



Epidemiological Features of Traumatic Spinal Cord Injury in Elderly in Ilam

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Abstract

Background: Spinal cord injuries are neurological disorders characterized by varying degrees of damage to the spinal cord.

Objectives: Considering the increase in the elderly population, identifying the prevalence and factors affecting the development of spinal cord lesions in this group can provide valuable results for researchers. Therefore, this study aimed to determine the prevalence of spinal cord injuries in the elderly in Ilam city.

Methods: In this retrospective study, patients who were hospitalized due to spinal cord trauma, as diagnosed by a doctor, were included. Information was collected using the results of radiography, radiology, and CT scans, along with patient files, demographic profile forms, and a researcher - made checklist. The definition of spinal cord injury included the cervical, thoracic, and lumbar regions.

Results: The results showed that most of the patients were male, with a rate of 256 (67.6%). The number of patients with damage in each area was as follows: 43 in the cervical area, 61 in the thoracic area, and 54 in the lumbar area. Additionally, the study results showed that 17 (4.5%) of the patients had infections, 35 (9.2%) had hyponatremia, 32 (8.4%) had bedsores, 30 (7.9%) had urinary complications, 21 (5.5%) had thrombosis, and 15 (3.9%) had other complications.

Conclusions: Considering the significant prevalence of spinal cord injuries among the elderly in Ilam city, it is necessary to implement interventions to prevent these injuries in this population.

Keywords: Spinal Cord Injury, Elderly, Epidemiology

1. Background

According to various definitions, aging starts at the age of 60 or 65. The health of the elderly is one of the most important challenges facing the global health system. The world's elderly population is projected to increase by about 2 million per year by 2050. In Iran, as in other countries, the increase in the elderly population is a significant concern, and based on recent census data, it is predicted that by 2050, aging will be considered a major health challenge in Iran (1).

In old age, progressive and irreversible physiological changes reduce a person's physical and mental abilities, leading to an inability to perform tasks. These changes may result from injuries or from the previous and current lifestyle of the elderly person. Factors such as

tobacco use, lack of physical activity, failure to take preventive health measures, and lack of proper self-care when symptoms arise affect the health of the elderly person. Additionally, accidents can cause injuries or illness, and since the elderly are more vulnerable, they may be seriously injured by any accidents (2-5).

One of the common issues in old age is trauma and fractures, which often lead to hospitalization. The stress caused by a combination of diseases, injuries, and the challenging hospital environment can exacerbate symptoms in the elderly. Furthermore, patient safety may be compromised, leading to additional problems. Spinal trauma is one of the most important causes of hospitalization and safety-threatening issues in this group of patients (6-9).

Spinal cord injuries are neurological disorders in which the spinal cord is damaged to varying degrees. This disorder affects all age groups and can cause short-term or long-term complications. Such injuries have long-term effects on the individual, their family, and the healthcare system (10). Complications from spinal cord injuries include pain and depression. A meta-analysis by Hatefi et al. reported a prevalence of pain at 65.9% and depression at 22.6% (11). The incidence and prevalence of spinal cord injury vary by country and city due to factors like lifestyle, frequency of accidents, and other variables (12-14).

Spinal injuries are among the leading causes of disability and mortality, with complications considered a global problem (15). Due to the limited effectiveness of rehabilitation methods for patients with spinal cord injuries, prevention is the most crucial factor in maintaining health. In developing countries, the incidence of spinal cord injury averages about 25.5 per million people annually, while in developed countries, it ranges from 10.4 to 83 per million people. Therefore, preventive measures for these patients are essential (16-19).

2. Objectives

Considering the increase in the elderly population, it is essential to carry out studies on the factors affecting the health of this group of people in the society. For this reason, this study was aimed at the prevalence of spinal cord injuries in the elderly in Ilam city.

3. Methods

3.1. Study Design and Development

In this study, elderly patients referred to Imam Khomeini Hospital (RA) in Ilam city with a diagnosis of spinal cord injury in 2021 were examined using a retrospective method.

3.2. Inclusion Criteria

- At least 65 years of age.
- Patients who have suffered a spinal cord injury due to trauma.
- Patients who have not suffered any other trauma in addition to the spinal cord injury.

3.3. Exclusion Criteria

- At least 65 years of age.

- Patients who have suffered a spinal cord injury due to trauma.

- Patients who have not suffered any other trauma in addition to the spinal cord injury.

3.4. Data Collection

In this study, patients who were hospitalized due to trauma related to the spinal cord, as diagnosed by a doctor, were included. Information was collected using the results of radiography, radiology, and CT scans, along with patient files, demographic profile forms, and a researcher-made checklist. The definition of spinal cord injury included the cervical, thoracic, and lumbar regions.

3.5. Ethics

After obtaining the ethics code in the research (IR.MEDILAM.REC.1402.022), data was collected. Also, all of these cases were carried out in the approved proposal of the university research project.

3.6. Statistical Analysis

Data analysis was conducted using SPSS software version 16. The data analysis process involved using descriptive tests to determine the average, frequency, and percentage. In this study, descriptive statistical tests were used to measure the mean, standard deviation, frequency, and percentage, as well as the Crosstab test.

4. Results

The demographic characteristics of the patients are shown in Table 1. The results showed that most of the patients were male, with a rate of 256 (67.6%) (Tables 1 and 2).

The results showed that the number of patients with damage was 43 in the cervical area, 61 in the thoracic area, and 54 in the lumbar area (Table 3).

In this study, the results showed that 17 (4.5%) of the patients had infections, 35 (9.2%) had hyponatremia, 32 (8.4%) had bedsores, 30 (7.9%) had urinary complications, 21 (5.5%) had thrombosis, and 15 (3.9%) had other complications (Table 4).

5. Discussion

Spinal injuries have a significant prevalence among the types of trauma caused to patients. Due to the importance and numerous complications associated with spinal cord trauma, it is necessary to conduct epidemiological studies in this field (20, 21). For

Table 1. Demographic Characteristics of the Elderly with Spinal Cord Injuries

Variables	No. (%)
Gender	
Man	256 (67.6)
Female	123 (32.4)
Age	
65 - 70	96 (25.3)
71 - 75	104 (27.4)
76 - 80	93 (24.5)
81 - 85	62 (16.3)
> 85	25 (6.6)
Marital status	
Have a wife	290 (76.3)
Single	90 (23.7)
Housing	
City	189 (49.7)
Village	191 (50.3)
season of occurrence	
Spring	67 (17.6)
Summer	93 (24.5)
Fall	153 (40.3)
Winter	67 (17.6)
GCS	
3 - 7	129 (33.9)
8 - 11	199 (52.4)
12 - 15	52 (13.7)
Triage level	
Level 1	276 (72.6)
Level 2	100 (26.3)
Level 3	4 (1.1)
How to transfer	
By ambulance	212 (55.8)
Other than the ambulance	168 (44.2)
The time of the incident	
8 - 12	78 (20.5)
12 - 18	114 (30)
18 - 24	165 (43.4)
00 - 8	23 (6.1)

instance, in a study by Ramezani et al. in Guilan, Iran, the incidence of spinal cord injuries was 0.6% in 2015, 0.3% in 2016, and 0.2% in 2017 (22), indicating a significant prevalence of these types of traumas.

Results from this study showed that 17 (4.5%) of the patients had infections, 35 (9.2%) had hyponatremia, 32 (8.4%) had bedsores, 30 (7.9%) had urinary complications, 21 (5.5%) had thrombosis, and 15 (3.9%) had other complications. Additionally, 210 (55.3%) patients did not report any complications. In a study by Wang et al., the rates of complications were as follows: Infection at 306 (79.5%), death at 9 (2.3%), septic shock at

14 (3.6%), respiratory failure at 100 (26%), and paralytic ileus at 2 (0.5%). Wang et al. reported 385 people with complications and 1421 without complications, which is consistent with our study's finding that most patients did not report complications (23). In Wang et al.'s study, the rates of pulmonary infection, bedsores, deep venous thrombosis, and hyponatremia were 437 (32.59%), 219 (16.33%), 157 (11.71%), and 326 (24.31%), respectively (19).

In this study, the number of patients with damage was 43 in the cervical area, 61 in the thoracic area, and 54 in the lumbar area. Similarly, in Ramezani et al.'s study, the location of SCI was as follows: 52 in the cervical area,

Table 2. The Condition of the Elderly with Spinal Cord Injuries in Terms of the Investigated Variables

Variables	No. (%)
Final status	
Discharge	209 (55)
Leaving the hospital with personal consent	10 (2.6)
Sending to other medical centers	156 (41.1)
Death	5 (1.3)
The cause of the damage	
Fall	119 (31.3)
Quarrel and conflict	88 (23.2)
Heavy object collision	63 (16.6)
Sports events	21 (5.5)
traffic accidents	89 (23.4)
Complications caused	
infection	17 (4.5)
Hyponatremia	35 (9.2)
Bedsores	32 (8.4)
Urinary	30 (7.9)
thrombosis	21 (5.5)
Bleeding	15 (3.9)
Others	20 (5.3)
No	210 (55.3)
The site of the injury is damaged	
Cervical	43 (11.3)
Thoracic	61 (16.1)
Lumbar	54 (14.2)
Cervical + thoracic	70 (18.4)
Cervical + lumbar	82 (21.6)
Thoracic + lumbar	55 (14.5)
Cervical + thoracic + lumbar	15 (3.9)

Table 3. Analysis of the Condition of the Type of Injury and age and Consciousness in the Examined Patients

Variables	Age					GCS		
	65 - 70	71 - 75	76 - 80	81 - 85	> 85	3 - 7	8 - 11	11 - 15
Cervical	11	23	8	1	0	11	24	8
Thoracic	42	17	2	0	0	21	30	10
Lumbar	3	16	22	10	3	18	30	6
Cervical + thoracic	17	14	27	11	1	22	40	8
Cervical + lumbar	23	29	19	10	1	23	47	12
Thoracic + lumbar	0	5	15	28	7	27	22	6
Cervical + thoracic + lumbar	0	0	0	2	13	7	6	2
Total	96	104	93	62	25	129	199	52

37 in the thoracic area, and 81 in the lumbar area (22). In a study by Yousefzadeh et al., 24 patients had fractures in the cervical area, 9 in the thoracic area, and 23 in the lumbar area (24). Additionally, another study reported cervical rates of 245 (78%), thoracic rates of 56 (18%), and lumbar/sacral rates of 12 (4%) (25). According to the

findings of this study and other studies, the incidence of cervical, thoracic, and lumbar injuries is significant.

The Glasgow Coma Scale (GCS) level of the patients at the time of admission was reported as follows: 129 (33.9%) patients had a GCS in the range of 3 - 7, 199 (52.4%) in the range of 8 - 11, and 52 (13.7%) in the range of 12 - 15.

Table 4. Analysis of the State of Injury and Consciousness of the Examined Patients

Variables	Complication							
	AGE	Infection	Hyponatremia	Bedsore	Urinary	thrombosis	Bleeding	Others
65 - 70	1	7	10	10	2	5	0	61
71 - 75	5	6	5	2	5	3	4	74
76 - 80	6	8	9	10	11	3	4	42
81 - 85	3	12	8	8	0	4	6	21
> 85	2	2	0	0	3	5	1	12
Total	17	35	32	30	21	15	20	15

In Grossman et al.'s study, 11 (4%) patients had a GCS of less than 8, 60 (19%) were in the range of 9 - 14, and 242 (77%) were in the range of 15 (25). In Stephan et al.'s study, the mean (SD) was 10.8 (4.7) (26).

5.1. Conclusions

Considering the significant prevalence of spinal cord injuries among the elderly in Ilam city, it is necessary to implement interventions to prevent such injuries in this population.

Footnotes

Authors' Contribution: Study concept and design, acquisition of the data, analysis and interpretation of the data, drafting of the manuscript, critical revision of the manuscript for important intellectual content, statistical analysis, study supervision: J.R, H.K, H.M, and M.O; administrative, technical, and material support: J.R, and H.M.

Conflict of Interests Statement: The authors declare no conflict of interest.

Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after publication.

Ethical Approval: The current study was conducted after obtaining approval by the Ethics Committee of Ilam University of Medical Sciences (IR.MEDILAM.REC.1402.022).

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Informed Consent: Written informed consent was obtained from the patients or their companions.

References

1. Samouei R, Keyvanara M. [Explaining the challenges of the Iranian health system in the face of future aging: Qualitative study]. *J Iran Ageing*. 2022;16(4):608-23. Persian.

2. Gurung S, Ghimire S. *Role of family in elderly care*. 2014. Available from: <https://www.theseus.fi/handle/10024/75830>.

3. Shahbazi Chahartagh A, Yousefi Afrshteh M, Morovati Z. Relationship between Spiritual Health with Life Satisfaction in the Elderly: A Mediating Role of Forgiveness. *J Iran Ageing*. <https://doi.org/10.32598/sija.2023.2076.5>.

4. Borji M, Tarjoman A. Investigating the Effect of Religious Intervention on Mental Vitality and Sense of Loneliness Among the Elderly Referring to Community Healthcare Centers. *J Relig Health*. 2020;59(1):163-72. [PubMed ID: 30291532]. <https://doi.org/10.1007/s10943-018-0708-x>.

5. Kazeminezhad B, Tarjoman A, Borji M. Relationship Between Praying and Self-Care in Elderly with Heart Failure: A Cross-Sectional Study in West of Iran. *J Relig Health*. 2020;59(1):19-28. [PubMed ID: 30644042]. <https://doi.org/10.1007/s10943-018-00757-8>.

6. Anpalahan M, Gibson SJ. Geriatric syndromes as predictors of adverse outcomes of hospitalization. *Intern Med J*. 2008;38(1):16-23. [PubMed ID: 17542997]. <https://doi.org/10.1111/j.1445-5994.2007.01398.x>.

7. Weaver SJ, Lubomksi LH, Wilson RF, Pfoh ER, Martinez KA, Dy SM. Promoting a culture of safety as a patient safety strategy: a systematic review. *Ann Intern Med*. 2013;158(5 Pt 2):369-74. [PubMed ID: 23460092]. [PubMed Central ID: PMC4710092]. <https://doi.org/10.7326/0003-4819-158-5-201303051-00002>.

8. Soleimani M, Shirazi M, Keshvari M. [Quality Assessment of Clinical Guidelines for Preventing Falls in Hospitalized Elderly People in Iran Using the Appraisal of Guidelines, Research, and Evaluation (AGREE) Checklist]. *Iran J Ageing*. 2024;18(4):536-53. Persian.

9. Nori S, Watanabe K, Takeda K, Yamane J, Kono H, Yokogawa N, et al. Influence of the timing of surgery for cervical spinal cord injury without bone injury in the elderly: A retrospective multicenter study. *J Orthop Sci*. 2024;29(2):480-5. [PubMed ID: 36720671]. <https://doi.org/10.1016/j.jos.2023.01.004>.

10. Thorogood NP, Noonan VK, Chen X, Fallah N, Humphreys S, Dea N, et al. Incidence and prevalence of traumatic spinal cord injury in Canada using health administrative data. *Front Neurol*. 2023;14:1201025. [PubMed ID: 37554392]. [PubMed Central ID: PMC10406385]. <https://doi.org/10.3389/fneur.2023.1201025>.

11. Hatefi M, Abdi A, Tarjoman A, Borji M. Prevalence of depression and pain among patients with spinal cord injury in Iran: A systematic review and meta-analysis. *J Trauma Mon*. 2019;24(4):1-8. <https://doi.org/10.5812/traumamon.87503>.

12. Cadarette SM, Wong L. An Introduction to Health Care Administrative Data. *Can J Hosp Pharm*. 2015;68(3):232-7. [PubMed ID: 26157185]. [PubMed Central ID: PMC4485511]. <https://doi.org/10.4212/cjhp.v68i3.1457>.

13. Hu S, Wang P, Dong Y, Li F. Incidence, prevalence and disability of spinal cord injury in China from 1990 to 2019: a systematic analysis of the Global Burden of Disease Study 2019. *Eur Spine J*.

- 2023;**32**(2):590-600. [PubMed ID: [36350373](#)]. <https://doi.org/10.1007/s00586-022-07441-2>.
14. Alves MA, Pilusa S, Mashola MK. The prevalence and profile of spinal cord injury in public healthcare rehabilitation units in Gauteng, South Africa. *Spinal Cord Ser Cases*. 2023;**9**(1):15. [PubMed ID: [37055403](#)]. [PubMed Central ID: [PMC10102299](#)]. <https://doi.org/10.1038/s41394-023-00571-9>.
 15. Karbakhsh M, Zandi NS, Rouzrokh M, Zarei MR. Injury epidemiology in Kermanshah: the National Trauma Project in Islamic Republic of Iran. *East Mediterr Health J*. 2009;**15**(1):57-64. [PubMed ID: [19469427](#)].
 16. Wyndaele M, Wyndaele JJ. Incidence, prevalence and epidemiology of spinal cord injury: what learns a worldwide literature survey? *Spinal Cord*. 2006;**44**(9):523-9. [PubMed ID: [16389270](#)]. <https://doi.org/10.1038/sj.sc.3101893>.
 17. Skolasky RL, Thorpe RJ, Wegener ST, Riley L3. Complications and mortality in cervical spine surgery: racial differences. *Spine (Phila Pa 1976)*. 2014;**39**(18):1506-12. [PubMed ID: [24859586](#)]. <https://doi.org/10.1097/BRS.0000000000000429>.
 18. Rahimi-Movaghar V, Sayyah MK, Akbari H, Khorramirouz R, Rasouli MR, Moradi-Lakeh M, et al. Epidemiology of traumatic spinal cord injury in developing countries: a systematic review. *Neuroepidemiology*. 2013;**41**(2):65-85. [PubMed ID: [23774577](#)]. <https://doi.org/10.1159/000350710>.
 19. Wang ZM, Zou P, Yang JS, Liu TT, Song LL, Lu Y, et al. Epidemiological characteristics of spinal cord injury in Northwest China: a single hospital-based study. *J Orthop Surg Res*. 2020;**15**(1):214. [PubMed ID: [32517761](#)]. [PubMed Central ID: [PMC7285705](#)]. <https://doi.org/10.1186/s13018-020-01729-z>.
 20. Sadiqi S, de Gendt EEA, Muijs SPJ, Post MWM, Benneker LM, Holas M, et al. Validation of the AO Spine CROST (Clinician Reported Outcome Spine Trauma) in the clinical setting. *Eur Spine J*. 2024;**33**(4):1607-16. [PubMed ID: [38367026](#)]. <https://doi.org/10.1007/s00586-024-08145-5>.
 21. Lai J, Wu S, Fan Z, Jia M, Yuan Z, Yan X, et al. Comparative study of two models predicting the risk of deep vein thrombosis progression in spinal trauma patients after operation. *Clin Neurol Neurosurg*. 2024;**236**:108072. [PubMed ID: [38061157](#)]. <https://doi.org/10.1016/j.clineuro.2023.108072>.
 22. Ramezani S, Mohtasham-Amiri Z, Kouchakinejad-Eramsadati L, Yousefzadeh-Chabok S. Epidemiology of traumatic spinal fractures and spinal cord injuries in Guilan, north of Iran. *Caspian Journal of Health Research*. 2019;**4**(1):12-5.
 23. Wang Z, Zhou W, Li M. Epidemiological characteristics of 1,806 patients with traumatic spinal cord injury: A retrospective study. *Front Surg*. 2022;**9**:988853. [PubMed ID: [36684310](#)]. [PubMed Central ID: [PMC9852498](#)]. <https://doi.org/10.3389/fsurg.2022.988853>.
 24. Yousefzadeh CS, Safaee M, Alizadeh A, Ahmadi DM, Taghinnejadi O, Koochakinejad L. Epidemiology of traumatic spinal injury: a descriptive study. *Archive of SID*. 2010.
 25. Grossman RG, Frankowski RF, Burau KD, Toups EG, Crommett JW, Johnson MM, et al. Incidence and severity of acute complications after spinal cord injury. *J Neurosurg Spine*. 2012;**17**(1 Suppl):19-28. [PubMed ID: [22985378](#)]. <https://doi.org/10.3171/2012.5.AOSPINE12127>.
 26. Stephan K, Huber S, Haberle S, Kanz KG, Bühren V, van Griensven M, et al. Spinal cord injury—incidence, prognosis, and outcome: an analysis of the TraumaRegister DGU. *Spine J*. 2015;**15**(9):1994-2001. [PubMed ID: [25939671](#)]. <https://doi.org/10.1016/j.spinee.2015.04.041>.