

## Original Research Article

# **The outcome of Cervical spine injury associated with traumatic brain injuries: Tertiary care hospital study**

### **ABSTRACT:**

**OBJECTIVE:** Outcome of cervical spine injury associated with traumatic brain injuries.

**MATERIAL & METHOD:** This study is a cross-sectional descriptive study that was performed at the Jinnah Post Graduate Medical Centre, Karachi. 158 total patients were included in the study, this study by non-probability consecutive sampling. The diagnosis was based primarily on a CT scan brain plain and an x-ray of the cervical spine of all the patients who were admitted to the ward.

**RESULT:** Among 158, the age distribution of the patient was observed as 43(27%) patients presented as less than 20 years, 32(20%) were between the age of 21-30 years range, 28(18%) patients were ranged between 31-40 years, 16(10%) patients aged in a range of 41-50 years while 39(25%) were above 50 years. Head injury severity was observed at 47% as mild head injury, 32% as moderate injury and 21% had a severe head injury while cervical injury in association with traumatic brain injury was found in 10% of patients.

**CONCLUSION:** The prevalence of cervical traumatic injury associated with moderate to severe head injury remained similar in the world overall with minute differences in the percentages that we have noticed in our study. The severity of the head injury is directly proportional to cervical injury.

**Keywords:** head injury, cervical injury, head injury

### **1. INTRODUCTION:**

Injury to the spinal cord worldwide is a high kind of disabling injury, even the injury to the spinal cord alone can itself lead to multiple organ damage or loss of motor and sensation function. The cervical spine injuries (CSIs) prevalence associated with traumatic brain injury ranges between 4 and 12.5% [1]. Its management of cervical injury associated with a head injury can be costly, long duration of recovery affects the person's psychologically and their family, in the loss of labor forces and leads to a societal burden [2]. Trauma is the most common cervical injury, and this can be due to accidents from the motor vehicle, falls, blunt or penetrating trauma, trauma-related to sports or injuries during driving. The non-traumatic causes can involve

compression fractures from cancer, arthritis, and osteoporosis, arthritis and the spinal cord's inflammation [3].

Associated injury with a head injury and cervical mortality is about 20 to 30%, head injuries can be mild, moderate or severe. The common reasons for traumatic brain injury are RTAs, falls and assault while in industrialized areas in this type of injury, road traffic accidents are accountable for about 36% to 57%[4]. Acute injury to the spinal cord is the highest cause of morbidity & mortality that results from trauma. Early injury diagnosis, demonstration of the function of the spinal cord nerve root and spinal alignment restoration stability are the reason for good management. Injury of the traumatic spinal cord is the most destructive type of injury [5]. Men are at more risk to sustain TBI compared to women. The management strategies can be conservative or it can be surgical for both injuries as well as monitoring associated complication or consequences [6].

These injuries are the reason for subsequent psychological morbidities, cosmetic dysfunction, and functional disabilities [7]. Traumatic injury to the brain (TBI) can cause multiple ranges of the outcome, it may range from transient symptoms to emotional, cognitive, physical or behavioral issues that lead to long-term disability [8]. Cervical spinal cord injuries are common and are among the serious type of spinal cord injuries. In an outcome, it may be in tetraplegia and quadriplegia with correlated loss of strength in the muscle in all 4 extremities [9].

The patients with traumatic brain injury need ICU protocol management and they may require the first aid measures of early closed realignment or reduction and cervical spine's immobilization. In the surgical indicated cases, the surgery should be performed as soon as possible to minimize the trauma the traumatic brain injuries generally need no treatment, rest and pain relievers to treat a headache could be done [10].

The rationale of the study is that traumatic injury to the brain is common in this region of the world and moderate to severe injuries can be associated with a cervical injury which at times are ignored and this can lead to morbidity and mortality, this is to provide awareness and calculate the overall ratio of the patient.

## 2. METHODS

**2.1 Study design:** This was a cross-sectional study, conducted at the neurosurgery department at Jinnah postgraduate medical Centre, Karachi. The duration of the study was from 1 March 2016 to 26 November 2019. The study was performed after the ethical approval was taken from the hospital board and the consent was taken from all the patients in this study. Glasgow coma scale was used in mild, moderate and severe head injuries Mild Head Injury is as any traumatic brain

injury secondary to blunt trauma with GCS 13-15 is called mild head injury while moderate head injury is any traumatic brain injury secondary to blunt trauma with GCS 9-12 and severe head injury is any traumatic brain injury secondary to blunt trauma with GCS less than 8 is called severe head injury. [21, 22] and cervical spine injury assessment was based on in vertebral displacement in horizontal line and rotation on x ray AP and Lateral views[23].

**2.2 Sample size:** 158, using the following assumption for the WHO formula of sample size: Proposed population proportion of cervical spinal injury in head trauma 11.62% Absolute precision of 5% Confidence interval of 95%

**2.3 Inclusion Criteria:** All patients with moderate to severe head injury with associated cervical injury of any gender and age was more than 18years.

**2.4 Exclusion Criteria:** Those patients who had a history of other cervical pathologies like pott's disease or malignancy, previously unrecognized cervical spinal injury, patients with soft tissue injury over the cervical region, previously operated patients for cervical problems, known case Osteoporosis.

#### **2.5 DATA COLLECTION:**

Patients who have a history of trauma and have a traumatic brain injury, those who fulfil inclusion criteria were part of the study. All of the patients were admitted in the ward with CT scan brain plain, AP and lateral view X-ray of the cervical spine was advised to check for the presence or absence of cervical spinal injury. All the patients were managed by a consultant neurosurgeon. The x-ray reports were obtained from an experienced radiologist. Exclusion criteria had followed strictly to avoid confounders and any biased results.

#### **2.6 DATA ANALYSIS:**

For the analysis, SPSS version 23 was used while the Standard deviation and mean were planned for variables. Categorical variables like gender, type of head injury and cervical spinal injury were expressed as percentages. Effect modifiers were controlled through stratification of gender and gender to observe the effect of these on outcome variables with help of the chi-square test and significance of p value less than 0.05.

### **3. RESULTS**

Among 158, the age distribution of the patient was observed as 43 (27%) patients presented as less than 20 years, 32(20%) were between the age of 21-30 years range, 28(18%) patients were ranged between 31-40 years, 16(10%) patients aged in a range of 41-50 years while 39(25%) were above 50 years. Head injury severity was observed at 47% as mild head injury, 32% as moderate injury and 21% had a severe head injury while cervical injury in association with traumatic brain injury was found in 10% of patients. The head injury was divided in extradural 43(27.21%) patients, brain contusion 35(22.10%), subdural hematoma 33(20.88%), skull depress fracture 22(14.1%) patients, diffuse axonal injury 25 (15.8%) patients, while associated cervical injury was divided into severe cervical spasm 6 (37.5%), cervical disc and subluxation 4 (25%) patients, facet dislocation 3 (18.75%), tear drop fracture 2 (12.5%) odontoid fracture 1(6.25%) and the mode of injury was road traffic accident was 115(72.78%), with history of fall 30(18.78%) patients and assault cases 13(8.22%) patients. The frequency of cervical spinal injury in moderate to severe head injury patients is shown in **TABLE-1** which shows that incidence of cervical spinal injury in moderate to severe head injury was in 16 (10.1%) patients in our region while the association of cervical trauma and age is shown in **TABLE-2**, which shows that cervical injury with age in years distribution, five patients were < 20 years, four patients were between the age of 21-30 years, two patients were in age in range of 31-40 years, one patient age was between 41-50 years while four patients had age above 50 years an association of cervical trauma and gender are in **TABLE-3** which shows that of cervical injury gender distribution was shown, twelve patients were male while four patients were female and stratification of cervical injury with the severity of the head injury was analyzed as in 84 cases of cervical spinal injury, ten patients had a moderate head injury while six patients had a severe head injury shown in **TABLE-4**.

**TABLE-1: Cervical Spinal Injury**

(n =158)

<b>CERVICAL SPINAL INJURY</b>	<b>FREQUENCY</b>	<b>%</b>
<b>Present</b>	16	10%
<b>Absent</b>	142	90%
<b>Total</b>	<b>158</b>	<b>100%</b>

**TABLE-2: Cervical spinal injury according to distribution of AGE**

(n = 158)

<b>CSI/AGE</b>	<b>&lt; 20 years</b>	<b>21_30 year</b>	<b>31_40 year</b>	<b>41_50 year</b>	<b>50 plus</b>	<b>n</b>
<b>Yes</b>	5	4	2	1	4	16
<b>No</b>	38	28	26	15	35	142
<b>Total</b>	<b>43</b>	<b>32</b>	<b>28</b>	<b>16</b>	<b>39</b>	<b>158</b>

Chi-square test calculated P-value was 0.004

**TABLE-3: Cervical Spinal injury based on Gender Distribution**

**(n =158)**

<b>AGE</b>	<b>MALE</b>	<b>FEMALE</b>	<b>n</b>
<b>Yes</b>	12	4	16
<b>No</b>	94	48	142
<b>Total</b>	<b>106</b>	<b>52</b>	<b>158</b>

A Chi-square test P-value was calculated to be 0.002

**TABLE-4: cervical spinal injury in severe of head injury**

**(n=158)**

<b>CSI/ AGE</b>	<b>MODERAT E</b>	<b>SEVERE</b>	<b>n</b>
<b>Yes</b>	10	6	16
<b>No</b>	41	27	68
<b>Total</b>	<b>51</b>	<b>33</b>	<b>84</b>

Chi-square test calculated P-value as 0.003

#### 4. DISCUSSION:

In one of the study, it was observed that traumatic brain injury, sometimes might be a reason to lead to the ignorance of cervical spine injury, which leads to long-term morbidity. It is stated that cervical spine injury with mild to severe brain injury should be examined in every patient [11]. while in another study, all individuals with a desensitised level of consciousness and poly-trauma, cervical spine injury must be spine AP, lateral cervical spine to CT scan with MRI of the cervical spine to make a definite diagnosis and more frequently the brain damage is correlated with upper cervical injury than lower cervical injury [12] while in our study the patient who came with a head injury had a cervical x-ray and a ray chest for exclusion of any associated injury.

One of the study in south India also considered cervical injury an important factor in association with a head injury which can affect the overall outcome [13] while another study gives an important demographics, traumatic brain injury was notified as an extra load of the current pool on the of traumatic brain injury management of the hospitals while steps for public awareness should be taken [14] while this study compared to our study among 158, the age distribution of the patient was observed as 43(27%) patients presented as less than 20 years, 32(20%) were between the age of 21-30 years range, 28(18%) patients were ranged between 31-40 years, 16(10%) patients aged in a range of 41-50 years while 39(25%) were above 50 years. Head injury severity was observed at 47% as mild head injury, 32% as moderate injury and 21% had a severe head injury while cervical injury in association with traumatic brain injury was found in 10% of patients.

In comparison to a retrospective study of Japan, the correlation between acute cervical spinal cord injury and dysphagia has been currently shown having an incidence of association of dysphagia with aspiration around was 7% other factors such as elderly age, paralysis and tracheostomy [15]. In another study non-helmet bicyclists have an increased risk of severe injury of the head and high mortality while those with helmet had a high association of cervical spine injury [16].

In another study of suspected sports-related concussion can be demonstrated with a broadly showcasing coinciding cervical trauma which leads to the essential impact on results and as well as on the management of the patient [17] while in another study the outcomes suggest that cervical spine injuries may because of persistent symptoms following concussion that is related to sports and this may cause prolonged clinical recovery [18] in our study, we had did not have any case related to sports injury the main mode of injury was trauma, fall and assault.

Patients with head trauma with acute intracranial pathology on CT have an increased risk of associated cervical spine injury when compared to patients with a CT-negative head injury [19]. while in our study 21% had a severe head injury while cervical injury in association with traumatic brain injury was found in 10% of patients

Those patients who are trauma victim may need behavior modification and education to minimize the risk of recurrence and the multidisciplinary approach with, relevant specialists and follow-up with the trauma team which are involved in their care and utilize rehabilitation services.<sup>20</sup> similarly, we have to aware regarding injuries that are not only related to the head but may include other relevant injury and the patient may need rehabilitation and behavioral counselling.

## **5. CONCLUSION:**

The prevalence of cervical traumatic injury associated with moderate to severe head injury remained similar in the world overall with minute differences in the percentages that we have noticed in our study. The severity of the head injury is directly proportional to cervical injury. This is of predominant importance to make our healthcare system better for appropriate management, transportation, and evaluation of trauma patients knowing that the strong correlation of severe cervical spinal injury with a head injury prevents the cervical injury's deleterious effects if improperly dealt with.

**LIMITATION:** The limitation of the study is that number of patients can be increased, multiple hospital can share traumatic data to give better results, recent imaging modalities can be utilized to assess the injury and post procedure results better.

**CONSENT:** All procedures and objectives of the study were explained to the patients and verbal informed consent was taken.

**ETHICAL APPROVAL:** It was as per international standard written ethical approval has been collected and preserved by the author(s).

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**Additional Information:**

**Human Subjects:** Consent was obtained by all patient(s)/participant(s) in this study.

**Other Relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

UNDER PEER REVIEW