EPIDEMIOLOGY OF SPINAL CORD INJURIES DUE TO BOMB BLAST ATTACKS, MANAGED AT PARAPLEGIC CENTRE PESHAWAR, PAKISTAN: A NINE YEARS RETROSPECTIVE STUDY

Aatik Arsh[1], Haider Darain[2]✉, Zia Ul-Haq[3], Amir Zeb[4], Ikram Ali[5], Syed Muhammad Ilyas[6]

[1] Physiotherapist, Paraplegic Centre Peshawar, Pakistan
[2]✉ Assistant Professor of Physiotherapy, Khyber Medical University, Peshawar, Pakistan
Email: haider.kmu@hotmail.com
Mobile # : +92-341-9990915
[3] Associate Professor of Public Health, Khyber Medical University, Peshawar, Pakistan
[4] HoD Physiotherapy Department, Paraplegic Centre Peshawar, Pakistan
[5] Lecturer Khyber Medical University, Peshawar, Pakistan
[6] Chief Executive Officer, Paraplegic Centre, Peshawar, Pakistan
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ABSTRACT

OBJECTIVES: To present demographic details, nature of injury, clinical characteristics of patients admitted to Paraplegic Centre, Peshawar, Pakistan who sustained spinal cord injury (SCI) due to bomb blasts attacks (BBA).

METHODS: This retrospective quantitative study was conducted on 91 patients who sustained SCI due to BBA. These patients were admitted to Paraplegic Centre, Peshawar from 2007 to September 2016. Data about demographic information, neurological level, ASIA impairment scale, clinical characteristics, complications and other associated problems of patients were retrieved.

RESULTS: Out of 91 patients, 75 (82.4%) were males and 16 (17.6%) were females with mean age of 28.3±11.0 years. Majority of the patients were from district Swat (14.3%) followed by Peshawar (12.1%). In 72 (79.1%) cases, SCI was caused by penetrating fragments (splinters/ shrapnel). Forty one (45.1%) patients had complete transaction at thoracic level. Fifty nine (64.8%) patients had wounds at multiple sites of body. Seventy seven (84.6%) patients had ASIA impairment scale 'A'. Common associated injuries included fractures in upper limbs (9.9%) and lower limbs (6.6%). Twenty three (25.3%) patients had laparotomy for visceral injuries. Sixty seven (73.7%) patients had pressure sores. Eighty eight (96.7%) patients completed rehabilitation program, 2 (2.2%) patients left hospital without completing rehabilitation program and one (1.1%) patient died during hospitalization.

CONCLUSION: The main cause of SCI due to BBA was penetration fragments. Male population is more exposed to these injuries compared to female. Moreover, SCI due to BBA was associated with injuries to other parts of body. Pressure sores were the most frequent secondary complication.

Key words: Spinal Cord Injury (MeSH), Spinal Injury (MeSH), Bomb Blast Attacks (Non-MeSH), Terrorism (MeSH), Suicide bombing (Non-MeSH), Mass Casualty Incidents (MeSH)

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INTRODUCTION

Bomb blast attacks (BBAs) and its associated terror severely affects both physical and mental health of general population.[1,2] The number of bomb blasts and its adverse effects on human being has increased many folds in the last few decades.[3-6] This may be regarded as one of the major threats to human survival. Compare to other injuries sustained by an individual, BBAs results in more sufferings as these injuries are often associated with significant loss to human lives and financial resources.[7,8]

BBAs are an unusual cause of spinal cord injury (SCI) in civilians' population and data related to these injuries in civilian population is scarce.[9,10] Patients who sustained SCI due to BBAs have additional medical and psychosocial problems and as a result, significant delays in rehabilitation of these patients have been reported.[11] The two main mechanisms involved in injuries to patients who sustained SCI due to BBAs are fragments penetration (penetrating injuries) and blunt trauma (explosion/ blast injuries).[10,12,13] Most of the penetrating injuries result in complete SCI and patients suffering from these injuries are less likely to show major improvement.

During the last two decades, the incidence of terror activities in Pakistan has increased tremendously and the country has seen a number of casualties caused by these attacks.[14] This is one of the reasons that spinal cord injury due to BBAs has increased many folds in Pakistan.[15] In the period from 2002 to 2014, 9606 terrorist attacks were reported in Pakistan[16] and about 52000 Pakistani citizens lost their lives while many more injured in these terrorist attacks. Apart from human losses, approximately $102.51 billion

economic losses were reported due to these attacks.[17] Comparing facts and figures of last four decades, it can be observed that majority of these BBAs were reported during the period of 2006-2016 in the country.[5,18] In the light of this recent increase in the number of BBAs, it is necessary to understand nature of injuries resulting from these attacks. As SCI due to BBAs has increased recently in the country, most of the health care professionals are unaware of the specific needs necessary for the management of these patients.[9,19]

As the terrorist activities in the country have increased many folds in the last two decades, injuries due to BBAs have received attention and few studies may be seen in the literature. Despite the latter fact, the available literature is limited in providing epidemiological information about SCI due to BBAs.[17,20-22] Scientific research on SCI due to BBAs in Pakistan is limited[19], and requires further research. Rathore FA, et al[19] reported a case series of 6 patients who sustained SCI due to suicide bombing in Pakistan. One of the limitations of this study was inclusion of only army personnel who sustained those injuries. Therefore, this study was designed to present demographic details, nature of injuries, clinical characteristics and associated problems of civilian patients who sustained SCI due to BBAs in the last 9 years in one of the largest paraplegic centres in the province.

METHODS

This retrospective study was conducted at Paraplegic Centre, Peshawar and approval from Paraplegic centre was obtained before accessing the data. Data of patients with SCI due to BBA's from 2007 to September 2016 were included in this study. The inclusion criterion was limited to Pakistani patients only and therefore; patients from Afghanistan were not included in the analysis. No limit was proposed for the age of the patients. Sample size calculation was not done and all patients who fulfilled the inclusion criteria of the study were included. For the latter purpose, clinical records containing information of these patients were accessed and reviewed. The clinical records of these patients are maintained in database developed by the rehabilitation centre and therefore; no specific data collection tool was used. The available data was retrieved from the database and was analysed. Data was entered into SPSS version 20 and was analysed. For data analysis, frequencies of the demographic information, neurological level, ASIA impairment scale, nature of injuries, clinical characteristics, complications and other associated problems of the patients were calculated using the mentioned software.

RESULTS

Clinical records of Paraplegic Centre, Peshawar revealed a total of 119 patients with injury to spinal cord due to BBAs. Out of total, only 91 patients were included in the study while the remaining 28 patients were excluded due to not fulfilling criteria of Pakistani citizenship. A total of 91 patients with mean age 28.3±11.0 years were admitted in Paraplegic Centre, Peshawar, Pakistan.

TABLE I: YEAR WISE DISTRIBUTION OF PATIENTS WITH BOMB BLAST RELATED SPINAL CORD INJURIES

Year	Frequency of patients with spinal cord injuries (n=91)	Percentage
2007	4	4.4
2008	6	6.6
2009	11	12.1
2010	12	13.1
2011	14	15.4
2012	16	17.6
2013	13	14.3
2014	8	8.8
2015	4	4.4
2016	3	3.3

TABLE II: DISTRICT DISTRIBUTION OF PATIENTS WHO SUSTAINED SCI DUE TO BOMB BLAST ATTACKS

District/Agency	No. of patients (n=91)	Percentage
Swat	13	14.3
Peshawar	11	12.1
Khyber agency	8	8.8
Kuram agency	8	8.8
Bajour agency	7	7.7
Waziristan agency	7	7.7
Kohat	5	5.5
Dir	3	3.3
Mansehra	3	3.3
Mardan	3	3.3
Nowshera	3	3.3
Other districts/agencies Khyber Pakhtunkhwa	16	17.6
Other provinces	4	4.4

TABLE III: SPINAL CORD INJURY LEVEL IN PATIENTS WHO SUSTAINED INJURIES DUE TO BOMB BLAST ATTACKS

Spinal Cord Injury Level	No. of patients (n=91)	Percentage
Complete Cervical	19	20.9
Incomplete Cervical	5	5.5
Complete Thoracic	41	45.1
Incomplete Thoracic	2	2.2
Complete Lumber	17	18.7
Incomplete Lumber	7	7.7

Majority of the patients (n=16; 17.6%) with blast related SCI were admitted in 2012 followed by 14 (15.4%) patients in 2011 (Table 1).

Out of total 91 participants, 75 (82.4%) were male while 16 (17.6%) were female population. More than half; 54 (54.3%) of the patients were married and the remaining; 37 (40.7%) were single. Majority of these patients, 87 (95.6%) patients were from Khyber Pakhtunkhwa and Tribal areas and the remaining 4 (4.4%) were from other provinces of Pakistan. Most of the patients were from district Swat (14.3%) and Peshawar (12.1%) as given in Table II.

Almost half of these patients 45 (49.4%) were uneducated while 46 (50.6%) were having different levels of education (from primary level to master level). By profession, most of the patients were labourer 22 (24.2%) and farmers 14 (15.4%) while rests of the 55 patients (60.4%) were having other kinds of professions.

In majority of the patients 72 (79.1%), SCI was caused by penetrating fragments (splinters/shrapnel) while in 19 (20.9%) patients SCI was caused by blunt trauma (explosion/blast injuries). Most of these patients 77 (84.7%) were managed conservatively whereas 14 (15.3%) patients were managed surgically (spine fixation was done). Out of the total patients, 41 (45.1%) were having complete transaction at thoracic level and 19 (20.9%) were having complete transaction at cervical level (For further details of number of patients with different levels of SCI see Table III). Majority of the patients 77 (84.6%) were having ASIA impairment scale 'A', 8 (8.8%) were graded 'B', 5 (5.5%) were graded 'C', and only one patients was graded 'D'.

On admission, more than half of these patients 59 (64.8%) were having wounds at multiple sites of their bodies. Moreover, the retrieved data showed that a big proportion of these patients had associated injuries due to BBAs. Fractures were common amongst these patients and 9 (9.9%) patients were having fracture at upper limb, 6 (6.6%) patients were having fracture at lower limb and 2 (2.2%) patients were having fracture at thoracic cages. In 2 (2.2%) patients unilateral vision loss was reported and one patient was reported with blast related hearing loss. One patient was having brachial plexuses injury along with injury to spinal cord.

A total of 23 patients underwent laparotomy; however, exact data regarding visceral or vascular injuries were not available in the records. Majority of patients (n=67; 73.7%) were having pressure sores at different parts of body whereas the skin of the 24 (26.3%) patients was intact. Only two patients were having hepatitis B and one patient was having hepatitis C. One patient was having type 2 diabetes mellitus.

Eighty eight (96.7%) patients completed rehabilitation program, 2 (2.2%) patients left hospital without completing rehabilitation program and one (1.1%) patient died during hospitalization.

DISCUSSION

The aim of this study was to present demographic details, nature of injuries, clinical characteristics and associated problems of civilian patients admitted to Paraplegic Centre, Peshawar, Pakistan, who sustained SCI due to BBAs. Clinical records of Paraplegic Centre, Peshawar revealed that the number of SCI patients admitted to the centre due to BBAs increased during recent years. Results showed that penetrating fragments had remained a major cause of SCI due to BBAs. Most of the patients were having complete transaction at thoracic level. On admission, more than half of the patients were having wounds at multiple sites of body. Fractures were the most frequent associated injury reported by these patients. Others associated injuries included unilateral vision loss, hearing loss and brachial plexuses injury. The most prevalent secondary complication amongst these patients was pressure sores.

Due to recent increase in terrorist activities, BBAs are increasing throughout the globe.[12,13] Blast related injuries have received considerable attention by researchers, however, SCI due to BBA's are not common and limited data in this area may be found in the literature.[10,19,23] Zeilig G, et al conducted a retrospective study in which they reported clinical characteristics of 11 patients who sustained SCI due to terror explosions.[10] Schwartz, et al in a study about rehabilitation in terror victims described clinical characteristics of 4 SCI patients who sustained blast related SCI.[23] Similarly, Rathore FA, et al reported pattern of injuries in 6 patients who sustained SCI due to suicide bombing.[19] All these studies were carried out on a small sample sizes in patients with SCI due to BBAs while in the current study clinical characteristics of 91 SCI patients were described.

The number of male population affected during bomb blasts has remained

higher than their counterpart's female population.[10,19,23] Similar findings were observed in the current study and 82% patients who sustained injury to spinal cord during bomb blasts were male population. This might be explain by the fact that in majority of the societies male population are more exposed to external environment and are vulnerable to these injuries.[19]

Injuries due to penetrating fragments (splinters/shrapnel) are common causes of SCI in patients who sustained SCI due to blast related injuries.[10,19,23] Most of the penetrating injuries result in complete SCI and that is one of the reasons that neurologic recovery in these patients is less likely.[10,24] Results of current study showed that in 79.1% patients, SCI was caused by penetrating fragments (splinters/shrapnel) while in 20.9% patients SCI was caused by blunt trauma (explosion/blast injuries).

Results of current study demonstrate that most of the patients (45.1%) were having complete thoracic level injury and 77 (84.6%) were having ASIA impairment scale 'A'. These results are consistent with previous studies where majority of patients who sustained injury to spinal cord due to bomb blast were classified as ASIA 'A'.[10,19,25] It is reported that due to inadequate evacuation protocols and severe associated injuries, chances of survival in patients who sustained cervical level SCI are minimal.[19,25] Studies carried out on SCI reported that patients who sustained blast related SCI, suffered injuries at multiple sites of the body.[10,19,22,23] In addition to SCI and fractures of vertebrae, most of the patients with blast related SCI present with other associated injuries.[19] Results of current study are similar to the latter fact and more than half of patients (64.8%) were having wounds at multiple sites of their bodies. Fractures were the most frequent associated injury reported by these patients and 9 patients were having upper limb fractures, 6 patients were having upper limb fractures, while 2 patients were having rib fractures.

Results of current study showed that a big proportion of patients who sustained SCI due to BBAs were having pressure sores. Rathore MFA, et al reported that half of the patients with blast related SCI developed pressure sores. It was reported that pressure sores were common secondary complication among SCI patients and lifetime prevalence of pressure sores in SCI patient was about 80%.[26-28]

On the basis of interpretation of the results it is clear that though SCI due to BBAs is not common in Pakistan but number of patients with blast related SCI has increased during recent years. One of the contributing factors to this may be a significant increase in terrorist activities in country. It is recommended that large scale trials on injury to spinal cord due to bomb blast may be carried out which might be helpful in understanding clinical characteristics and associated problems in these patients.

CONCLUSION

The main cause of spinal cord injury due to bomb blast is penetration fragments and complete transaction of spinal cord is common. Male population is more exposed to these injuries as compared to female. Moreover, spinal cord injury due to bomb blast is associated with multiple injuries to other parts of body and rehabilitation in these patients might need longer duration.

REFERENCES

1. Zeilig G, Weingarden H, Laufer R, Brezner A, Navon M. Terror and rehabilitation of two family members with spinal cord injury. Isr Med Assoc J 2002; 4(7):563.
2. Darain H, Ilyas SM, Zeb A, Ullah I, Muhammad D. Epidemiology of Spinal Cord Injury in Pakistan: A Retrospective Study. Phys Med Rehab Kuror 2017; 27(02):106-9.
3. Spurrier E, Singleton JA, Masouros S, Gibb I, Clasper J. Blast injury in the spine: dynamic response index is not an appropriate model for predicting injury. Clin Orthop Relat Res 2015; 473(9):2929-35.
4. Morley B, Leslie GD. Terrorist bombings: motives, methods and patterns of injuries. Australas Emerg Nurs J 2007;10(1):5-12.
5. Hassan R. Life as a weapon: The global rise of suicide bombings: Routledge; 2014.
6. Bell RS, Vo AH, Neal CJ, Tigno J, Roberts R, Mossop C, et al. Military traumatic brain and spinal column injury: a 5-year study of the impact blast and other military grade weaponry on the central nervous system. J Trauma Acute Care Surg 2009; 66(4):104-11.
7. Hyder AA, Razzak JA. The challenges of injuries and trauma in Pakistan: An opportunity for concerted action. Public health 2013;127(8):699-703.
8. Khan IQ, Khan NU, Naeem R, Kerai S, Allen K, Zia N, et al. Bomb blast injuries: an exploration of patient characteristics and outcome using Pakistan National Emergency Departments Surveillance (Pak-NEDS) data. BMC Emerg Med 2015;15(2):1-5.
9. Control CfD, Prevention. Explosions and blast injuries: a primer for clinicians. Centers for Disease Control. 2007.
10. Zeilig G, Weingarden H, Zwecker M, Rubin-Asher D, Ratner A, Ohry A. Civilian spinal cord injuries due to terror explosions. Spinal cord 2010;48(11):814-8.
11. Weaver FM, Burns SP, Evans CT, Rapacki LM, Goldstein B, Hammond MC. Provider perspectives on soldiers with new spinal cord injuries returning from Iraq and Afghanistan. Arch Phys Med Rehabil 2009;90(3):517-21.
12. Mathews ZR, Koyfman A. Blast injuries. J Emerg Med 2015 Oct;49(4):573-87. doi: 10.1016/j.jemermed.2015.03.013. Epub 2015 Jun 10.
13. Hussain M, Bari ME. Suicide bomb attack causing penetrating craniocerebral injury. Chinese J Traumatol 2013;16(1):51-3.
14. Rasheed S, Khalid N. A study of assorted data on suicide bombings in Pakistan. J Def Model Simul Appl Methodol Technol 2016:15:S 1-10. DOI: 10.1177/1548512916665723
15. Surani AA, Ali S, Surani A, Zahid S, Shoukat A, Varon J, et al. Pattern of external injuries sustained during bomb blast attacks in Karachi, Pakistan from 2000 to 2007. J Pak Med Assoc 2015;65(7):715-20.
16. Huerta-Barrientosa A, Longoriaa PP. Understanding the Interrelationship Between Global Terrorist Attacks and the Citizen's Wellbeing: The Complexity of Terrorism. Sociology Study 2016; 6(5):283-92. doi: 10.17265/2159□5526/2016.05.001
17. Siddiqui MA, Jawad A, Minhas S, Ansari A, Siddiqui A, Mehtab S. Pakistan: the new target of terrorism. Are Karachi's

emergency medical response systems adequately prepared? J Pak Med Assoc 2009; 59(7):441-5.

18. Ikram H. Terrorism and Manufacturing Productivity Growth in Pakistan. World Appl Sci J 2016; 34(8):1021-5.
19. Rathore FA, Ayub A, Farooq S, New PW. Suicide bombing as an unusual cause of spinal cord injury: a case series from Pakistan. Spinal cord 2011; 49(7):851-4.
20. Mirza FH, Parhyar HA, Tirmizi SZA. Rising threat of terrorist bomb blasts in Karachi–A 5-year study. J Forensic Leg Med 2013;20(6):747-51.
21. Nasrullah M, Xiang H. The epidemic of injuries in Pakistan--a neglected problem. J Pak Med Assoc 2008;58(8):420-1.
22. Yasin M, Nasreen G, Malik S. Injury pattern of suicide bomb attacks in Pakistan. Eur J Trauma Emerg Surg 2012;38(2):119-27.
23. Schwartz I, Tsenter J, Shochina M, Shiri S, Kedary M, Katz-Leurer M, et al. Rehabilitation outcomes of terror victims with multiple traumas. Arch Phys Med Rehabil 2007;88(4):440-8.
24. Kluger Y, Peleg K, Daniel-Aharonson L, Mayo A, Group TI. The special injury pattern in terrorist bombings. J Am Coll Surg 2004;199(6):875-9.
25. Rathore MFA, Hanif S, Farooq F, Ahmad N, Mansoor SN. Traumatic spinal cord injuries at a tertiary care rehabilitation institute in Pakistan. J Pak Med Assoc 2008;58(2):53-7.
26. DeVivo M, Farris V. Causes and costs of unplanned hospitalizations among persons with spinal cord injury. Top Spinal Cord Inj Rehabil 2011;16(4):53-61.
27. Kaltenthaler E, Withfield M, Walters S, Akehurst R, Paisley S. UK, USA and Canada: how do their pressure ulcer prevalence and incidence data compare? J Wound Care 2001;10(1):530-5.
28. Arsh A, Darain H, Ilyas SM, Zeb A. Prevelacne of pressure ulcers in patients with spinal cord injury; a retrospective study. P J Neurol Sci 2012;11(4):16-21.

CONFLICT OF INTEREST

Authors declared no conflict of interest

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Following authors have made substantial contributions to the manuscript as under:

AA, HD: Concept & study design, acquisition, analysis & interpretation of data, drafting the manuscript, final approval of the version to be published

ZUH: Critical revision, drafting the manuscript, final approval of the version to be published

AZ, IA, SMI: Acquisition of data, drafting the manuscript, final approval of the version to be published, final approval of the version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

KMUJ web address: www.kmuj.kmu.edu.pk

Email address: kmuj@kmu.edu.pk