

# Traumatic Brain Injury among the Sri Lankan Combat Veterans

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**Abstract:** During the Eelam War in Sri Lanka a significant numbers of combatants sustained traumatic brain injuries. Traumatic Brain Injury has been identified as one of the signature injuries of the Eelam War. Traumatic brain injury was reported as a major cause of mortality and morbidity among the combatants. The combatants with traumatic brain injuries encounter numerous psychosocial problems. They mostly experience cognitive loss, amotivation, psychosis, mood, changes, impaired impulse control, epilepsy and various other symptoms. These symptoms affect their functionality and quality of life. An effective psychosocial rehabilitation services should be provided for the veterans with brain injuries.

**Key Words:** Traumatic Brain Injury (TBI), Sri Lankan Combatants, Eelam War

A significant number of Sri Lankan soldiers sustained head injuries during the Eelam War that lasted from 1983 to 2009. These head injuries mainly occurred due to gunshot wounds, mortar blast injuries, grenade explosions and artillery blasts. Traumatic Brain Injuries increased High morbidity and mortality rates among the Sri Lankan combatants. Traumatic Brain Injury (TBI) had been one of the signature injuries of the Eelam War.

Traumatic brain injury has short and long term consequences. It affects the physical, social, psychological and occupational aspects of combatant's life. The combatants with severe TBI have permanent neurobiological damage with profound psychosocial problems. TBI has been identified as one of the disabling conditions among the combatants.

Traumatic brain injury (TBI) refers to a physiologically significant disruption of brain function resulting from the application of external physical force, including acceleration/deceleration forces (Silver et al, 2009). The victims experience emotional liability, sensory impairments, neuro- cognitive deficits and spasticity following traumatic brain injuries.

Traumatic brain injury is a common cause of neurological damage and disability among civilians and servicemen (Auxéméry, 2012). Schneider and colleagues (2009) elucidate that behaviorally the military population in general is considered to be a high risk group for TBI. According to Scherer et al., (2013) within the last decade, more than 220,000 service members have sustained traumatic brain injury (TBI) in support of military operations in Iraq and Afghanistan.

In Sri Lanka from 1983 to 2009 over 200,000 military personal were deployed in the operational areas and considerable numbers sustained mild to severe head injuries following enemy attacks. In a convenience sample of 824 Sri Lankan Army servicemen who were referred to the Psychiatric ward Military Hospital Colombo during August 2002 to March 2006 time period 29

combatants (3.51%) were diagnosed with TBI. These diagnoses were based on International Classification of Diseases- Tenth Revision (ICD-10) criteria and done by the Consultant Psychiatrist of the Sri Lanka Army.

### **The Immediate Impact of TBI**

Traumatic brain injury has immediate impacts. TBI combines mechanical stress to brain tissue with an imbalance between cerebral blood flow and metabolism, excitotoxicity, oedema formation, and inflammatory and apoptotic processes (Werner & Engelhard, 2007). The immediate effect of head trauma could be loss of consciousness followed by headaches and dizziness. Sometimes confusion and disorientation could occur from mild to moderate from of head injuries. In severe form of TBI prolonged periods of loss of consciousness, seizures and paralysis could occur.

### **Traumatic Brain Injury in the War Zone**

During the Eelam War some of the combatants who sustained head injuries were not immediately evacuated due to technical difficulties. Intensify heavy fighting and weather conditions affected evacuation of the battle casualties. However the wounded received first aid and then brought back to the rear zone medical aid point where they were examined by a qualified medical officer. The head injuries were assessed and then transferred to the Palali Military Hospital or to a nearby hospital. Some battle casualties who sustained severe head trauma were air lifted and transferred to major hospitals in Anuradhapura or in Colombo. In these hospitals the war casualties received specialized treatment by the Neurosurgeons.

### **TBI and Cognitive Impairments**

The combatants who sustained serious head trauma later found with cognitive impairments. Neurocognitive impairments are prevalent in TBI. Among the debilitating conditions memory impairments, difficulty with attention and concentration, difficulty with new learning, and impaired problem solving skills are frequently identified. As indicated by Arciniegas (2003) cognitive impairments are among the most common neuropsychiatric sequelae of traumatic brain injury at all levels of severity. Traumatic brain injury (TBI) can produce persistent attention and memory impairment that may in part be produced by impaired auditory sensory gating (Arciniegas et al., 2000).

Cognitive dysfunctions associated with TBI were known to military psychologists since the World War One. The British Physician Frederic Mott (WW1) and Dr Alexander Luria of the

Soviet Army (in the WW2) extensively studied the impact of combat related head injuries. Caveness , Walker, & Ascroft (1962) believed that World War I, World War II, and the Korean war produced a large number of combatants with TBI and other associated complications. In the Vietnam War 12 to 14 percent of all combat casualties had a brain injury (Okie , 2005).

TBI-related cognitive impairment is common in veterans who have served in recent conflicts in the Middle East and is often related to blasts from improvised explosive devices (Halbauer et al., 2009). The Sri Lankan combat veterans who sustained severe form of head injuries reported drastic impairments in memory and concentration. Some were found with post-traumatic amnesia. A large percentage of combatants found with intellectual disabilities and impaired language skills.

### **Personality Changes Following Head Injury**

Personality change has been reported in 49% to 80% of patients with traumatic brain injury (Brooks et al., 1986). A significant number of Sri Lankan combatants with TBI were found with subsequent Personality changes. Some of the personality changes such as agitation, paranoia, mood swings, aggression, lack of inhibition, inappropriate sexual activity and impaired self control have caused major barriers to their military and personal lives.

Prominent behavioral characteristics in TBI patients have included altered emotion (including restricted emotions with occasional inappropriate or uncontrolled emotional outbursts); impaired judgment and decision-making (including difficulty arriving at decisions as well as poor decisions); impaired initiation, planning, and organization of behavior; and defective social comportment (including egocentricity and impaired empathy). These impairments tend to be accompanied by a marked lack of insight. (Fowler, 2011; Barrash et al.,2000). According to Oddy et al. (1985) two thirds of individuals with TBI experience personality changes for long periods and sometimes over 15 years.

### **TBI and Depression**

Mood disturbances are common sequelae of traumatic brain injury (Hurley & Taber, 2002). Bay and colleagues (2004) are of the view that Pre-injury factors (such as mood and anxiety disorders, psychosocial dysfunction, and alcohol abuse), injury factors (such as left ventrolateral and dorsolateral injury and serotonergic dysfunction), and post-injury factors (such as postconcussive symptoms, psychosocial dysfunction, and lack of social supports) contribute to the development of depression after TBI, although the relevance of each factor varies among patients.

Combatants with TBI have a large array of psychosocial problems that affect their professional and family lives. Jorge et al. (2004) observed strong association between posttraumatic depression and psychological and psychosocial factors.

Sometimes post TBI depression could increase anger, aggression and suicide risk (Fann , Katon , Uomoto & Esselman, 1995). An increased suicide risk has been identified among the combatants who fought in the Eelam War. According to the Military Spokesperson of the Sri Lanka Army from 2009 to 2012 postwar period nearly 400 soldiers had committed suicide (Sriyananda, 2012).

### **TBI and Posttraumatic Stress Disorder**

Post-traumatic stress disorder (PTSD) and traumatic brain injury (TBI) often coexist because brain injuries are often sustained in traumatic experiences. In addition evidence suggests that mild TBI can increase risk for PTSD (Bryant, R 2011).

Some investigators have argued that individuals who had been rendered unconscious or suffered amnesia due to a TBI are unable to develop PTSD because they would be unable to consciously experience the symptoms of fear, helplessness, and horror associated with the development of PTSD. Other investigators have reported that individuals, who sustain TBI, regardless of its severity, can develop PTSD even in the context of prolonged unconsciousness. (Sbordone & Ruff, 2010).

Despite the discrepancies strong connection between Post-traumatic stress disorder and traumatic brain injury has been reported from battlefields around the world. Hoge et al. (2008) point out that mild traumatic brain injury (i.e., concussion) occurring among soldiers deployed in Iraq is strongly associated with PTSD and physical health problems 3 to 4 months after the soldiers return home. Elder & Cristian (2009) too report high association of mild traumatic brain injury with posttraumatic stress disorder among the veterans of the wars in Iraq and Afghanistan. A notable number of Sri Lankan combatants have been diagnosed with TBI and PTSD during the Eelam War.

### **Posttraumatic Epilepsy**

Posttraumatic epilepsy is a major source of disability following traumatic brain injury (TBI) and a common cause of medically-intractable epilepsy (Guo et al., 2013). As indicated by Diaz-Arrastia and colleagues (2009) posttraumatic epilepsy is a common complication of traumatic brain injury (TBI), occurring in up to 15-20% of patients with severe brain trauma. There are a number of risks associated with Posttraumatic epilepsy. Yeh et al. (2012) hypothesize that the risk of epilepsy after TBI varied by patient gender, age, latent interval and complexity of TBI.

Combat veterans with head trauma are at high risk of developing posttraumatic epilepsy. As indicated by Chen and colleagues (2009) both Korean and Vietnam War veterans with penetrating TBI had a 53% risk of developing PTE.

According to the Consultant Neurologist Dr. Ranjani Gamage around, 300,000 patients with epilepsy have been reported in Sri Lanka. (Press Interview, 2003). It might be a valid assumption that this number includes soldiers who fought in the Eelam War.

### **Psychiatric Symptoms Followed by TBI**

The intersection between traumatic brain injury and Psychosis has become one of the major concerns. Some of the Sri Lankan combatants with TBI were later found with psychosis and these individuals had disorganized thought and speech, paranoid delusions with loss of contact with reality.

Koponen et al. (2002) suggest that traumatic brain injury may cause decades-lasting vulnerability to psychiatric illness in some individuals. In addition they hypothesize that traumatic brain injury seems to make patients particularly susceptible to depressive episodes, delusional disorder, and personality disturbances. In one of the studies that was conducted by Deb and colleagues (1999) found that in comparison with the general population, a higher proportion of adult patients had developed psychiatric illnesses one year after a traumatic brain injury. Fann et al. (1995) point out that psychiatric disorders are major cause of disability after traumatic brain injury.

### **Chronic Traumatic Encephalopathy in Combatants**

Chronic Traumatic Encephalopathy (CTE) is thought to be a neurodegenerative disease associated with repeated concussive and subconcussive blows to the head (Mez ,Stern & McKee , 2013). During military training soldiers repetitively sustain mild head trauma that has negative impact on their mental health. According to Zhang et al. (2013) subconcussive blows can result in cognitive function changes that are consistent with mild traumatic brain injury of the frontal lobes.

The soldiers who served in the artillery batteries during the Eelam War were frequently exposed to blast impacts. Furthermore they faced artillery attacks, mortar fire, grenade and claymore blasts initiated by the enemy. Although a large number of combatants did not sustain any head trauma a considerable percentage experienced the blast shockwaves. The shock waves may have had negative cumulative effect on them. A considerable fraction of combatants who were exposed to blast shockwaves complain of chronic headaches, tremors and generalized body pain. This factor was evident in the numerous battles that were fought in different countries.

Military physicians of the World War One believed that artillery blasts could cause miniature hemorrhages in the brain causing tremors and long lasting headaches in soldiers. Teland,& Huseby (2102) of the Norwegian Defence Research Establishment (FFI) hypothesize that military personnel who are exposed to blast waves during training and combat are at a significant health risk.

The combat-related traumatic brain injuries (TBI) resulting from exposure to explosions is highly prevalent among military personnel who have served in current wars. Blast trauma can be understood as experiencing a shockwave on the brain and as a psycho-traumatic event (Auxéméry, 2012). Chronic pain is a common complication of TBI. It is independent of psychological disorders such as PTSD and depression and is common even among patients with apparently minor injuries to the brain. (Nampiarampil, 2008).

Head trauma could cause degenerative changes in the brain tissue. Byrnes et al. (2012) point out that traumatic brain injury initiates biochemical processes that lead to secondary neurodegeneration. Traumatic brain injury causes progressive neurodegeneration associated with chronic microglial activation (Xue et al, 2013). Atrophic changes of the brain that is resulted by TBI can have a lasting impact on soldiers. Symptoms can range to prolong headaches to severe neurological and psychological consequences.

### **Treatment Options**

TBI has drastic impacts on independent living skills of the combatant. The survivors need effective psychosocial rehabilitation. The outcome and impact evaluation following combat related TBI is highly essential in the rehabilitation process. The concept of “the outcome of brain injury” needs to be viewed in the context of a dynamic and changing series of events which occur throughout a person’s life Gainer, 2010).

Various risk factors for poor outcome after TBI have been identified. Most of these are fixed at the time of injury such as age, gender, mechanism of injury, and presenting signs (Glasgow Coma Scale and pupillary signs), but some such as hypotension and hypoxia are potential areas for medical intervention (Moppett, 2007).

Cerebral metabolic derangement and excitotoxicity play critical roles in the evolution of traumatic brain injury (Hwabejire et al., 2013). Expert opinion suggests that combination therapies will be necessary to treat any stage of TBI recovery (Shear & Tortella, 2013). Drug management is important in seizure control. Chen and colleagues (2009) are of the view that optimal seizure control is essential to the physical and emotional health of veterans with TBI and to their ability to lead productive lives.

Psychotherapy is an important component of the treatment of neuropsychiatric problems following TBI (Arciniegas et al., 2000). Cognitive rehabilitation may also be useful for the

treatment of impaired attention, interpersonal communication skills, and executive function following TBI (Arciniegas et al., 2002). Bédard et al. (2003) suggest mindfulness-based intervention to improve quality of life among individuals who sustained traumatic brain injuries. In addition occupational therapy, speech language therapy and physiotherapy play a key role in the rehabilitation process.

### **Case Discussion**

- 1) Private SNX764 joined the Army in 1991 and served in the operational areas. He took part in several major military operations against the LTTE. In 1995 he was posted to Mallakam -Jaffna. There he had to face fierce enemy attacks. Once the enemy attacked them with mortars. Following nonstop mortar attacks Private SNX764 was stunned and disoriented. His bunker was damaged severely and he wanted to crawl to a safe area. When he tried to reach the next bunker an incoming mortar blasted a few meters away from him. Suddenly he could feel bleeding from his ears and he lost consciousness. After a few hours of fighting the enemy retreated. Then he was evacuated and taken to the Palali military hospital. He was treated for a head injury. Although he survived the mortar blast his speech was impaired. He experienced severe intermittent headaches and insomnia. By 1996 he had intrusions, flashbacks and marked avoidance for combat related settings. His mental health started deteriorating further. Several times Private SNX764 had tried to commit suicide while serving in the operational areas. Finally he was referred for a psychological evaluation and found with chronic PTSD.
- 2) Capt. KXXC385 was an experienced field officer who participated in numerous commando operations. He sustained a head injury as a result of a parachuting accident. He was unconscious for over two weeks and treated at the Neurological unit. After the acute phase he was referred for rehabilitation therapy. After years of treatment he returned to his unit as a completely changed person. He had difficulty in concentration, Emotional lability and cognitive impairments. His personality changed tremendously after the head trauma. Once a skillful professional soldier turned in to a dependent unsteady person with marked psychosocial dysfunctions. His professional and private life fell apart. His decision-making and initiation were significantly deteriorated and sometimes he engaged in socially inappropriate behavior failing to detect social cues. Capt. KXXC385 was diagnosed with Personality changes following head injury.
- 3) Major WXX856 sustained a head injury due to a grenade blast in a training mission. He was unconscious and treated at the Neurosurgical unit of the National Hospital Colombo. Major WXX856's injury was reordereed as a moderate type of head injury based on the Glasgow Coma Scale (GCS). After the injury he experienced frequent headaches and irritability. He had low frustration tolerance and often became very impulsive. His family members observed drastic changes in his behavior. Frequently he engaged in family violence. His personality started to change with head trauma. The senior officers found that Major WXX856 was neglecting his duties. A number of times he was reprimanded. To displace his psychosocial difficulties Major WXX856 started to drink alcohol in large quantities in daily basis. His treatment schedule was interrupted and eventually in the final two years he did not receive any treatment at all. Major WXX856 became more and more isolated and had homicidal urges. In 2004 Major WXX856 committed several murders secretly and enjoyed the brutal acts. He took his final victim – a cab driver to his remote camp and intoxicated him and then killed him by cutting the victim's throat. He had no remorse or any regrets after committing these murders. Major WXX856 was looking for more victims to fulfill his homicidal urge. In his final attempt he tried to abduct a victim near

a remote tea estate but the attempt was unsuccessful. Some estate workers alerted the Police. Hence he was arrested and sent to the remand prison. The investigators found several other murders that were committed by Major WXX856. While his trial was pending Major WXX856 committed suicide by hanging.

- 4) Private KXXT342 met with a land mine explosion in Chunnakam –Jaffna in 1996 while travelling in a military vehicle. Some of his buddies got killed due to the blast. He could only remember the black smoke and fatal outcry of his buddies. The soldiers from the second vehicle took the wounded to the hospital immediately. Private KXXT342 sustained a head injury and treated at the Palali military hospital and then referred to the National Hospital -Colombo. He underwent treatment for several months. He had impaired hearing, slurred speech and loss of coordination after the injury. In addition he suffered epileptic fits. Private KXXT342 was diagnosed with Posttraumatic Epilepsy. After became a battle casualty Private KXXT342 experienced a number of psychosocial problems which affected his life. He was treated with antiepileptic drugs and CBT. Following treatment he was able to overcome most of his psychosocial problems.
- 5) Corporal BXVX486 served in an artillery battery for over 9 years. During this time period his team had fired a large number of artillery rounds. Although he was physically unharmed throughout the war his luck changed dramatically. Corporal BXVX486 complained of tremors in both hands, frequent headaches and myalgia after serving lengthy years in the artillery battery. The physicians who examined him found no any organic factor associated with his condition. There were no Electroencephalography (EEG) changes and his brain scan and other reports were normal. He was suspected as a malingerer at one point but later found that his symptoms were real. Corporal BXVX486 poorly responded to the pain killers. His condition started to improve with relaxation therapy and EMDR.
- 6) L/ Cpl AXXCX831 sustained a TBI following a gun short injury. After he became a battle casualty L/ Cpl AXXCX831 experienced a number of psychosocial problems. He could not control his anger and became extremely hostile. He used to physically abuse his wife and children. He had depression and several times he planned to end his life. Once he took poison and immediate hospitalization saved his life. He was treated with Selective serotonin reuptake inhibitors (SSRI ) and mood stabilizers with CBT. Following drug therapy and psychotherapy L/ Cpl AXXCX831's condition improved notably.

## **Conclusion**

Although Traumatic Brain Injury has impacted a large number of Sri Lankan combatants who fought in the Eelam War, the psychological sequelae of brain trauma were not adequately studied. The combatants who sustained TBI have persistent headaches, memory impairments, sleep difficulties, low frustration tolerance, impaired life skills, emotional difficulties, impaired decision making and behavioral changes. TBI has caused profound psychosocial problems among the veterans. These problems affect their private and professional lives. The combatants with TBI need effective psychosocial rehabilitation to overcome their current difficulties. Further research is needed to estimate the overall impact of TBI among Sri Lankan combat veterans.

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