

# Effect of Oral and Maxillofacial Injuries on the Development of Post-Traumatic Stress Disorder: A Cross-Sectional Study

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## ABSTRACT

**Objective:** To assess the influence of oral and maxillofacial trauma on the development of Post-Traumatic Stress Disorder (PTSD) and to determine the efficiency of the Impact of Event Scale-Revised (IES-R) as a diagnostic tool for detecting PTSD in patients with Oral and Maxillofacial injuries. **Material and Methods:** PTSD was assessed one month postoperatively by the diagnostic instrument, IES-R, to arrive at a provisional diagnosis. A structured clinician-administered PTSD Scale then assessed the patients for the Diagnostic and Statistical Manual of Mental Disorders-5th edition (CAPS-5) to establish a final diagnosis. The assessment of the severity of PTSD was done based on various types of oral and maxillofacial injuries. **Results:** The IES-R scale provisionally diagnosed 54 subjects with PTSD, out of which 42 were diagnosed to have PTSD by the CAPS-5 scale. Subjects with injuries involving the 'orbital complex,' those presenting with a perceptible scar in the maxillofacial region and with multiple avulsed/ luxated anterior teeth, showed a higher affinity to develop PTSD, and this was statistically significant. **Conclusion:** Higher levels of PTSD in patients with injuries to the maxillofacial region warrants correct diagnosis and detection, and hence the maxillofacial surgeon plays a vital role in this regard. The IES-R is a useful diagnostic tool to detect PTSD early.

**Keywords:** Maxillofacial Injuries; Stress Disorders, Post-Traumatic; Tooth Avulsion.

## Introduction

Maxillofacial deformity resulting from trauma can affect the facial skeleton, including the dentition and the covering of soft tissues. The deformities can be functional or aesthetic, resulting in severe psychological trauma with devastating consequences. Although psychological complications associated with maxillofacial trauma is a common finding, they often go undetected [1]. Studies conducted in this regard have not adequately addressed the psychological effects due to trauma to the maxillofacial region [2]. It has been shown that patients treated by maxillofacial surgery exhibited higher levels of anxiety [3]. Anxiety, depression, insomnia, and Post-Traumatic Stress Disorder (PTSD) were exhibited by many patients after encountering maxillofacial trauma [1].

Trauma-induced stress can lead to PTSD, a psychiatric condition that can severely damage the patient. In this condition, the subjects, in addition to depression, may also exhibit suicidal tendencies [4]. Some patients may meet the full criteria of PTSD symptoms, and others may have a 'partial PTSD,' wherein there is no complete fulfillment of PTSD criteria [5]. A prevalence of 10% - 30% of chronic PTSD has been reported 12 months after the trauma [6,7]. Avoidance of thoughts/numbing, frequent re-experiencing the traumatic episode and hyperarousal are the exclusive features of PTSD [8,9].

The Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) comprises intrusive recollections, signs of avoidance, and symptoms of hyperarousal [10]. The Impact of Event Scale-Revised (IES-R) can evaluate PTSD symptoms in various settings. Weiss and Marmar [11] modified the original impact of Event Scale (IES) questionnaire by adding 'hyperarousal,' the third important PTSD cluster, in addition to previously present 'intrusion' and 'avoidance of thoughts' diagnostic clusters. This was as per the specification of DSM-IV. The IES-R questionnaire is a good measure for assessing PTSD [12]. The use of IES-R to evaluate PTSD in maxillofacial trauma patients is rare, and its efficiency in this regard is not known. This study aimed to estimate the influence of different types of maxillofacial facial injuries on the development of PTSD in an Indian population and determine the efficiency of the IES-R as a diagnostic instrument for determining PTSD.

## Material and Methods

### Ethical Clearance

This study abides by the Helsinki Declaration and ethical principles regarding human experimentation. This research study project was carried out after approval by the Institutional Ethics Committee, Kasturba Hospital, Manipal, Manipal Academy of Higher Education (No: 470/ 2017).

### Study Design and Sample

The registration number for this trial is CTRI/2017/11/010719, Name of the registry: Clinical Trials Registry - India ([www.ctri.nic.in](http://www.ctri.nic.in)). One hundred forty-seven patients with all types of maxillofacial injuries, admitted in the maxillofacial surgery unit in Kasturba Hospital, Manipal, India, from August 2017 to February 2018, were considered. All participants received complete details regarding the study, and the investigators obtained informed consent from each one of them.

The study included patients with oral and maxillofacial injuries, aged between eighteen and sixty-five years, who were willing to come for a follow-up. The study excluded patients with a preexisting cognitive impairment, those on antipsychotic medication in the preceding year, and associated neurologic/orthopedic/abdominal/chest injuries.

## Data Collection

Surgical or non-surgical management of injuries depended on various factors, including displacement of fractured segments, occlusal derangement, dental injuries, aesthetic concerns, and the age of the patient. Surgical management included open reduction and internal fixation either under general or local anesthesia. Non-surgical management included debridement, wound closure, and replacement of missing teeth. The selected patients were assessed at least one month after trauma and not later than three months post-trauma. The IES-R scale was used as the assessment tool for screening PTSD in the patients.

The IES-R has 22 items, and the patient rates each symptom as to how bothersome it had been during the preceding week. Each IES-R format has five responses (0, 1, 2, 3, 4), and it assesses 're-experiencing / intrusion,' 'avoidance / numbing,' and hyperarousal. A total IES-R cut-off score of 35 was taken as a reasonable value for the provisional PTSD diagnosis.

A final assessment by qualified experts was next done by a standard scale, the Clinician-Administered PTSD Scale for the Diagnostic and Statistical Manual of Mental Disorders-5th edition (CAPS-5), in which the patients needed to meet with the eight diagnostic criteria as per the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), to be labeled positive for PTSD. Two specifications, which included delayed expression and a dissociative subtype of PTSD, were also considered to diagnose PTSD. PTSD assessment was assessed based on different types of maxillofacial injuries, which included soft tissue and dental injuries.

## Data Analysis

The SPSS 22 version (IBM Corp., Armonk, NY, USA) was used in data analysis. The Pearson chi-square test was used to determine the correlation between continuous variables and the significance level was set at 5%.

## Results

Among 154 patients included in the study, seven patients (4.5%) did not turn up for a follow-up. Ninety-three (63.3%) were males and fifty-four (37%) females. Most of the injuries were due to road traffic accidents (RTA). RTA accounted for 127 patients, followed by a history of falls accounting for 15 patients. Five patients had a history of interpersonal violence (IPV). Forty-five patients (30.6%) had 'orbital complex' injuries associated with either a Zygomaticomaxillary complex fracture or a Lefort fracture without involving the mandible. Midface fractures not associated with an orbital component accounted for 18 subjects. Mandibular fractures accounted for 75 subjects, and panfacial fractures involving both the midface and the mandible accounted for nine patients. Ninety patients (61.2%) with an associated soft tissue injury in the maxillofacial region. Sixty-one patients had associated avulsion/luxation of anterior teeth.

The IES-R scale had 54 patients (36.7%) above the cut-off score of 35. The final diagnosis of PTSD, as determined by CAPS-5, accounted for 42 subjects (28.6%). All the subjects diagnosed with PTSD showed significantly higher IES-R scores.

The Pearson Chi-square test determined the influence of various types of fracture injuries on the development of PTSD. The current study found that out of 42 patients diagnosed with PTSD, 23 had fractures involving the orbital complex (ZMC fractures and Lefort 2 and 3), and this was found to be statistically significant ( $p < 0.01$ ) (Table 1). The other fracture injuries did not show any significant results. Only two

patients with isolated midface fractures not associated with an orbital component developed PTSD. Sixteen patients with mandibular fractures and only one patient with panfacial fractures developed PTSD.

**Table 1. Association of orbital complex fractures with PTSD.**

Orbital Complex Injuries	CAPS 5		Total N (%)	p-value
	Absent N (%)	Present N (%)		
Absent	83 (79.0)	19 (45.2)	102 (69.4)	<0.001*
Present	22 (21.0)	23 (54.8)	45 (30.6)	
Total	105 (100.0)	42 (100.0)	147 (100.0)	

\*Statistically Significant.

Out of the 42 patients diagnosed with PTSD, 34 had a perceptible facial scar caused due to the traumatic event. The presence of a perceptible facial scar in patients following trauma and its effect on PTSD was found to be statistically relevant by the Pearson Chi-square test ( $p < 0.01$ ) (Table 2).

**Table 2. Association of perceptible facial scars with PTSD.**

Perceptible Facial Scar	PTSD		Total N (%)	p-value
	Absent N (%)	Present N (%)		
Absent	49 (46.7)	8 (19.0)	57 (38.8)	<0.001*
Present	56 (53.3)	34 (81.0)	90 (61.2)	
Total	105 (100.0)	42 (100.0)	147 (100.0)	

\*Statistically Significant.

Patients with avulsed/ luxated anterior teeth showed increased rates of PTSD. Out of 42 patients with PTSD, 29 had associated avulsed/ luxated anterior teeth and was statistically significant as determined by the Pearson Chi-square test ( $p < 0.01$ ) (Table 3).

**Table 3. Association of avulsed/luxated anterior teeth with PTSD.**

Dental Avulsion	CAPS 5		Total N (%)	p-value
	Absent N (%)	Present N (%)		
Absent	73 (69.5)	13 (31.0)	86 (58.5)	<0.001*
Present	32 (30.5)	29 (69.0)	61 (41.5)	
Total	105 (100.0)	42 (100.0)	147 (100.0)	

\*Statistically Significant.

## Discussion

Oral and maxillofacial traumatic injuries warrant the need for psychological assessment of the affected patients requiring treatment [13]. Early identification of PTSD prevents the patient from slipping into depression and harboring any suicidal thoughts [14]. Although trauma can lead to many reactions, not all traumatic events lead to a psychological disorder like PTSD. The outcome following trauma is usually an interaction between the patient, the traumatic event, and the circumstances [15]. Some studies have reported that the role of road traffic accidents as an etiologic factor in facial bone fractures has considerably decreased, and those caused by violence and sports injuries have increased [16,17]. However, in a suburban Indian population, as was found in the current study, most of the injuries were caused by road traffic accidents. This finding is similar to a study done by Ruslin et al. [18].

The current study shows the high prevalence of PTSD in patients with maxillofacial injuries. In addition to assessing PTSD in maxillofacial injuries, it determines the efficiency of a diagnostic instrument, IES-R, in the diagnosis of PTSD from an oral and maxillofacial point of view by relating them to a standard structured instrument, CAPS-5. In the current study, almost 29% of patients with oral and maxillofacial injuries exhibited PTSD, and this corresponds to the study findings of Bisson et al. [19], who reported a 27% prevalence.

The use of self-report instruments has been proposed to recognize patients who are likely to develop PTSD following traumatic events [20]. The IES-R has been used with reasonable accuracy in both clinical and in large scale research studies to identify patients with PTSD [21]. Generally, there are no acceptable standard specificity and sensitivity levels. However, in the early phase following injury, to identify as many cases as possible, sensitivity may be important. These identified cases can be referred for a further diagnostic examination to determine the presence of a psychological disorder [22]. The cut-off scores were found to differ among various studies and ranged from 22 to 44 [23]. The current study considered a minimum value of sensitivity of 83%. Accordingly, the corresponding cut-off scores for IES-R was 35. This cut-off score fell well within the acceptable range as determined by other studies [22-25].

Some of the factors that can lead to PTSD include loss of organs, loss of relatives, and property loss [26]. An understanding of the etiology of PTSD is essential for proper assessment and management of the condition. Patients with no family support, larger presenting scars, and even the type of trauma may lead to increased anxiety levels [27]. Ranganath et al. [1] proved in their study that one of the main risk factors in the development of PTSD is a cosmetic deformity. Moreover, disfigured/cosmetic maxillofacial injuries show higher PTSD scores [28]. Soft tissue injuries, such as lacerations and contusions, are most common in oral and maxillofacial trauma and accounted for 49.3% and 92.1%, respectively [29]. Mosaddad et al. [30], in their study of oral and maxillofacial trauma in motorcyclists in Iran, found that, in dental injuries, luxation and avulsion injuries accounted for 23.2% and 18.9%, respectively. Luxation or avulsion of anterior teeth can be disturbing to the patient due to aesthetic concerns. In the current study, the presence of multiple avulsed anterior teeth has a significant relation to the development of PTSD. The presence of a perceptible facial scar was also significantly associated with the development of PTSD in this study. This finding corresponds to a study done by Islam et al. [31], who reported that a facial scar reinforces a negative psychological response.

The occurrence of PTSD can vary depending on the anatomic location of traumatic injuries. Unay et al. [32] found that PTSD in patients with spinal injuries is significantly higher than injuries in different anatomic locations, such as the upper limbs. From a maxillofacial perspective, in the current study, the trauma involving the 'orbital complex' plays a vital role in PTSD compared to other maxillofacial regions. In trauma involving the 'orbital complex,' certain clinical features such as circumorbital ecchymosis, circumorbital edema, subconjunctival hemorrhage, diplopia, proptosis, enophthalmos, among others, lead to increased anxiety and stress in the affected individuals and can lead to the development of PTSD. These features can affect the individual, both cosmetically and functionally.

The outcome of the current study is manifold. It is evident that, in maxillofacial trauma, the IES-R is a good diagnostic screening tool to detect PTSD. The proper knowledge about the factors playing a significant role in the development of PTSD in maxillofacial trauma, such as orbital injuries, facial lacerations, and avulsed anterior teeth, can direct maxillofacial surgeons to focus on these aspects during the surgical management of the patient. Treatment measures should be directed to minimize post-traumatic deficits by addressing both functional and esthetic deformities. Other measures to prevent suicidal intentions and to

develop a positive attitude among the affected patients are desirable. Psychotherapy for traumatic injuries can be a useful option, along with antidepressants. Post-traumatic deficits, if inevitable, can compromise on the facial appearance of the patient and will require excellent support, psychological counseling, and a proper follow-up.

A limitation of the study is that it does not consider the mode of treatment given to the patients, as both surgical and non-surgical treatment modalities were considered. Further research is needed to determine the effect of treatment modalities in the development of PTSD.

## Conclusion

The need for the correct diagnosis and early PTSD detection in maxillofacial injuries is essential, and hence, the oral and maxillofacial surgeon plays a vital role in this regard. The IES-R co-relates well with the CAPS-5 structured instrument scale. Subjects with maxillofacial injuries involving the orbital complex, those with a perceptible post-traumatic scar and avulsed anterior teeth, are more prone to develop PTSD.

## Authors' Contributions

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All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

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## Conflict of Interest

The authors declare no conflicts of interest.

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## Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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