UMER ULLAH (ASSISTANT PROFESSOR)
Manuscript revisions, critical input.
Coordination of collaborative efforts.
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KHALIQ HUSSAIN (RESIDENT ORAL)
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Coordination of collaborative efforts.

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References

1. Stocchetti N, Zanier ER. Chronic impact of traumatic brain injury on outcome and quality of life: a narrative review. Critical Care. 2016; 20:1-12.
2. Hyder AA, Wunderlich CA, Puvanachandra P, Gururaj G, Kobusingye OC. The impact of traumatic brain injuries: a global perspective. Neuro-Rehabilitation. 2007; 22(5):341-53.
3. Maas AI, Menon DK, Adelson PD, Andelic N, Bell MJ, Belli A, Bragge P, Brazinova A, Büki A, Chesnut RM, Citerio G. Traumatic brain injury: integrated approaches to improve prevention, clinical care, and research. The Lancet Neurology. 2017; 16(12):987-1048.
4. Salentijn EG, Collin JD, Boffano P, Forouzanfar T. A ten-year analysis of the traumatic maxillofacial and brain injury patient in Amsterdam: complications and treatment. Journal of Cranio-Maxillofacial Surgery. 2014; 42(8):1717-22.
5. Al-Hassani A, Ahmad K, El-Menyar A, Abutaka A, Mekkodathil A, Peralta R, Al Khalil M, Al-Thani H. Prevalence and patterns of maxillofacial trauma: a retrospective descriptive study. European journal of trauma and emergency surgery. 2019; 1:1-7.
6. Othman A, Al-Mofreh Al-Qahtani F, Al-Qahtani H, Jaber M, Bishawi K, Hassan Khamis A, Al-Shanably A. Traumatic brain injuries and maxillofacial fractures: a systematic review and meta-analysis. Oral and maxillofacial surgery. 2023; 27(3):373-85.
7. Bouamra O, Wrotchford A, Hollis S, Vail a, Woodford M, Lecky F. Outcome prediction in trauma. Injury. 2006; 1(12):1092-7.
8. Vandenbroucke JP, Elm EV, Altman DG, Gøtzsche PC, Mulrow CD, Pocock SJ, Poole C, Schlesselman JJ, Egger M, Strobe Initiative. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): explanation and elaboration. Annals of internal medicine. 2007; 16; 147(8): 159-163.
9. Işik D, Gönüllü H, Karadaş S, KOÇAK ÖF, KESKİN S, Garca MF, EŞEOĞLU M. Presence of accompanying head injury in patients with maxillofacial trauma. Ulus Travma Acil Cerrahi Derg. 2012;18(3):200–6
10. Tsang KK-T, Whitfield PC. Traumatic brain injury: review of current management strategies. Br J Oral Maxillofac Surg. 2012; 50(4):298–308. Available from: http://dx.doi.org/10.1016/j.bjoms.2011.03.004
11. Asturias A, Knoblauch T, Rodriguez A, Vanier C, Le Tohic C, Barrett B, et al. Diffusion in the corpus callosum predicts persistence of clinical symptoms after mild traumatic brain injury, a multi-scanner study. Front Neuroimaging. 2023; 2:1153115. Available from: http://dx.doi.org/10.3389/fnimg.2023.1153115
12. Joshi UM, Ramdurg S, Saikar S, Patil S, Shah K. Brain Injuries and Facial Fractures: A Prospective Study of Incidence of Head Injury Associated with Maxillofacial Trauma. J Maxillofac Oral Surg. 2018;17(4):531-7
13. Rajandram RK, Syed Omar SN, Rashdi MF, Jabar A, Nazimi M. Maxillofacial injuries and traumatic brain injury—a pilot study. Dent Traumatol. 2014; 30:128–32
14. Gwyn PP, Carraway JH, Horton CE, Adamson JE, Mladick RA. Facial fractures-associated injuries and complications. Plast Reconstr Surg. 1971; 47:225–30
15. Grant AL, Ranger A, Young GB, Yazdani A. Incidence of major and minor brain injuries in facial fractures. J Craniofac Surg. 2012;23(5):1324–d32
16. Zandi M, Seyed Hoseini SR. The relationship between head injury and facial trauma: a case-control study. Oral Maxillofac Surg. 2013; 17:201–7
17. Rahman SA, Chandrasala S. When to suspect head injury or cervical spine injury in maxillofacial trauma? Dent Res J. 2014;11(3):336-9
18. 18. Hassan NA, El Kelany RS, Emara AM, Amer M. Pattern of craniofacial injuries in patients admitted to Tanta University Hospital-Egypt. J Forensic Leg Med. 2010;17(1):26–32
19. Arabion HR, Tabrizi R, Aliabadi E, Gholami M, Zarei K. A retrospective analysis of maxillofacial trauma in Shiraz, Iran: a 6-year-study of 768 patients (2004–2010) J Dent Shiraz Univ Med Sci. 2014;15(1):15–21
20. Follmar KE, Debruijn M, Baccarani A, Bruno AD, Mukundan S, Erdmann D, Marcus J. Concomitant injuries in patients with panfacial fractures. J Trauma. 2017; 63:831–835.

[Citation Afsar, H., Hayat, M., Ullah, U., Shah, Z., Hussain, K. (2024). Evaluating association of traumatic brain injuries in patients presenting with maxillofacial fractures: an insight from lady reading hospital, kpk. *Biol. Clin. Sci. Res. J.*, **2024***: 1081*. doi: https://doi.org/10.54112/bcsrj.v2024i1.1422]