

Comparison of health related quality of life between two groups of veteran and non-veteran spinal cord injured patients

Payman Salamati¹, Reza Rostami², Soheil Saadat³, Taher Taheri⁴
Maryam Tajabadi⁵, Ghazale Ranjbari⁶, Zohrehsadat Naji⁷, Saba Jafarpour⁸
Vafa Rahimi-Movaghar⁹

Received: 2 March 2014

Accepted: 17 June 2014

Published: 15 April 2015

Abstract

Background: Patients with spinal cord injury (SCI) have a lower health related quality of life (HRQOL) compared to both healthy controls and the normal population. The aim of this study was to compare HRQOL between two groups of veteran and non-veteran SCI patients.

Methods: All male paraplegic non-veterans who had sustained complete SCI before 1988 and were residents of Tehran province (Iran), and a similar group of SCI veterans who consecutively participated in a health screening program were enrolled in this study. Patients fewer than 35 and older than 65 years of age were not included in this study. The participants were interviewed based on the Persian version of SF-36 questionnaire by two psychologists. Eight sub-scales and two physical and mental component summaries of the instrument were assessed. We used chi-square, odds ratio, Mann-Whitney U, independent t-test and linear regression for analysis.

Results: Overall, 25 veterans and 22 non-veterans were enrolled in the study. The mean age, time since injury and the presence of comorbid illnesses were not significantly different between the two groups ($P > 0.05$). A greater number of veterans were married ($p = 0.003$) and employed ($p = 0.047$). On average, veterans had more years of formal education than non-veterans ($p = 0.001$). The mean (SD) bodily pain sub-scale was 72.73(31.253) for non-veterans and 49.7 (28.287) for veterans ($p = 0.011$). Absence of comorbid illnesses was associated with a better physical component summary ($p < 0.001$). Employment was associated with a better mental component summary ($p = 0.022$).

Conclusion: We did not find any differences in HRQOL between the two groups except for the bodily pain sub-scale. Further studies with larger sample sizes are recommended.

Keywords: Quality of Life, Spinal Cord Injuries, Veterans, Iran.

Cite this article as: Salamati P, Rostami R, Saadat S, Taheri T, Tajabadi M, Ranjbari Gh, Naji Z, Jafarpour S, Rahimi-Movaghar V. Comparison of health related quality of life between two groups of veteran and non-veteran spinal cord injured patients. *Med J Islam Repub Iran* 2015 (15 April). Vol. 29:198.

Introduction

Proposing a comprehensive definition for the quality of life and well-being has been a challenge for the experts of this field in the recent decades (1). Despite its definition,

quality of life is acknowledged as an important component of health. Although medical care improvement has increased longevity, it is supposed to improve quality of life as well.

¹ Professor of Community Medicine, Sina Trauma and Surgery Research Center, Tehran University of Medical Sciences, Tehran, Iran
psalamati@sina.tums.ac.ir

² Associate Professor of Psychiatry, University of Tehran, Tehran, Iran. rezaros@gmail.com

³ Associate Professor, Sina Trauma and Surgery Research Center, Tehran University of Medical Sciences, Tehran, Iran.
soheil.saadat@gmail.com

⁴ Neurosurgeon, Shafa Neuroscience Research Center, Khatam ol Anbia Hospital, Tehran, Iran. khatam_sci@yahoo.com

⁵ (Corresponding author) M.A. in General Psychology, Allameh Tabatabaee University, Tehran, Iran. tajabadi1988@gmail.com

⁶ (M.A. in Clinical Psychology, Shahid Beheshti University of Medical Sciences, Tehran, Iran. ghazale.ranjbari@gmail.com

⁷ Assistant Professor, Quran and Hadith University, Tehran, Iran. zohrehsadat.naji@gmail.com

⁸ MD, Sina Trauma and Surgery Research Center, Tehran University of Medical Sciences, Tehran, Iran. sabajafarpour@yahoo.com

⁹ Professor, Sina Trauma and Surgery Research Center, Tehran University of Medical Sciences, Tehran, Iran. V_rahimi@yahoo.com

Spinal cord injury (SCI) is a problem that affects different aspects of the victim's life, particularly the health-related quality of life (HRQOL) (2-6), and imposes a relatively high burden of the disease (7). Numerous studies have been carried out on the HRQOL in patients with SCI, all indicating a lower quality of life in these patients when compared with the general population (6, 8-11) or healthy controls (12-15).

Over one million people suffer from SCI in the United States (16). In Iran, although many people sustain SCI due to road traffic crashes annually, their precise number is not known. According to a study by Eslami and Rahimi Movaghar (17), 8104 non-veteran spinal cord injury patients receive services from the State Welfare Organization of Iran. In addition, the 1980-1988 Iraq-Iran war has left many casualties in Iran (18, 19), with 400,000 injured people; among whom, 2012 suffer complete SCI (20).

To date, no definite cure has been found for complete SCI. Thus, rehabilitation is currently the most effective means to improve the function of these patients. A comprehensive understanding of different aspects of quality of life in this group of patients is crucial for designing a successful rehabilitation plan (21).

This study was conducted to assess different factors determining the HRQOL in SCI patients and to find out whether there are any differences between veterans and non-veterans with SCI in terms of HRQOL. The perceived difference lies in some suppositions: First, the context in which injury has occurred varies among the two groups. Veterans voluntarily exposed themselves to the risk of injury and sacrificed their health for the sake of their country and defending national boundaries. On the other hand, SCIs in non-veterans typically occur due to accidents that are not foreseen by the sufferers. Moreover, veterans receive a wider range of governmental support covering prolonged disability care and rehabilitation expenses. In this study, we sought to compare the HRQOL of veterans and non-

veterans with complete SCI in order to provide a better insight to physical and mental aspects of quality of life in these patients. The results could be beneficial for designing effective policies to improve the HRQOL in this targeted population.

Methods

Participants

All participants were male paraplegic patients with complete SCI occurring before 1988 (before the end of the Iraq-Iran war). Patients fewer than 35 and older than 65 years of age were not included in this study. Non-veterans were approached through an NGO covering all spinal cord injury individuals in Tehran province. All of the twenty three patients who met the inclusion criteria and agreed to take part in the study were enrolled. Similarly, 26 consecutive veterans were approached using the SCI clinic database of Shafa Neuroscience Research Center. In a national level, this center provides regular health screening programs for all Iranian veterans including a one-week in-patient medical surveillance.

The responses of two participants (one veteran and one non-veteran) seemed to be unreliable, so they were excluded from the study.

Instrument

SF-36 questionnaire: This data collection measure tool consisted of two parts: a general questionnaire for demographic factors and the Short Form 36-items (SF-36) questionnaire for collecting data on HRQOL.

SF-36 is the most common questionnaire utilized worldwide for assessing the HRQOL (22). This questionnaire was translated into Farsi and validated by Montazeri et al. (23). The Persian version which is a psychometrically sound measure has been previously used by a number of researchers to assess quality of life in Iranian spinal cord injury patients (20, 24-28). The questionnaire comprises measures of physical functioning, role limitation due to physical problems (RP), bodily pain (BP), general

health perceptions (GH), vitality (VT), social functioning (SF), role limitation due to emotional problems (RE) and mental health (MH). Scores in each component range from 0 to 100, with a higher global score indicating a more favorable condition and better HRQOL. Scores in the first four components are summated as physical component summary (PCS), and the sum of the scores in the next four components form the mental component summary (MCS).

The questionnaires were completed by two trained psychologists who performed face-to-face interviews with the participants.

Ethics

This study was approved by the Ethics Committee of Tehran University of Medical Sciences. The aim of this research was discussed with the patients, and informed consent was obtained from all participants.

Statistical Analysis

We used K.S test to check the normal distribution of the quantity variables. Statistical analysis was conducted using odds ratio, chi square, Mann-Whitney U test and independent t-test to compare the two groups. Type 1 error of less than 0.05 was considered acceptable. Regression models were used to examine the association be-

tween individual characteristics and physical and mental aspects of HRQOL. Separate regression analyses were carried out for the PCS and MCS, which were considered as dependent variables. The distributions of these variables were examined, and their conformity with normal distribution was not ruled out. Independent variables included being veteran or non-veteran, age, marital status, years of formal education, employment status, time since injury, and co-morbid illnesses. Variables were eliminated from the regression model, using the backward elimination procedure with elimination and threshold of $p > 0.1$.

Results

Overall, 25 veterans and 22 non-veterans were enrolled in the study, and information about their age, marital status, years of formal education, employment status, time since injury and comorbid illnesses was obtained (Table 1). The mean age, time since injury and the presence of co-morbid illnesses were not significantly different between the two groups ($p > 0.05$). A greater number of veterans (92%, $n = 23$) than non-veterans (54.5%, $n = 12$) were married ($p = 0.003$) and employed (56% of veterans and 27.3% of non-veterans, $p = 0.047$). On average, veterans had accomplished more years of formal education than non-

Table 1. General characteristics of the participants based on age, years of formal education and time since injury using independent-t test

Variable	Group of Patients		p
	Non-veteran (mean± SD)	Veteran (mean± SD)	
Age	52.05 ± 8.454	48.92 ± 4.396	0.129
Years of formal education	8.86 ± 5.321	13.79 ± 3.243	0.001
Time since injury	28.36 ± 3.017	28.96 ± 2.312	0.455

Table 2. General characteristics of the participants based on marital status, employment status and comorbid illness using chi-square test

Variable		Group of Patients		p
		Non-veteran N(%)	Veteran N(%)	
Marital status	Single	10(45.5%)	2(8%)	0.003
	married	12(54.5%)	23(92%)	
Employment status	Unemployed	16(72.7%)	11(44%)	0.047
	Employed	6(27.3%)	14(56%)	
Comorbid illness	Absent	6 (27.3%)	5(20%)	0.557
	Present	16 (72.7%)	20(80%)	

veterans (13.79 ± 3.243 compared to 8.86 ± 5.321 , respectively, $p = 0.001$).

The average scores of eight components of SF-36 as well as PCS and MCS for veterans and non-veterans are demonstrated in Table 2. No statistically significant differences were found between the two groups except for the mean bodily pain component score, which was lower in veterans (49.7 ± 28.287) than non-veterans (72.73 ± 31.253) ($p = 0.011$).

To assess the role of each independent variable in predicting PCS and MCS, separate regression analysis models were used for each of these two dependent variables. The absence of comorbid illnesses and being employed were the only statistically significant predictors of a more favorable PCS and MCS in these models, respectively (Table 3).

Discussion

The aim of this study was to investigate different factors that determine the HRQOL in spinal cord injury patients and to compare the HRQOL between veterans and non-veterans with complete SCI. Our findings showed no differences between the two groups in seven out of eight components of HRQOL as well as PCS and MCS.

Bodily pain was the only component that showed a significant difference, with non-veterans scoring higher, representing a more favorable life quality in this domain. According to our study, the absence of comorbid illnesses and being employed were the only statistically significant predictors of PCS and MCS in SCI patients, respectively.

A similar study by Saadat et al. (20) assessed HRQOL in 39 Iranian male veterans and 63 non-veterans with SCI. In contrast to our results, their findings showed that spinal cord injury veterans had lower HRQOL than non-veterans in PCS, MCS and in all SF-36 subscales except for physical and social functioning. Moreover, they found positive associations between PCS and time since injury and between MCS with both age and years of education. However, differences in the sampling should be taken into account while comparing the results of the two studies. The study of Saadat et al. utilized a larger sample size, but with greater heterogeneity between the two groups of subjects. For instance, veterans were significantly older and had a longer chronicity of the disability (23.4 ± 3.6 years since injury compared with 7.0 ± 4.9 years in non-veterans). Furthermore,

Table 3. SF -36 scores based on the group of patients

Variable	Group of Patients		Test statistics	p
	Non-veterans (mean \pm SD)	Veterans (mean \pm SD)		
Physical functioning	53.41 \pm 21.179	61.15 \pm 22.724	Independent-t= -1.203	0.235
Role limitation due to physical problems	57.95 \pm 45.242	41.00 \pm 43.827	Z Mann-Whitney U= -1.239	0.215
Bodily pain	72.73 \pm 31.253	49.70 \pm 28.287	Independent-t= 2.652	0.011
General health perceptions	52.95 \pm 18.623	48.80 \pm 20.63	Independent-t= 0.721	0.475
Vitality	64.32 \pm 20.488	62.40 \pm 21.560	Independent-t= -0.311	0.757
Social functioning	83.52 \pm 27.109	74.00 \pm 31.441	Z Mann-Whitney U= -0.890	0.373
Role limitation due to emotional problems	69.70 \pm 44.732	56.00 \pm 45.866	Z Mann-Whitney U= -1.157	0.247
Mental health	62.73 \pm 20.148	68.00 \pm 17.776	Independent-t= -0.953	0.346
Physical component summary	237.05 \pm 81.309	200.65 \pm 87.977	Independent-t= 1.466	0.150
Mental component summary	280.27 \pm 78.038	260.40 \pm 92.449	Independent-t= 0.790	0.434

Table 4. Regression analysis of physical component summary (PCS) and mental component summary (MCS)

Variables	Unstandardized Coefficients		Standardized Coefficients		
	B	SE	Beta	t	p
PCS and comorbid illness	-103.834	25.452	-0.524	-4.080	0<001
MCS and occupation	60.614	25.465	0.351	2.380	0.022

*Variables that failed to represent significant P value ($P < 0.10$) were excluded from the model using a back ward elimination procedure

each group was interviewed by a different set of interviewers, imposing the risk of bias in data collection. In addition, the presence of co-morbid illnesses which is a significant confounding factor was not determined. In other words, the difference in the HRQOL of veterans and non-veterans in the study conducted by Saadat could in fact be the effect of confounding factors which were not controlled between the two groups of patients.

However, it is noteworthy to mention that non-veterans showed a more favorable condition in bodily pain subscale in both studies. In fact, this subscale, which is the only component in our study that differed among veterans and non-veterans, showed the greatest statistically significant difference between the two groups in the study by Saadat et al.

Our study revealed that a greater proportion of veterans were married and employed, and had higher education. This difference can be partly due to governmental supports and privileges for veterans and their family members, providing them with more opportunities to marry, continue their education and find a job.

Different studies have shown contradictory results in terms of association of the age, marital status, education and time since injury with quality of life in SCI patients (8, 29). With respect to age, it is particularly important to consider age at the time of injury, because it is speculated that injury at older age is associated with a lower capacity to cope with the disability. However, while in some studies age was negatively correlated with HRQOL (15, 30), some others found no significant correlation (8). Marriage had a positive impact on the quality of life of the SCI patients in a study by Westgren and Levi (31), but Kreuter et al. did not find any association between marital status and global HRQOL (32).

A longer time since injury can be expected to be associated with a better life quality because of the presumptive adaptation to the different lifestyle over a long period of time. This was evident in a study

by Smith et al. (33). Some investigations (34-36) did not prove this association in concordance with our study. On the other hand, Falvo et al. (37) observed significantly lower PCS scores with an increase in post-deployment time in the U.S. service members who returned from Afghanistan and Iraq.

Higher education is expected to result in a higher rate of employment (38) and working in occupations which are less physically demanding. Because of the interaction between education, employment, financial issues and cultural backgrounds, it is difficult to ascertain the net effect of education on the HRQOL of SCI patients. Clayton and Chubon found that the educational level, employment status, income and social activities were associated with the perceived quality of life (39). In a study by Kreuter et al. who compared two groups of Australian and Swedish patients, higher education was associated with higher HRQOL in Australian SCI patients, but represented no significant correlation in the Swedish group (32). In our study, employment was associated with a higher score in the mental component of the quality of life. It can be argued that having an active social role can improve one's self-image and result in psychological satisfaction and higher perceived quality of life. Employment status was independently associated with the HRQOL in a study by Jain et al. (29). Nevertheless, a study of 21 Iranian female SCI veterans did not show an association between employment and the HRQOL (26). Gender difference and various study designs could explain the inconsistent results.

We found that the physical component of the HRQOL was reversely associated with the presence of comorbid illnesses, which was predictable. It is documented that complicated medical problems associated with SCI adversely affect the HRQOL (8). Der-Martirosian and colleagues also found an association between the HRQOL and comorbidity among older American female veterans (40).

This study had some limitations. The at-

tempt to match the two groups of veterans and non-veterans based on age, time since injury and injury severity (complete SCI) resulted in a relatively small sample size, which could lead to the observed insignificant differences.

Conclusion

The HRQOL did not differ between veterans and non-veterans in seven out of eight main domains of the quality of life as well as PCS and MCS. Non-veterans scored higher in the bodily pain component, representing a more favorable HRQOL in this aspect. The physical component of the HRQOL had a reverse association with the presence of comorbid illnesses, while the mental component of the quality of life was associated with employment. Further well-designed investigations are required to obtain more reliable results.

Acknowledgements

The authors express their appreciation to Dr. Mohammad Reza Soroush, Dr. Batool Mousavi, Dr. Masoud Javadi, and Ms. Parvaneh Adib for their kind cooperation. This study was supported by Grant No. 160 of Sina Trauma and Surgery Research Center.

References

1. Dodge R, Daly A, Huyton J, Sanders L. The challenge of defining wellbeing. *International Journal of Wellbeing* 2012; 2(3): 222-235.
2. Barker RN, Kendall MD, Amsters DI, Pershous KJ, Haines TP, Kuipers P. The relationship between quality of life and disability across the lifespan for people with spinal cord injury. *Spinal Cord* 2009; 47:149-155.
3. Middleton J, Tran Y, Craig A. Relationship between quality of life and self-efficacy in persons with spinal cord injuries. *Arch Phys Med Rehabil* 2007; 88:1643-1648.
4. Blanes L, Carmagnani MI, Ferreira LM. Quality of life and self-esteem of persons with paraplegia living in São Paulo, Brazil. *Qual Life Res* 2009; 18:15-21.
5. Hu Y, Mak JN, Wong YW, Leong JC, Luk K. Quality of life of traumatic spinal cord injured patients in Hong Kong. *J Rehabil Med* 2008; 40:126-131.
6. Lidal IB, Veenstra M, Hjeltnes N, Biering-Sørensen F. Health-related quality of life in persons with long-standing spinal cord injury. *Spinal Cord* 2008; 46:710-715.
7. Rahimi-Movaghar V, Moradi-Lakeh M, Rasouli MR, Vaccaro AR. Burden of spinal cord injury in Tehran, Iran. *Spinal Cord* 2010; 48:492-497.
8. Ku JH. Health-related quality of life in patients with spinal cord injury: review of the short form 36-health questionnaire survey. *Yonsei medical journal*. 2007 Jun 30; 48(3):360-70. PubMed PMID: 17594142. Pubmed Central PMCID: PMC2628081. Epub 2007/06/28. eng.
9. Forchheimer M, McAweeney M, Tate DG. Use of the SF-36 among persons with spinal cord injury. *Am J Phys Med Rehabil* 2004; 83:390-395.
10. Lucke KT, Coccia H, Goode JS, Lucke JF. Quality of life in spinal cord injured individuals and their caregivers during the initial 6 months following rehabilitation. *Qual Life Res* 2004; 13:97-110.
11. Elfstrom M, Ryden A, Kreuter M, Taft C, Sullivan M. Relations between coping strategies and health-related quality of life in patients with spinal cord lesion. *J Rehabil Med* 2005; 37:9-16.
12. Boakye M, Leigh BC, Skelly AC. Quality of life in persons with spinal cord injury: comparisons with other populations. *J Neurosurg Spine*. 2012; 17 (1 Suppl):29-37.
13. Celik B, Gultekin O, Beydogan A, Caglar N. Domain-specific quality of life assessment in spinal cord injured patients. *Int J Rehabil Res* 2007; 30:97-101.
14. Arango-Lasprilla JC, Nicholls E, Olivera SL, Perdomo JL, Arango JA. Health-related quality of life in individuals with spinal cord injury in Colombia, South America. *NeuroRehabilitation* 2010; 27:313-319.
15. Oh SJ, Ku JH, Jeon HG, Shin HI, Paik NJ, Yoo T. Health related quality of life of patients using clean intermittent catheterization for neurogenic bladder secondary to spinal cord injury. *Urology* 2005; 65:306-310. PubMed PMID: 15708043. Epub 2005/02/15. Eng.
16. Wilson JR, Hashimoto RE, Dettori JR, Fehlings MG. Spinal cord injury and quality of life: a systematic review of outcome measures. *Evid Based Spine Care* 2011; 2:37-44.
17. Eslami V, Rahimi-Movaghar V. A demographic profile of 7273 traumatic and non-traumatic spinal cord injured patients in Iran. *J Inj Violence Res*. 2012; 4(3 Suppl 1): Paper No. 47.
18. Salamati P, Razavi SM, Shokraneh F, Mohazab Torabi S, Laal M, Hadjati Gh, et al. Mortality and injuries among Iranians in Iraq-Iran war: a systematic review. *Archives of Iranian Medicine* 2013; 16(9): 542 - 550.
19. Razavi SM, Salamati P, Saghafinia M, Abdollahi M. A review on delayed toxic effects of sulfur mustard in Iranian veterans. *DARU Journal of Pharmaceutical Sciences* 2012; 20(51):2-8.
20. Saadat S, javadi M, Sabet Divshli B, Tvakoli

A.H, Ghodsi.M, Montazeri A, Rahimi movaghar V. Health-related quality of life among individuals with long-standing spinal cord injury: a comparative study of veterans and non-veterans. *BMC Public Health*. 2010; 10:6

21. Wilson JR, Fehlings MG. Assessing quality of life in traumatic spinal cord injury: an evolving landscape. *J Neurosurg Spine*. 2012; 17(1 Suppl): 27-8.

22. Wood-dauphinee S, Exner G, the SCI Consensus Group. Quality of life in patients with spinal cord injury-basic issues, assessment, and recommendations. *Restor Neurol Neurosci*. 2002; 20(3-4): 135-149

23. Montazeri A, Goshtasebi A, Vahdaninia M, Gandek B. The Short Form Health Survey (SF-36): translation and validation study of the Iranian version. *Qual Life Res* 2005; 14:875-882.

24. Mousavi B, Soroush MR, Montazeri A. Quality of life in chemical warfare survivors with ophthalmologic injuries: the first results from Iran Chemical Warfare Victims Health Assessment Study. *Health and Quality of Life Outcomes* 2009; 7:2.

25. Khani H, Joharinia S, Kariminasab MH, Ganji R, Azadmarzabadi E, Shakeri M, Bidarmaghzi M. An evaluation of quality of life in amputee veterans in Mazandaran. *J North Khorasan Univ Med Sci*. 2011; 1(7):49-56. (Persian)

26. Mousavi B, Montazeri A, Soroush MR. Quality of life in spinal cord injured female veterans. *Payesh* 2008; 7:75-81. (Persian).

27. Mousavi B, Mirsalim F, Soroush MR, Masoumi M, Montazeri A. Quality of life in war related bilateral lower limb amputee: Results of a national project from Iran. *Payesh*. 2009; 8(3):303-10. Persian.

28. Ebrahimpzadeh MH, Shojaei BS, Golhasani-Keshtan F, Soltani-Moghaddas SH, Fattahi AS, Mazloumi SM. Quality of life and the related factors in spouses of veterans with chronic spinal cord injury. *Health and Quality of Life Outcomes* 2013; 11:48.

29. Jain NB, Sullivan M, Kazis LE, Tun CG, Garshick E. Factors associated with health-related quality of life in chronic spinal cord injury. *American journal of physical medicine & rehabilitation / Association of Academic Physiatrists*. 2007 May; 86(5):387-96. PubMed PMID: 17449983. Pubmed Central PMCID: PMC2292343. Epub 2007/04/24. Eng.

30. Edwards L, Krassioukov A, Fehlings MG. Importance of access to research information among

individuals with spinal cord injury: results of an evidenced-based questionnaire. *Spinal cord*. 2002 Oct; 40(10):529-35. PubMed PMID: 12235536. Epub 2002/09/18. Eng.

31. Westgren N, Levi R. Quality of life and traumatic spinal cord injury. *Archives of physical medicine and rehabilitation*. 1998 Nov; 79(11):1433-9. PubMed PMID: 9821906. Epub 1998/11/20. Eng.

32. Kreuter M, Siosteen A, Erholm B, Bystrom U, Brown DJ. Health and quality of life of persons with spinal cord lesion in Australia and Sweden. *Spinal cord*. 2005 Feb; 43(2):123-9. PubMed PMID: 15545980. Epub 2004/11/17. Eng.

33. Smith BM, LaVela SL, Weaver FM. Health-related quality of life for veterans with spinal cord injury. *Spinal Cord* 2008; 46, 507-512.

34. Shahandeh H, Moradi S, Bavandpour K, Bohlooli F. The quality of life of patients with spinal cord injuries. *J Inj Violence Res*. 2012; 4(3 Suppl 1): Paper No. 73.

35. Leduc BE, Lepage Y. Health-related quality of life after spinal cord injury. *Disabil Rehabil* 2002; 24: 196-202.

36. Liu CW, Huang CC, Yang YH, Chen SC, Weng MC, Huang MH. Relationship between neurogenic bowel dysfunction and health-related quality of life in persons with spinal cord injury. *Journal of rehabilitation medicine: official journal of the UEMS European Board of Physical and Rehabilitation Medicine*. 2009 Jan; 41(1):35-40. PubMed PMID: 19197567. Epub 2009/02/07. Eng.

37. Falvo MJ, Serrador JM, McAndrew LM, Chandler HK, Lu SE, Quigley KS. A retrospective cohort study of U.S. service members returning from Afghanistan and Iraq: is physical health worsening over time? *BMC Public Health* 2012; 12: 1124.

38. Calman KC. Quality of life in cancer patients--an hypothesis. *Journal of medical ethics*. 1984 Sep; 10(3):124-7. PubMed PMID: 6334159. Pubmed Central PMCID: PMC1374977. Epub 1984/09/01. Eng.

39. Clayton KS, Chubon RA. Factors associated with the quality of life of long-term spinal cord injured persons. *Archives of physical medicine and rehabilitation*. 1994 Jun; 75(6):633-8. PubMed PMID: 8002760. Epub 1994/06/01. Eng.

40. Der-Martirosian C, Cordasco KM, Washington DL. Health-related quality of life and comorbidity among older women veterans in the United States. *Qual Life Res*. 2013; 22(10):2749-56.