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# Medical Complications and Patient Outcomes in Iranian Veterans with Spinal Cord Injury

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**A** – research concept and design; **B** – collection and/or assembly of data; **C** – data analysis and interpretation; **D** – writing the article; **E** – critical revision of the article; **F** – final approval of article; **G** – other

## Abstract

**Background.** Spinal cord injury [SCI] occurring in military veterans is a disabling and highly morbid event. Often the victims are young active males who sustain these injuries during military conflict and suffer from the complications of the SCI for the rest of their lives.
**Objectives.** The aim of the study is to report the epidemiology of Iranian SCI veterans and their health related quality of life, medical complications and patient associated outcomes.
**Material and Methods.** A cohort of 1984 patients was examined to investigate the epidemiology of Iranian SCI veterans of the Iraq-Iran War (1980–1988); 1803 out of the total number of SCI records were included. Health monitoring was carried out through scheduled monthly visits by general physicians, followed by interviews with specialists from March 20, 2007, to March 19, 2010. Additional follow-up was conducted by telephone survey.
**Results.** In all, 174 patients (8.77%) had incomplete injury and the rest had complete injury. the most frequent level of injury was the thoracic level (1256 patients – 63.30%). Pressure ulcers were the most frequent complication (up to 14.7% annual prevalence), followed by reactions to severe stress and adjustment disorders (up to 13.6%) and diabetes (up to 10.1%). In the telephone surveys, kidney and/or urologic disorders were the most frequent reported complaints (21.6%). A total of 101 out of the 1984 SCI veterans died between 2000 and 2010 (~0.5% per year).
**Conclusions.** In veterans with spinal cord injury, pressure area ulcers (ICD10:L89), reactions to severe stress and adjustment disorders (ICD10:F43), diabetes mellitus (ICD10:E10-E14) and kidney and/or urologic disorders are common and should be addressed aggressively in healthcare planning and management programs for patients with spinal cord injuries (**Adv Clin Exp Med 2014, 23, 2, 269–275**).

**Key words:** spinal cord injury, complications, epidemiology, veterans.

Spinal cord injury [SCI] is often a disabling and highly morbid injury that military veterans are faced with. Many are young active males who were injured during a war and suffer from SCI complications for the rest of their lives [1]. Despite various experiments, from trials of early surgical interventions to implantation of Schwann cell cultures in chronic SCIs, no proven treatment for SCI has been established to date [2–6].

The burden of SCI in Tehran is significant due to the persistent disability, costs of care, and suffering generated by this injury in this region. In 2008, the disability-adjusted life-years [DALY] for SCI were 5441 years, or 0.7 DALY per 1000 people

in Tehran, Iran [7]. The prevalence and incidence of SCI was recently assessed in an article reviewing literature published since 1995. Although not necessarily representative of the world population, the results of that study found an incidence of 29.5 and a prevalence of 485 per million inhabitants [8, 9]. Studies of SCI epidemiology during the last 30 years show an increase in incidence in Europe and North America, with constant prevalence and higher rates of tetraplegia and complete injuries [8]. Using clustered sampling and household interviews, the domestic prevalence of SCI in Tehran was estimated to be 4.4 per 10,000 people [10].

SCI results in various problems that compromise veterans' physical condition and their health-related quality of life (HRQOL) [11]. These complications may vary by the level of the spinal cord injury and the type and timing of the intervention after the SCI [3, 5, 6, 12]. Reports indicate that during 8 years of war between Iraq and Iran (1980–1988), more than 400,000 people sustained injury; among them, a total of 1984 Iranian veterans suffered from SCI. These veterans' health status is monitored by various methods, including scheduled physician visits along with laboratory tests, imaging procedures and further treatments when needed. All of these are performed as a free service [11].

SCI veterans are prone to a spectrum of complications and the present study sought to determine the rates of complications and common complaints among Iranian veterans. Understanding this epidemiology may help answer questions regarding the long-term outcomes of SCI [1]. The objective of this study was to elucidate the epidemiology of Iranian SCI veterans of the Iraq-Iran War and their health related complaints, medical complications and need for care in order to provide a basis for further studies and related decision making.

## Material and Methods

A three-year prospective monitoring study of Iranian veterans with SCI was conducted from March 20, 2007, to March 19, 2010. International Statistical Classification of Diseases and Related Health Problems – Tenth Revision (ICD-10) codes were used throughout the study and were recorded by the physicians. The exclusion criteria were those patients who were physicians or resided in health-care facilities and whose health status was therefore monitored according to a different protocol.

### Routine Monitoring Process

In the present system of veteran care, each veteran has a corresponding general physician. Each general physician is responsible for five veterans, and oversees their health surveys according to ICD-10 coding. The survey includes the general physician's visits, specialist referrals and consultation information (when referred by the general physician), as well as laboratory tests and imaging in order to confirm a suspected diagnosis. Routine monitoring was done each month by the general physicians. Telephone calls were also used to follow up on medical complications as reported by the patients. The results of the routine monthly scheduled visits by the general physicians were recorded. The visits included 20- to 30-min interviews, including a physical examination, followed by laboratory assessment, distribution of prescriptions and individualized specialist consultations for each patient. To ensure complete care for all veterans, routine visits were conducted in the patient's living quarters in cases of limited mobility or the veteran's preference. The annual incidence of certain ICD-10-defined medical conditions was derived from the records of the corresponding general physician for each veteran.

### Telephone Survey

A telephone survey was performed to assess patients' health-related complaints and any new diagnoses during January and February of 2010. Successful calls were made to 125 veterans based on randomization of their ID numbers. During the calls veterans were asked about complaints regarding their health status via open-ended questions. Patients were asked what their major health complaints are; then they were asked if additional medical problems or concerns had developed since their most recent follow-up with their primary care physician.

### Additional Data-Gathering Outings

In addition to the monitoring, 21 recreational outings including educational, medical and cultural programs were held for 600 veterans and 1800 of their family members, which provided a further opportunity to gather health information. Patients with a common medical status were included on each trip so that specific educational programs for their level and type of injury could be provided.

## Statistical Analysis

A descriptive statistical analysis was performed, including evaluations of the level of injury, medical complications (as ICD-10 codes), subjectively reported medical complaints, mortality statistics and causes of death. Microsoft Excel (Microsoft Office – 2007) and SPSS software (Version 13 – 2004) were used for the analysis.

In conducting this study the applicable institutional or governmental regulations concerning the ethical use of human volunteers were followed during the course of this research.

# Results

The total number of Iranian SCI veterans of the Iraq-Iran war was 1984: 34 females (1.71%) and 1950 males (98.29%), according to the Iranian national database. In the health-monitoring study complete records were available for 1506, 1684 and 1803 SCI patients for the years 2007, 2008 and 2009 respectively. The median year of birth of the SCI veterans was 1964. The mean age was 46 ± 6.68 by the year 2010. A total of 1873 patients (94.40%) were married. The causes of injury were bullets and shrapnel, road traffic accidents and city bombardments. Table 1 reveals the distribution of the spinal cord injury levels. Classifying the participants using the American Spinal Injury Association (ASIA) Impairment Scale (AIS), the majority were ASIA A (complete SPI with no motor or sensory function preserved in the sacral segment). Only 174 (8.77%) had incomplete injuries (not separately defined on other ASIA impairment scales).

Monitoring was carried out for three consecutive years, from March 20, 2007, to March 19, 2010. Table 2 shows descriptive data on the health-related status of the participants, obtained from the general physicians' monthly visits. Table 3 presents the data from successful telephone calls addressing the self-reported complaints of SCI veterans. The most frequent complaint in the telephone survey was related to kidney and/or urologic disorders, while pressure ulcers were the most frequent problem reported in interviews during the physicians' monitoring process.

The monitoring and follow-up were carried out with veterans who suffered SCI during the eight-year period of the Iraq-Iran War (1980–1988) abd whose injuries had lasted between 23 to 31 years (median of 27 years). A total of 101 SCI veterans among the 1984 records died between 2000 and 2010, prior to the conclusion of this study. By March 2010, out of a total of 1984 veterans, 1803 (90.88%) were included in follow-up monitoring, 101 (5.09%) had died, and 77 (3.88%) were lost to follow up. The causes and numbers of death are shown in Tables 4 and 5. Among the deceased veterans, the mean duration of injury (in years) was 16.27 for cervical-level injuries, 24.71 for thoracic-level injuries and 22.00 for lumbar-level injuries.

# Discussion

In the three-year follow-up of the 1803 SCI veterans, pressure ulcers were the most frequent complication, followed by psychiatric disorders (anxiety disorders, reaction to severe stress and adjustment disorders) and diabetes. This objective data was accompanied by a subjective telephone survey asking the participants about their health complaints; this survey indicated that kidney and/or urologic disorders were the complaints most frequently reported by patients. This difference between the interview and telephone survey findings is due to the discrepancy between patient perception and physician assessment of a defined complication.

In the data available for review it was noted that even though such complaints are not those most commonly noted in the medical records, the patients most commonly complain of urologic disorders, including urinary tract infections (UTI), chronic renal failure (CRF), hydronephrosis, kidney stones and anatomically-related sexual disorders such as erectile dysfunction, priapism and infertility. These complications of spinal cord injury are of great concern to the patients in the present study population, and have more negative effects on their health-related quality of life (HRQOL)

**Table 1.** Level of injury in Iranian SCI veterans

| Level of injury | Total number of veterans | Number of veterans with incomplete injuries |
|---|---|---|
| Cervical | 219 (11.04%) | 16 (7.3%) |
| Thoracic | 1256 (63.30%) | 59 (4.70%) |
| Lumbar | 472 (23.79%) | 84 (17.80%) |
| Sacral | 37 (1.86%) | 15 (40.54%) |
| Overall | 1984 | 174 (8.77%) |

**Table 2.** Descriptive major health-related situations of the study group, derived from monthly physicians' visits during each year (International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) Version for 2010)

| **Medical complication*** | **Numbers and annual prevalance: 2007** (n = 1506)** | **Numbers and annual prevalance: 2008** (n = 1684)** | **Numbers and annual prevalance: 2009** (n = 1803)** |
|---|---|---|---|
| Anxiety disorders: reaction to severe stress and adjustment disorders | 205 (13.61%) | 200 (11.87%) | 206 (11.42%) |
| Pressure ulcers: Decubitus ulcers and pressure area | 221 (14.67%) | 210 (12.47%) | 192 (10.65%) |
| Diabetes mellitus | 145 (9.63%) | 170 (10.09%) | 159 (8.82%) |
| Single kidney status | 85 (5.64%) | 85 (5.05%) | 89 (4.94%) |
| Colostomy status | 61 (4.05%) | 51(3.03%) | 50 (2.77%) |
| Chronic kidney disease | 43 (2.85%) | 60 (3.56%) | 55 (3.05%) |
| Kidney transplant | 30 (1.99%) | 26 (1.54%) | 28 (1.55%) |
| Heart failure, chronic ischemic heart diseases | 27 (1.79%) | 30 (1.78%) | 32 (1.77%) |
| Myocardial infarct, acute Ischemic heart diseases (Individuals, not episodes) | 20 (1.33%) | 22 (1.31%) | 24 (1.33%) |
| Asthma | 18 (1.20%) | 19 (1.13%) | 15 (0.83%) |
| HCV infection | 15 (1.00%) | 10 (0.59%) | 12 (0.66%) |
| HBV infection | 14 (0.93%) | 22 (1.31%) | 23 (1.27%) |
| Chronic kidney disease on dialysis | 7 (0.46%) | 10 (0.59%) | 21 (1.16%) |
| Cancer: Malignant neoplasms | 5 (0.33%) | 4 (0.24%) | 4 (0.22%) |
| Cerebrovascular diseases | 3 (0.02%) | 0 (0.00%) | 2 (0.11%) |
| Liver transplant status | 1 (0.07%) | 0 (0.00%) | 0 (0.00%) |
| Human immunodeficiency virus [HIV] disease | 1 (0.07%) | 1 (0.06%) | 0 (0.00%) |

* Corresponding ICD10-2012 codes: Anxiety disorders: reaction to severe stress, and adjustment disorders (F43); Pressure ulcer: Decubitus ulcer and pressure area (L89); Diabetes mellitus (E10-E14); Colostomy status (Z93.3); Chronic kidney disease (N18); Kidney transplant (Z94.0); Heart failure, chronic ischemic heart diseases (I25); Myocardial infarct, acute ischemic heart diseases (I20-I24); Asthma (J45); HCV infection (B18.2); HBV infection (B18.1); Chronic kidney disease on dialysis (N18.5); Cancer, malignant neoplasms (C00-C97); Cerebrovascular diseases (I60-I69); Liver transplant status (Z94.4); Human immunodeficiency virus [HIV] disease (B20-B24).

** From March 20 of the mentioned year to March 19 of the next year.

**Table 3.** Veterans' main self-reported complaints during the past month (telephone survey)

| | **Number of veterans** | **Percentage (%)** |
|---|---|---|
| No complaint | 53 | 42.4 |
| Kidney and/or urologic disorders | 27 | 21.6 |
| Hypertension | 15 | 12 |
| Pressure ulcers | 9 | 7.2 |
| Hyperlipidemia | 9 | 7.2 |
| Diabetes | 7 | 5.6 |
| Fatty liver | 5 | 4 |
| Overall | 125 | 100 |

**Table 4.** Causes of death from 2000 to 2010

| Cause | Actual deaths |
|---|---|
| Heart failure | 31 |
| Kidney and/or urologic disorders | 15 |
| Internal organ failure | 10 |
| Septicemia | 6 |
| Motor vehicle accident | 6 |
| Respiratory failure | 5 |
| Cerebrovascular accidents | 4 |
| Cancer | 3 |
| Complicated pressure ulcers | 1 |
| All other causes including unknown | 20 |
| Total | 101 |

**Table 5.** Number of SCI veterans who died during each year

| | |
|---|---|
| 2000 | 6 |
| 2001 | 5 |
| 2002 | 1 |
| 2003 | 4 |
| 2004 | 8 |
| 2005 | 17 |
| 2006 | 19 |
| 2007 | 16 |
| 2008 | 10 |
| 2009 | 11 |
| 2010 (prior to the preparation of the report) | 4 |
| Overall | 101 |

[11]. Disparities are also noted when the patients do not consider some disease processes or milder complaints to be noteworthy complications. In another study of veterans, under-reporting was observed in telephone conversations about health complaints even in comparison to email interviews, which tended to elicit more minor complaints [13].

## Level of Injury

For a precise diagnosis and a better assessment of the completeness of SCI and the likelihood of recovery, extensive physical examination including sensory anal examination and assessment of the bulbocavernous reflex are important [14]. All of the participants in the current study were ASIA A except 174 (8.77%), who had incomplete injury. Among these participants, thoracic-level injury was the most frequent, followed by lumbar-level injury (around half the number of thoracic cases). This distribution is similar to that reported by other studies showing a high prevalence of thoracolumbar injuries in Iran, which is likely due to the high mortality of cervical level injuries in a developing country [3, 5, 6, 12]. This is in contrast to studies in other regions describing cervical spine injuries as the most frequent [9]. Moreover, the outcome may be affected by the completeness of the injury and whether the patient is quadriplegic or paraplegic [7]. SCI patients with different levels of injury have differing challenges to their quality of life because of the nature of the complications they are faced with. Previous reports show a lower HRQOL in complete SCI male veterans in contrast to complete SCI non-veteran males, which is thought to be related to higher patient expectations among veterans, more consistent access to medical care, and education related to self-care following spinal cord injuries. Although veterans have well-structured support from the government, it is possible that psychological factors and the younger age of military personnel compared to the general population play a role. As with other patient populations with spinal cord injury, these patients report higher levels of psychological conditions than the general population [11]. According to a recent unpublished qualitative study, complete SCI male veterans believe that their HRQOL is not worse than complete SCI non-veteran males.

## Diabetes Mellitus (ICD10 Codes: E10-E14)

More than 145 of the study participants (up to 10.09% annual prevalence) had diabetes. Previous studies have suggested a greater prevalence of diabetes among SCI veterans compared to the general population [15]. A previous study of SCI patients with diabetes found a higher prevalence of diabetes but a similar history. The same study suggested a higher frequency of complications related to diabetes, such as slow healing of foot ulcers and lower HRQOL. In the current three-year study, annual complaints of pressure ulcers were made by up to 14.67% of individuals and 145, 170 and 159 veterans were diagnosed with diabetes each year. The same previous study showed an increase in the prevalence of diabetes in SCI patients with longer follow-up after SCI. All the patients in the current study cohort were veterans of the war between Iraq and Iran, which ended 23 years prior to completion of this study. The presence of diabetes in a patient with prior SCI increases the risk of developing conditions including chronic ischemic heart disease, asthma and hepatitis, all of which are listed in the current study group as other complications, with the highest annual prevalence of 1.79%, 1.20%, and 1.94%, respectively. These comorbidities are likely to reflect the indirect long-term health impact of diabetes in SCI patients.

## Decubitus and Pressure Area Ulcers (ICD10 Code: L89)

Pressure ulcers [PU] are common complications among SCI patients, including the veteran cohort in the current study (192 – 221, with an annual incidence of up to 14.67% in the three-year monitoring period). SCI can cause PU both in direct ways (i.e., when patients are bedridden) and indirect ways. Risk factors for PU in SCI patients are traumatic causes, older age and male sex; all of which are characteristics of the current study population [16]. Another study of veterans emphasized the prevention of PU to improve both the financial and social resources of caretaking organizations, a valuable lesson for the state welfare organization of Iran (SWOI). This study found a higher recurrence of PU in patients with risk factors that include poverty, a low level of education, unemployment and hospitalized ASIA A and traumatic SCI patients. The incidence of PU can be used as indicators of quality of care for healthcare providers [17].

## Cancer, Malignant Neoplasms (ICD10 Codes: C00-C97)

Cancer is one of the delayed complications that SCI patients are faced with, especially close to the end of their lives. Cancer incurred the highest cost in a cohort study of American veterans [18]. Among cancers, bladder cancer is more frequent among SCI patients, particularly SCI patients with indwelling catheters, as well as those with multiple risk factors like kidney and/or urologic disorders [19]. Kidney and/or urologic disorders are among the most frequent complications in the veterans in the current study group, among whom four to five cancer diagnoses were reported annually, which means up to 0.33% of the participants are living with malignancy.

## Limitations of the Study

Assessment of other health-related issues, including musculoskeletal problems, with more details on specific disorders of the participants, would lead to more precise conclusions. Detailed causes of injury were not defined separately, due to overlaps as well as a lack of approved data. Another limitation of the current study is the fact that the objectives were limited and concentrated on revealing medical complications and complaints of SCI veterans. Previous investigations on psychological issues affecting the SCI veterans' HRQOL are also available [11].

Decubitus and pressure area ulcers (ICD10 codes: L89), reactions to severe stress and adjustment disorders (ICD10 codes: F43) and diabetes mellitus (ICD10 codes: E10-E14) are the main health-related conditions of SCI veterans. Urological disorders represent the main self-reported complication among SCI patients. Close follow-up of SCI veterans for the described conditions can identify the risk factors for adverse outcomes and may be useful as an aid for national health care institutions.

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