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Is Level of Injury a Determinant of Quality of Life Among Individuals with Spinal Cord Injury? A Tertiary Rehabilitation Center Report

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ABSTRACT

Objectives: The role of injury-related variables in determining health-related quality of life (HRQOL) among Iranian persons with spinal cord injury (SCI) has not yet been fully described. In this study, we compared HRQOL between individuals with injury at cervical level and those with injury at thoracolumbar sections and evaluated the discriminating value of injury level as a determinant of HRQOL among Iranian people with SCI. ***Methods***: Individuals with SCI, who were referred to Brain and Spinal Cord Injury Research Center, were invited to participate in this investigation. HRQOL was assessed using the Short Form (SF-36) questionnaire to determine the quality of life (QOL) in eight domains: physical functioning (PF), role limitation due to physical problems (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role limitation due to emotional problems (RE), and mental health (MH). ***Results:*** Ninety patients with paraplegia and 94 quadriplegic patients participated in this investigation. The mean score of PF domain was significantly lower in patients with injury at cervical level ($p < 0.0001$). There was no significant difference in other domains of SF-36 between subjects with paraplegia and quadriplegia ($p = 0.670$, 0.700, 0.910, 0.710, 0.730, 0.290 and 0.850 for RP, RE, VT, MH, SF, BP and GH, respectively). Similarly, the mean physical component summary (PCS) score was significantly higher among individuals with injury at thoracolumbar sections ($p < 0.0001$). The mean mental component summary (MCS) score did not differ between the two groups ($p = 0.720$). ***Conclusions:*** Patients with SCI at the cervical level have similar mental health compared to those with injury at thoracolumbar sections, which shows proper mental adaptability in quadriplegic individuals. Injury level can be used as a major determinant of the physical component of QOL among people with SCI.

Individuals with spinal cord injury (SCI) experience a noticeable reduction in quality of life (QOL) due to physical limitations and immobility after injury.[1–5] However, determination of QOL requires consideration of multifactorial components including social, environmental, and community characteristics.[6] Therefore, it is reasonable to assess health-related quality of life (HRQOL) in each population separately.

The role of injury-related variables in determining HRQOL has been poorly categorized among Iranian population with SCI. Previously, Ebrahimzadeh et al,[7] found no difference between Iranian paraplegic veterans with chronic SCI versus those with tetraplegia. By considering the multidimensional construct of HRQOL, determination of QOL among Iranian non-veteran individuals was essential. To our knowledge, this is the first study that evaluates the role of injury level as a determinant of HRQOL in Iranians with chronic SCI.

Studies have shown an increasing incidence of SCI in developing countries,[8] which emphasizes the need to implement strategies to improve HRQOL

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in these populations. It is necessary to evaluate the baseline QOL among the Iranian population with SCI before the application of any intervention. Identification of the main determinants of HRQOL can help clinicians set therapeutic targets when addressing QOL. Lude et al,[9] demonstrated that QOL can change with rehabilitation.

HRQOL has two main summary scores, the physical and mental component summary.[10,11] There are conflicting results on the influence of injury level on HRQOL. Boakye et al,[12] demonstrated that patients with tetraplegia had a lower physical domain of QOL than did those with paraplegia. On the other hand, Ebrahimzadeh et al,[7] and Rognoni et al,[13] found an insignificant association between injury level and QOL. The lack of longitudinal studies in this area means that the impact of injury level on HRQOL after SCI remains unclear.[12] In patients with quadriplegia, the injury is mostly associated with the cervical section of the spine, and the thoracolumbar sections are mostly involved in individuals with paraplegia.

In this study, we compared components of HRQOL between subjects with paraplegia (injury level at thoracolumbar sections) and quadriplegia (injury level at cervical sections) to determine whether injury level can be used as a determinant of HRQOL among people with chronic SCI.

METHODS

Patients with chronic SCI who were referred to the Brain and Spinal Cord Injury Research Center between 2013 and 2014 were invited to participate in this cross-sectional investigation. Participation in the study was voluntarily, and written consent was obtained from each individual before enrollment. The study protocol was approved by the ethical committee of Tehran University of Medical Sciences.

Participants were selected according to the following inclusion criteria: traumatic SCI, aged 18–65 years old, and ability to speak and understand Persian. Exclusion criteria included: non-traumatic etiology of SCI, cognitive impairment, history of mental diseases, coincidental chronic illnesses including cancer, liver dysfunction, kidney failure, endocrinology disease, acute infection, history of myocardial infarction, and consumption of special medications such as antidepressants, steroids, hormones, and anticonvulsive drugs. Patients addicted to illegal drugs or with a history of alcoholism were also excluded.

Patients' age, gender, marital status, educational level, occupation, cause of injury, and time since injury were asked directly during interviews and were indexed in pre-prepared forms. The level of injury was assessed by clinical examinations and magnetic resonance images and was confirmed by a neurosurgeon.

The Short-form (SF-36) health survey was used to assess HRQOL. The psychometric properties of the Iranian version of SF-36 questionnaire along with its admissible validity and reliability are well documented.[14,15] This instrument has also been shown to be a promising measurement tool to assess mental health in people with SCI.[16] This instrument includes 36 items that evaluate QOL in eight domains: physical functioning (PF), role limitation due to physical problems (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role limitation due to emotional problems (RE), and mental health (MH). These scales provide two component summary scores: physical component summary (PCS) and mental component summary (MCS). Scores range from 0 to 100 and higher scores represent a better QOL.[17]

Categorical variables were described as frequency and percentages. Expression of mean ± standard deviation (SD) was used to describe continuous values. The chi-square test (Fisher's exact test) was used to compare categorical variables between groups, and the *t*-test and one-way analysis of variance (ANOVA) were used to compare the mean between groups. All statistical analysis was conducted using Stata software (StataCorp LP., Texas, US) version 1. A p-value < 0.050 was considered statistically significant.

RESULTS

Table 1 gives the baseline characteristics of the 184 participants included in the study. One hundred and forty-nine (81.0%) were male, and 35 (19.0%) were female. They had a mean age of 33.2±9.1 years. Fifty-eight patients (31.5%) were single, 48 (26.2%) were married, 19 (10.3%) were widowed, 30 (16.3%) were divorced, and 29 (15.7%) were separated. The majority of patients were unemployed (64.7%). The most common cause of injury was motor vehicle collisions (61.4%). Ninety-four (51%) patients had

Table 1: Baseline and injury-related variables among participants with SCI.

Item		Frequency (percentage)	Mean ± SD
Gender	Male	149 (81.0)	-
	Female	35 (19.0)	-
Age, year			33.2±9.1
Marital Status	Single	58 (31.5)	-
	Married	48 (26.1)	-
	Widowed	19 (10.3)	-
	Divorced	30 (16.3)	-
	Separated	29 (15.8)	-
Occupation	Student	22 (12.0)	-
	Government staff	31 (16.8)	-
	Unemployed	119 (64.7)	-
	Other	12 (6.5)	-
Cause of Injury	Motor vehicle crash (road crash)	113 (61.4)	-
	Violence (fights)	12 (6.5)	-
	Falling	38 (20.7)	-
	Sport	11 (6.0)	-
	Other	10 (5.4)	-
Educational level	Illiterate	21 (11.4)	-
	Primary school	52 (28.3)	-
	High school	77 (41.8)	-
	Academic educations	34 (18.5)	-
Level of Injury	Cervical	94 (51.1)	-
	Thoracic and Lumbosacral	90 (48.9)	-
Time since injury, Years	≤ 4 years	83 (45.1)	-
	> 4 years	101 (54.9)	-
Age at the time of Injury, Years	18-30	96 (52.2)	-
	31-43	53 (28.8)	-
	44-65	35 (19.0)	-

SD: Standard Deviation

an injury at the cervical sections level, and injury at the thoracolumbar level was detected in 90 patients (49%). Time since injury was four years or more in over half (54.9%) of the patients.

Scores of SF-36 domains, PCS, and MCS scores are given in Table 2. The mean physical functioning domain score was significantly lower in patients with injury at the cervical level compared to the thoracolumbar level (33.3±26.9 and 52.9±23.3, respectively; $p < 0.0001$). There was no significant difference in other domains of SF-36 between subjects with paraplegia and quadriplegia. Similarly, the mean PCS score was significantly higher among individuals with injury at thoracolumbar sections compared to the cervical (57.9±14.9 and 48.7±15.7, respectively; $p < 0.0001$). The mean score of MCS did not differ between the two groups ($p = 0.720$).

No relation between age and MCS and PCS scores could be detected ($p = 0.712$ and 0.338, respectively). According to our data, age was not a major determinant of HRQOL and its association with all domains of the SF-36 questionnaire was not significant ($p = 0.110$, 0.270, 0.080, 0.120, 0.530, 0.090, 0.270 and 0.640 for PF, RP, RE, SF, GH, VT, MH, and BP, respectively). No effect of time since injury on HRQOL was observed, which is indicative of a poor influence of adaptability through time on QOL among individuals with SCI. The correlation between time since injury and all SF-36 domains was not significant ($p = 0.551$, 0.910, 0.344, 0.668, 0.439, 0.232, 0.350, and 0.071 for PF, RP, RE, SF, GH, VT, MH and BP, respectively). Similar results were found for the relationship between time since injury and PCS and MCS scores ($p = 0.883$ and 0.595, respectively).

DISCUSSION

Our study showed that patients with tetraplegia have similar scores in the mental component of HRQOL, but the physical component was significantly higher among paraplegic individuals. Previously, Boakye et al,[12] demonstrated that patients with tetraplegia had a lower physical domain of QOL than those with paraplegia, which is in line with our results. It seems that individuals with injury at the cervical level have a similar ability to adapt mentally compared to those with injury at thoracolumbar sections.

Previously, Jain et al,[18] demonstrated that a higher injury level was associated with lower QOL scores, which can be due to more severe muscle loss and decreased muscle strength and performance. Our results revealed lower scores of QOL among patients with higher injury level can only be observed in physical components. Ebrahimzadeh et al,[7] and Rognoni et al,[13] showed no association between injury level and QOL. The insignificant influence of injury level on HRQOL was detected in MCS score of SF-36 in our investigation. One reason for such discrepancy is the complexity of factors that affect QOL. These include educational level, employment

Table 2: The comparison of obtained scores in domains of SF-36 questionnaire between people with quadriplegia and paraplegia.

Item	Quadriplegia n = 94	Paraplegia n = 90	*p*-value
Physical functioning	33.3±26.9	52.9±23.3	<0.001*
Role limitation due to physical problems	61.2±34.4	63.4±37.8	0.670
Role limitation due to emotional problems	74.1±33.3	72.2±34.1	0.700
Vitality	72.7±18.4	73.0±17.6	0.910
Mental health	85.4±25.1	84.1±23.1	0.710
Social functioning	79.7±21.6	78.6 ±22.1	0.730
Bodily pain	76.9±21.0	73.5±22.9	0.290
General health	56.2±11.1	56.5±11.5	0.850
Physical component summary	48.7±15.7	57.9±14.9	<0.001*
Mental component summary	78.6±18.7	77.6±19.4	0.720

 # Data is presented as mean±standard deviation
**Significance at level of p <0.010*

status, income, social activities, familial support, and community characteristics.[19] Existence of these confounders may affect the linear relationships between variables and further investigations with adjustment for these confounders are required to clarify the role of injury level in determining HRQOL individuals with SCI in Iran.

Previously, Lin et al,[20] reported that quadriplegics have a poorer QOL compared to people with paraplegia. Our study revealed that only physical components contribute to poorer QOL whereas mental components are relatively spared. The similar QOL in mental components between people with paraplegia and quadriplegia may be due to the existence of facilities and recreational programs for patients that enable them to participate in social activities that, in turn, improve their mental component-related QOL. Since the extent of social contribution and ease of access to facilities are dependent on social support and patients' financial and emotional support system, improvement of the mental component of QOL may vary among different nations. Thus, it is reasonable to evaluate the HRQOL in each nation separately. Furthermore, consideration of patients' socioeconomic characteristics may help to clarify the effect of injury level and other injury-related variables on QOL.

Another reason for the discrepancy of results on QOL among different studies is the use of various assessment tools to determine QOL. In the general population, the term 'subjective well-being' (SWB) is usually used instead of HRQOL.[21] SWB differs from HRQOL in many aspects. While HRQOL describes difficulties caused by poor health on mental and physical functioning and task performance,[22] SWB includes overall life satisfaction and satisfaction with life domains.[23] Geyh et al,[24] measured the cross-cultural validity of four QOL scales in individuals with SCI: the Satisfaction with Life Scale (SWLS), the Life Satisfaction Questionnaire (LISAT-9), the Personal Well-Being Index (PWI), and the 5-item World Health Organization Quality of Life Assessment (WHOQOL-5). Their results showed that the WHOQOL-5 and the PWI were cross-culturally valid, but the LISAT-9 and the SWLS should be interpreted with caution.[24] The SF-36 questionnaire, which we used in our study, has been shown to have acceptable validity and reliability in assessment of QOL among individuals with SCI.[16] A proper comparison of QOL between different studies can only be obtained when similar assessment instruments have been used.

Previous studies found no correlation between age and QOL among people with SCI, which is in line with our findings. [25,26] On the other hand, one study demonstrated a negative effect of older age on QOL.[27] Existence of various confounders affecting QOL may contribute to such discrepancies about the impact of age on QOL.

In line with previous reports, we found no significant influence of time since injury on QOL.[7,25,26] Geyh et al,[28] showed that a shorter time since injury was related with a poorer QOL. However, our study does not confirm the positive effect of a longer post injury duration and adaptability over time on QOL among people with SCI.

CONCLUSION

We looked at the role of injury level as a determinant of HRQOL among Iranian individuals with SCI. The comparison of obtained scores of SF-36 domains revealed that people with quadriplegia have a poorer HRQOL in physical functioning domain only compared to paraplegic individuals. People with injury at a cervical level have similar mental health compared to those with injury at thoracolumbar sections. It seems that individuals with quadriplegia could adapt their mental situation and preoccupations as well as those with paraplegia. To our knowledge, this is the first investigation demonstrating the role of injury level in determining HR-QOL among Iranian individuals with SCI.

Disclosure

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