Health Condition and Quality of Life in Persons with Spinal Cord Injury

Sanja TRGOVCEVIC [1], *Milena MILICEVIC [2], Goran NEDOVIC [3], Goran JOVANIC [3]

1. College of Health Studies, Cuprija, Serbia
2. Institute of Criminological and Sociological Research, Belgrade, Serbia
3. Faculty of Special Education and Rehabilitation, University of Belgrade, Belgrade, Serbia

*Corresponding Author: Email: mileninaadresa@gmail.com

Abstract

Background: During the last few decades, focus of rehabilitation outcome has been redirected to the lifetime monitoring of quality of life. The purpose of this study was to investigate the differences in quality of life perceptions between participants with spinal cord injury and participants of typical population.

Methods: This cross-sectional controlled study of 100 adults aged 18–65 years was based on two questionnaires, Short Form-36 Health Survey (SF-36) and Spinal Cord Injury Quality of Life Questionnaire (QL-23), completed by 23 participants with paraplegia, 21 participants with tetraplegia, and 56 participants of typical population. Mann-Whitney U-test for planned comparison between groups and χ^2 test were used to analyze the differences between research groups.

Results: Participants from control group perceived their general quality of life at higher level in comparison to participants with spinal cord injury (U=415.000, z=-5.804, $P<0.000$). Negative influence of spinal cord injury was detected in six domains (physical functioning, physical role, bodily pain, vitality, social functioning, mental health). Statistical differences between participants with paraplegia and participants with tetraplegia only in domain of functional limitations (U=103.000, z=-3.256, $P<0.005$).

Conclusion: The participants with spinal cord injury perceived both health-related and general quality of life at a lower level in comparison to controls. However, the injury level only partially determined the estimated quality of life.

Keywords: Spinal cord injuries, Quality of life, Paraplegia, Tetraplegia, Health status

Introduction

There are few events in life that could be so dramatic and that could change a life in a second. Spinal cord injury (SCI) is a major trauma that affects people's lives. In the last few decades, the trend of increase in number of SCI patients is evident. Extreme sports, violence, increased number of patients with tumors and chronic illnesses, general aging of population and the fact that elderly persons are injured easily, along with the significant technological development, make important

risk factor for occurrence of SCI. Incidence rate ranges between 10.4 and 83 cases per million in one year, worldwide. In Europe, the incidence is from 10.4 per million per year to 29.7 per million per year, while 27.1 was reported in Asia (1). Recently published data indicate the incidence of 10.5 per million per year in Tehran, Iran (2). Incidence between 27.1 per million per year and 83 per million per year was observed in Northern America (3, 4).

Injuries can occur at any level of spinal cord. The segment that is injured and the impairment severity will determine which body functions will be compromised or lost. Consequently, temporary or permanent change in normal motor, sensory, or autonomic functions will occur. Besides that, secondary complications such as diabetes, decubitus, thrombosis, hypertension and hypotension more frequently occur (5). Considering high rate of incidence, the increased survival rates following acquired injury, extended life expectance and expanded age limit related to the time of injury, the focus of outcomes in rehabilitation treatment have been redirected to the lifetime monitoring of the quality of life (QOL) in persons with SCI in the last few decades. Despite this change in focus, the researches indicated that QOL of persons with SCI was not equivalent to those in their peers from typical population (6). It has also been established that QOL in persons with SCI differ from country to country. In the research from 2010, the authors published data about QOL in persons with SCI in Australia, Brazil, Canada, Israel, South Africa and USA, and obtained results showed variations in QOL from country to country (7).

The concept of QOL can be explained in many ways. It can be defined as the individual's personal perception of overall well-being and contentment in life including both psychosocial and physical or health-related domains (8, 9). As most people emphasize the health as the most important quality above others, there is a clear need for its evaluation in relation to the perception of QOL. The health-related quality of life (HRQOL) is perceived as a multidisciplinary concept that in addition to physical symptoms associated with the disease, should also embrace physical, physiological and social functioning (10). Having in mind the general recommendation of World Health Organization (WHO) to use new ways of assessment, HRQOL was measured using the Short Form-36 Health Survey (SF-36) (11, 12). Moreover, the Spinal Cord Injury Quality of Life Questionnaire (SCI QL-23) (13) was used to assess QOL in persons with SCI in our study. Up to date, there are no studies focused at QOL of persons with SCI in Republic of Serbia, except of partial studies of the

certain diseases that lead to physical impairments (14). By reviewing available literature, it was noted that population of persons with SCI consisted mostly of young, especially active men in productive age (2, 15-20). Therefore, studies of this kind could contribute significantly to both developing and implementing of preventive measures, the improvement of rehabilitation interventions, as well as social planning.

The aim of our study was to determine the difference in perceiving of QOL between the participants with various levels of injury and the participants of typical population.

Methods

Participants

This cross-sectional study included 100 participants of both gender, aged 18−65 years, residing in the territory of the Republic of Serbia. The general inclusion criteria for all participants were as follows: age from 18 to 65 years, negative history of any chronic medical problem, brain injury, significant congenital diseases, psychiatric disorders or somatic diseases. The general criterion for exclusion for all participants was subject's unwillingness to participate in the study.

The total sample consisted of two subgroups of participants with SCI and one control group. The first group (E-1) consisted of 23 participants with paraplegia. Specific inclusion criterion for E-1 group was diagnosed injury at thoracic, lumbar or sacral level of spinal cord (diagnosis of paraplegia). The second group (E-2) accounted for 21 participants with tetraplegia. Specific inclusion criterion for E-2 group was diagnosed injury at cervical level of spinal cord (diagnosis of tetraplegia). Common criterion for both E-1 and E-2 group was related to the period of time from injury occurrence to conduction of present study which had to be longer than one year, whereas all participants should had been treated in an inpatient ward for rehabilitation after SCI for at least six months. In addition to the above mentioned general inclusion and exclusion criteria, a method of purposive or convenience sampling of control group was used.

Therefore, control group was not representative of the general population. Control group included 56 participants of typical population (healthy participants without SCI or any other physical impairment).

Procedure

The study was conducted during November and December 2013 at the Clinic for Rehabilitation "Dr Miroslav Zotovic" and the Health Centre "Dr Simo Milosevic" in Belgrade, Serbia. The study was conducted in two phases. In the first phase, the general inclusion and exclusion criteria for all research groups were applied, as well as the specific inclusion criterion for two subgroups of participants with SCI. All patients that were present at the Clinic for Rehabilitation and the Health Centre during the time period of this research and met the criteria listed above were included. Medical records were reviewed in order to exclude potential participants with medical conditions, impairments or illness that could affect the research results. The study purpose and focus were introduced to selected participants. Participation was voluntary, and written informed consent was obtained from all participants. After the sample was formed, data on health status, time and cause of injury, age, gender, and diagnosis of paraplegia or tetraplegia (for both E-1 and E-2 group) were extracted from medical records.

In the second phase, data were collected using the selected assessment instruments, SF-36, SCI QL-23. Each participant was provided a peaceful and quiet setting in a separate room within the clinic. Participants responded to questions individually, in one session that took no more than 90 minutes. If needed, the time was extended or divided into two time intervals. Assistance of the first was available all the time.

Measures

For assessing of HRQOL, the Serbian version of SF-36 was used (21). As a generic measure of HRQOL, this questionnaire provides an acceptable, psychometrically correct and efficient way of measuring QOL from the patient's point of view. The SF-36 consists of thirty-six items grouped in eight scaled scores and measures eight dimensions of different health domains. The scale sections include Physical Functioning, Role-Physical, Bodily Pain, General Health, Vitality, Social Functioning, Role-Emotional and Mental Health. In accordance to recommendation (12), summary scores were calculated after obtaining of individual SF-36 scores. These two aggregate measures are the Physical Component Summary and the Mental Component Summary. Scores can range from zero (worst possible health state) to 100 (best possible health state), and higher values indicate better functioning and well-being.

The SCI QL-23 is self-report questionnaire designed for assessing of QOL in persons with SCI. This questionnaire is derived from a comprehensive battery of general and specific questionnaires applied in numerous studies of persons with SCI (13, 22-24). The SCI QL-23 consists of 23 statements/questions, 22 of which contain three variables of physical, mental and social functioning. The SCI QL-23 includes the Functioning Scale (ten items assessing physical and social functional limitations in mobility, body care, movement and social interaction), the Mood Scale (six items concerning anxiety and depressive feelings), the Problems Related to the Injury (six items describing the perception with loss of physical independence, SCI-related complications and associated social stigma), and Global Quality of Life (indicates overall rating of life situations). The entire SCI QL-23 questionnaire was applied only on participants in E-1 and E-2 groups. It was used in order to measure the level of QOL and determine differences in perceived QOL among participants with SCI. Participants from control group were asked to answer only on item no. 4 that was related to the self-assessment of global QOL.

Ethical notes

The study protocol was approved by the Ethical Committee of Clinic for Rehabilitation "Dr Miroslav Zotovic", Belgrade, Serbia. Participation in this study was voluntary. Written informed consent was obtained from the volunteers who participated in the study. The ethical issues in this study included introducing the researcher to each partic-

ipant and giving necessary explanation on study purpose and content of questionnaires. Participants were also informed that they could withdraw from the study at any time, and they were ensured about confidentiality and privacy of information.

Statistics

Statistical analysis of data collected from the documentation, survey and assessment of persons with SCI, consisted of a simple descriptive analysis (calculation of frequencies, means, and standard deviation) and inferential statistics. Mann-Whitney U-test for planned comparison between groups, as a nonparametric technique, was applied for the reason that basic assumptions underlying *t*-test and ANOVA had not been fulfilled (sample size, distribution normality, linearity). In addition, χ^2 test was used in order to determine differences between research groups according to gender and age of participants. A *P* value of <0.05 was considered statistically significant. In the part of preliminary analysis, the Cronbach's alpha coefficients were calculated. All analyses were completed using Statistical Package for the Social Sciences for Windows (SPSS) version 19.0.

Results

This study included total sample of 100 participants. Of these, 56 participants were from the general population (without SCI), 23 participants had an injury at thoracic, lumbar or sacral level of spinal cord (paraplegia), while 21 participants had cervical SCI and functional diagnosis of tetraplegia. The presence of male participants was dominant in all three groups: 90.5% (E-2), 73.9% (E-1), and 75.1% (controls), yet without statistically significant difference (χ^2=2.422; df=2; *P*=0.298). At the time of study, the average age of participants in control group was 39.20 years (SD=14.88). The average age of participants in E-1 and E-2 group was 45.43 years (SD=10.56) and 41.38 years (SD=12.89), respectively. There was no statistically significant difference between this three research groups in relation to age groups [χ^2=5.124; df=6; *P*=0.528]. Distribution of participants according to their gender and age are presented on Table 1.

Table 1: Distribution of participants according to gender and age groups

		Tetraplegia n (%)	Paraplegia n (%)	Controls n (%)	Total n (%)
18–28	Male	6 (100.0)	0 (0.0)	8 (53.3)	14 (60.9)
	Female	0 (0.0)	2 (100.0)	7 (46.7)	9 (39.1)
	Total	6 (100.0)	2 (100.0)	15 (100.0)	23 (100.0)
29–39	Male	3 (100.0)	1 (25.0)	7 (58.3)	11 (57.9)
	Female	0 (0.0)	3 (75.0)	5 (41.7)	8 (42.1)
	Total	3 (100.0)	4 (100.0)	12 (100.0)	19 (100.0)
40–50	Male	5 (100.0)	9 (100.0)	11 (68.8)	25 (83.3)
	Female	0 (0.0)	0 (0.0)	5 (31.3)	5 (16.7)
	Total	5 (100.0)	9 (100.0)	16 (100.0)	30 (100.0)
51–65	Male	5 (71.4)	7 (87.5)	6 (46.2)	18 (64.3)
	Female	2 (28.6)	1 (12.5)	7 (53.8)	10 (35.7)
	Total	7 (100.0)	8 (100.0)	13 (100.0)	28 (100.0)
Total	Male	19 (90.5)	17 (73.9)	32 (57.1)	68 (68.0)
	Female	2 (9.5)	6 (26.1)	24 (42.9)	32 (32.0)
	Total	21 (100.0)	23 (100.0)	56 (100.0)	100 (100.0)

The most common cause of SCI in E-1 group was tumors (34.8%). Battlefield and traffic accidents were etiological factors of paraplegia in 13% of cases each. Unidentified causes such as injuries on work, electric shocks, etc. accounted for 26.1% of cases. The most common cause of SCI in E-2

group was water diving (42.9%), followed by traffic accidents (28.6%) and tumors (19%), while violence and falls due to weakness or aging process were etiological factors in 4.8% of cases.

Cronbach's alpha coefficients were calculated for the selected assessment instruments. The value of 0.848 was recorded on SCI QL-23, while the value of 0.869 was found on SF-36, both indicating a high reliability.

Table 2 shows the SF-36 score values of participants with and without SCI. In the group of participants with SCI, the lowest mean score was noted in physical functioning domain (10.11±11.49), as opposed to the group of healthy controls in which the highest score was found in that same QOL domain (89.73±15.51). Participants with SCI reported the highest score of QOL in domain of emotional problems (72.73±36.85). On the other hand, in the group of healthy controls, the lowest mean score was found in domain

of general health perceptions (53.57±9.43). Statistically significant differences were confirmed on the following subscales: Physical Functioning (U=5.000, z=-8.643, $P<0.001$), Role-Physical (U=571.000, z=-5.023, $P<0.001$), Bodily Pain (U=663.000, z=-4.011, $P<0.001$), Vitality (U=799.500, z=-3.017, $P<0.005$), Social Functioning (U=799.000, z=-3.059, $P<0.005$), and Mental Health (U=816.500, z=-2.894, $P<0.005$). However, the statistical significance of the difference was not confirmed in domain of General Health (U=1168.500, z=-0.447, $P=0.655$), and Role-Emotional (U=1063.000, z=-1.372, $P=0.170$). The greatest extent of range of responses was noted in both groups on Role-Physical and Role-Emotional subscale. In addition, in the group of participants with spinal cord injury, the greatest extent of range of responses was also found on Bodily Pain subscale and Social Functioning subscale.

Table 2: Comparisons of the short form-36 health survey (SF-36) subscale scores between participants with and without spinal cord injury

Subscale	Group	M	SD	Min	Max	Mean Rank	Mann-Whitney U-test
Physical Functioning	SCI	10.11	11.49	0.00	45.00	22.61	$P<0.000$
	Control	89.73	15.51	25.00	100.00	72.41	
Role-Physical	SCI	50.00	40.71	0.00	100.00	35.48	$P<0.000$
	Control	87.50	24.77	0.00	100.00	62.30	
Bodily Pain	SCI	55.82	32.93	0.00	100.00	37.57	$P<0.000$
	Control	82.34	19.64	41.00	100.00	60.66	
General Health	SCI	52.05	13.48	25.00	85.00	49.06	$P=0.655$
	Control	53.57	9.43	30.00	80.00	51.63	
Vitality	SCI	57.39	21.42	5.00	100.00	40.67	$P=0.003$
	Control	69.37	15.49	30.00	100.00	58.22	
Social Functioning	SCI	62.22	30.20	0.00	100.00	40.66	$P=0.002$
	Control	81.25	16.51	37.50	100.00	58.23	
Role-Emotional	SCI	72.73	36.85	0.00	100.00	46.66	$P=0.170$
	Control	82.14	29.79	0.00	100.00	53.52	
Mental Health	SCI	64.91	17.38	16.00	100.00	41.06	$P=0.004$
	Control	74.07	17.01	16.00	100.00	57.92	

SCI – Spinal Cord Injury

When it comes to a global measure of physical and mental functioning, participants with SCI reported lower score in physical domain (29.57±6.57) when compared to score in domain of mental functioning (55.11±8.83) (Table 3). On

the other hand, such difference was not confirmed in control group. Participants without SCI reported similar scores in overall physical and mental domains, 50.40±6.57 and 49.92±7.27, respectively. Results obtained by Mann-Whitney U-

test indicated that the groups of participants with SCI and participants without SCI differed with statistical significance in both overall physical domain (U=48.000, z=-8.222, *P<0.001*) and mental domain (U=767.000, z=-3.229, *P<0.005*). However, the extent of responses in overall physical domain in the groups of participants with SCI was lower when compared with the range of responses of healthy controls. On the other hand, the extent of responses in overall mental ability in the groups of healthy controls was lower when compared with the range of responses of participants with SCI.

As shown in Table 4, the low mean scores found on the Mood Scale of SCI QL-23 in groups of both participants with tetraplegia and paraplegia (31.22±16.05 and 36.23±25.12, respectively) reflect greater perceived QOL in this domain. In contrast, QOL was perceived as lower in domain of functioning and in the area of problems related to the injury. However, the only one statistically significant difference between participants with tetraplegia and participants with paraplegia was

noted on the Functioning Scale (U=103.000, z=-3.256, *P<0.005*). The mean score in the subgroup of participants with tetraplegia was 73.37 (SD=20.80), while the mean score in the subgroup of participants with paraplegia was 44.07 (SD=29.11). No statistically significant difference was found on other tree subscales (Mood Scale, Problems Related to the Injury Scale, Global Quality of Life). On all subscales of SCI QL-23, participants with paraplegia had scores in the range that was wider than the range of values of answers of participants with tetraplegia.

Table 5 presents the scores of Global Quality of Life Scale of SCI QL-23. The mean score noted in the groups of participants with SCI was lower than the mean score in healthy controls, 52.27±6.57 and 81.85±6.57, respectively. These groups differed with statistical significance (U=415.000, z=-5.804, *P<0.000*). It is also important to note that scores in the group of participants with SCI ranged from 0.00 to 83.33, while the extent of this range in the group of healthy controls was lesser (from 43.33 to 100.00).

Table 3: Comparisons of the short form-36 health survey (SF-36) summary scores between participants with and without spinal cord injury

Subscale	Group	M	SD	Min	Max	Mean Rank	Mann-Whitney U-test
Physical Component Summary	SCI	29.57	6.57	17.79	46.44	23.59	*P<0.000*
	Control	50.40	6.57	29.30	63.41	71.64	
Mental Component Summary	SCI	55.11	8.83	30.34	68.56	61.07	*P=0.001*
	Control	49.92	7.27	27.50	59.83	42.20	

SCI – Spinal Cord Injury

Table 4: Comparisons of the spinal cord injury quality of life questionnaire (SCI QL-23) subscales scores participants with tetraplegia and participants with paraplegia

Subscale	Group	M	SD	Min	Max	Mean Rank	Mann-Whitney U-test
Functioning Scale*	E-2	73.37	20.80	35.57	100.00	29.10	*P=0.001*
	E-1	44.07	29.11	0.00	100.00	16.48	
Mood Scale*	E-2	31.22	16.05	5.56	61.11	21.52	*P=0.628*
	E-1	36.23	25.12	0.00	83.33	23.39	
Problems Related to the Injury Scale†	E-2	60.85	21.48	16.67	100.00	23.83	*P=0.508*
	E-1	59.66	21.98	5.56	100.00	21.28	
Global Quality of Life†	E-2	54.76	19.82	16.67	83.33	23.36	*P=0.662*
	E-1	50.00	21.90	0.00	83.33	21.72	

E-2 – group of participants with tetraplegia, E-1 – group of participants with paraplegia /* Lower scores reflect greater perceived quality. /† Higher scores reflect greater perceived quality.

Table 5: Comparisons of global quality of life scale scores between participants with and without spinal cord injury

Subscale	Group	M	SD	Min	Max	Mean Rank	Mann-Whitney U-test
Global Quality of Life Scale	SCI	52.27	6.57	0.00	83.33	31.93	*P<0.000*
	Control	81.85	6.57	43.33	100.00	65.09	

SCI – Spinal Cord Injury

Discussion

In this study, the differences between perception of QOL among participants with SCI and participants without SCI have been observed, as well as among participants with different levels of injury. By analyzing the differences between SF-36 scores obtained in the group of participants with SCI and participants without SCI (Table 2), a negative influence of SCI was detected on six of the eight SF-36 subscales: Physical Functioning, Role-Physical, Bodily Pain, Vitality, Social Functioning and Mental Health. On the other hand, subscales related to general health and emotional role did not show statistically significant differences between groups. Statistically significant results were not found only on two subscales (General Health and Role-Emotional subscales). Most studies involved in HRQOL research, usually with the SF-36, show that persons with SCI have expectedly lower scores in physical functioning compared to general population. Similar data have been detected when it comes to bodily pain, social functioning and mental health (20). However, unlike other studies, participants with SCI identified general health and emotional issues approximately equal as those from the typical population in present research.

Similar results were obtained in a study conducted in Sweden and Australia in which the same methodology was used. Specifically, Kreuter, Siösteen, Erkholm et al. (22) identified the highest difference in both Physical Functioning and Role-Physical subscales between group of participants with SCI and group of participants without SCI, which were results equivalent to results presented in this study. In addition, statistically significant differences were observed on both Social Functioning and Mental Health subscales. However, on the Role-Emotional subscale, the answers of participants from Serbia did not match the answers of participants from Sweden and Australia.

Next, the Physical Component Summary and the Mental Component Summary, which represent total physical and mental abilities, were compared between group of participants with SCI and control group. Arithmetic means have reached different values (Table 3), therefore resulting with differences in total physical domain and overall mental abilities. Moreover, the results obtained on the scale of mental component indicated that the minimum score in SCI group was higher than the same of control group (30.34 versus 27.50). Similarly, the maximal score achieved in SCI group was higher in comparison to control group (68.56 versus 59.83). Such a distribution of scores had further caused occurrence of greater differences in favor of SCI group. These results could be interpreted by the fact that questionnaire SF-36 represents a self-assessment of QOL of participants, more precisely of both physical and mental components of their QOL. Self-assessment itself implies different levels of personal aspirations. The participants with SCI were satisfied to a greater extent with their own participation in life situations, socializing, going out, etc. In contrast, participants of typical population considered that they were not satisfied with their QOL in these domains, which further suggested that their wishes and demands were rather higher or different compared to population of person with SCI.

The additional assessment of QOL was conducted by SCI QL-23. Participants from E-1 and E-2 group responded on every item. In this way, the degree of differences in QOL within participants with SCI in relation to the level of injury was determined. The participants from control group

were asked to respond only on item no. 4 related to the self-assessment of the general QOL, i.e. global QOL. As presented in Table 4, there were no statistically significant differences between participants with tetraplegia and participants with paraplegia on the Mood Scale, the Problems Related to the Injury scale and the Global QOL Scale. In contrast, on the Functioning Scale, groups of participants with tetraplegia had achieved the mean value of 73.37 (SD=20.80), whereas the group of participants with paraplegia achieved the mean of 44.07 (SD=29.11) which indicated a statistically significant difference (U=103.000, z=-3.256, *P*<0.005). The obtained results demonstrated that participants with tetraplegia showed lower results on the subscale of physical and social dysfunctions than participants with (paraplegia. Persons with preserved function of upper limbs, as it was expected, showed higher level of both physical and social independence, compared to persons who did not have the upper or lower limbs functionality. Regarding mood, independence and general QOL, all participants with SCI showed approximate values, which indicates that the level of injury is related to the minimal connection with the QOL assessment, which was detected in similar previous researches (20, 22, 25, 26).

When it comes to general QOL assessed by Global QOL Subscale, participants with SCI had lower observed mean scores in comparison to controls (52.2±6.57 and 81.8±6.57, respectively). This difference reached a level of statistical significance (U=415.000, z=-5.804, *P*<0.000). Considering that higher global QOL scores reflect greater perceived QOL, and based on the obtained results, it can be concluded that participants without SCI perceived their QOL at a higher level compared to those with SCI.

The same questionnaire was used in assessing of QOL of persons with SCI and control group from typical population the study conducted in Australia and Sweden (22, 27). The obtained results were equivalent to research results presented here because both groups of SCI participants (Sweden and Australia) estimated their global QOL on a significantly higher level in relation to the control group. In addition, it should be noted that statistically significant difference (*P*<0.0001) between the group of participants with SCI and control group from Australia and Sweden was detected on the Mood Scale, whereas such a difference was not confirmed in this study.

The concept of QOL contains different domains. However, it is obvious that not all of them are equally affected when it comes to population of persons with SCI. Research results presented here indicate that when the impairment occurs as a consequence of acquired SCI, perceived QOL is changed. The participants of typical population perceived their general QOL on a higher level in comparison to participants with SCI. In addition, when it comes to HRQOL, the group of participants of typical population perceived their QOL at a higher level in most cases. Nevertheless, general health and emotional problems were not proved as different. Thus, differences are not as big as it might be expected. By observing the participants in relation to the level of injury, it can be concluded that level of injury could determine the self-perception of QOL, yet in a small degree. Differences were evident on the physical and social dysfunction scales, as expected, and clearly defined by the level of injury. Even so, in all other areas of functioning, no relationship was found between level of injury and the perceived QOL. In other words, self-reported QOL is not necessarily determined by the level of SCI.

Considering that this study was focused on initial exploration of self-reported health status and QOL in persons with SCI, and given that in the Republic of Serbia, up to date, no studies have dealt with this topic, it should be emphasized that forming of an overall picture represents only a starting point for future studies. This descriptive study has limitations that further research should overcome. First, sample was relatively small and therefore did not allow detailed examination of the differences. A more detailed picture of connections between different domains of QOL could be obtained only if analyzes were conducted on larger sample. In addition, all data were self-reported, thus individuals may not have always expressed all of their perceptions. Moreover, re-

gardless of given diagnosis of paraplegia and tetraplegia, there is a general heterogeneity in population of persons with SCI. This heterogeneity limits generalizability of findings. As recently reported, newly injured persons with SCI encounter numerous barriers during the first year post injury (28). Perception of barriers to community reintegration that persons with SCI experience should be included in future studies, as well as the availability of facilities for persons with SCI. Finally, future research should include other factors that could influence QOL of persons with SCI, such as place of residence, age, marital status, family cohesion, occupation and employment, income and economic conditions, different factors of social protection and welfare, social support, etc.

Conclusion

Regardless of the injury level, person with SCI perceive their QOL and HRQOL at a lower level in comparison to healthy population. The results of this study suggest that a comprehensive rehabilitation should include focuses on increasing of physical functioning and vitality level, enhancing of independence within the activities of daily living, reducing of bodily pain, and improving of both social functioning and mental health. This study has important practical implications in the design of further interventions in rehabilitation and reintegration of persons with SCI. Considering the growing population of people with SCI, more studies are needed in order to provide a good basis for developing long-term strategies of improving the QOL. The contribution is evident in the development of methods of post-traumatic rehabilitation, and in the prevention of occurrence of injuries, in general, as well as consequential social isolation.

Ethical considerations

Ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. have been completely observed by the authors.

Acknowledgement

References

1. Milićevic S, Bukumiric Z, Karadžov A, Babovic R, Jankovic S (2012). Demographic characteristics and functional outcomes in patients with traumatic and nontraumatic spinal cord injuries. *Vojnosanit Pregl*, 69 (12): 1061–7.
2. Sharif-Alhoseini M, Rahimi-Movaghar V (2014). Hospital-Based incidence of traumatic spinal cord injury in Tehran, Iran. *Iran J Public Health*, 43 (3): 331–341.
3. Burke DA, Linden RD, Zhang YP, Maiste AC, Shields CB (2001). Incidence rates and populations at risk for spinal cord injury: A regional study. *Spinal Cord*, 39 (5): 274–278.
4. Warren S, Moore M, Johnson MS (1995). Traumatic head and spinal cord injuries in Alaska (1991–1993). *Alaska Med*, 37 (1): 11–19.
5. Jacobs PL, Nash, MS (2004). Exercise recommendations for individuals with spinal cord injury. *Sports Med*, 34 (11): 727–51.
6. Jain NB, Sullivan M, Kazis LE, Tun, CG, Garshick E (2007). Factors associated with health-related quality of life in chronic spinal cord injury. *Am J Phys Med Rehabil*, 86 (5): 387–96.
7. Geyh S, Fellinghauer BA, Kirchberger I, Post MW (2010). Cross-cultural validity of four quality of life scales in persons with spinal cord injury. *Health Qual Life Outcomes*, 8: 94.

8. Majnemer A, Shevell M, Law M, Poulin C, Rosenbaum P (2008). Reliability in the ratings of quality of life between parents and their children of school age with cerebral palsy. *Qual Life Res*, 17 (9): 1163–71.

9. Alilović M, Peroš-Golubičić T, Radošević-Vidaček B, Košćec A, Tekavec-Trkanjec J, Solak M, Hećimović A, Smojver-Ježek S (2013). WHOQOL-BREF Questionnaire as a Measure of Quality of Life in Sarcoidosis. *Coll Antropol*, 37 (3): 701–6.

10. Hays R, Bjomer J, Revicki D, Spritzer K, Cella D (2009). Development of physical and mental health summary scores from the patient-reported outcomes measurement information system (PROMIS) global items. *Qual Life Res*, 18 (7): 873–80.

11. Sullivan M, Karlsson J, Taft C (1999). How to assess quality of life in medicine: rationale and methods. In: *Progress in Obesity Research*. Ed, Guy-Grand B, Ailhaud G. John Libbey. London, UK, pp. 749–55.

12. Ware J, Sherbourne, C (1992). The MOS 36-Item Short Form Health Survey (SF-36): I. Conceptual framework and item selection. *Med Care*, 473–83.

13. Lundqvist C, Siösteen A, Sullivan L, Blomstrand C, Lind B, Sullivan M (1997). Spinal cord injuries: a shortened measure of function and mood. *Spinal Cord*, 35 (1): 17–21.

14. Jovanović M (2011). *The quality of life of people with disabilities in Serbia* [dissertation]. Faculty of Political Science: Beograd (Serbia).

15. National Spinal Cord Injury Statistical Center (2013). *Spinal Cord Injury Facts and Figures at a Glance*. National Spinal Cord Injury Statistical Centre: University of Alabama, Alabama.

16. McDonald JW, Sadowsky C (2002). Spinal-Cord Injury. *The Lancet*, 359 (9304): 417–25.

17. Wyndaele M, Wyndaele JJ (2006). Incidence, prevalence and epidemiology of spinal cord injury: what learns a worldwide literature survey? *Spinal Cord*, 44 (9): 523–9.

18. Devivo MJ, Go BK, Jackson AB (2002). Overview of the national spinal cord injury statistical center database. *J Spinal Cord Med*, 25 (4): 335–8.

19. Stover, S (1996). Facts, figures and trends on spinal cord injury. *Am Rehabil*, 22 (3): 25–32.

20. Post M, Noreau L (2005). Quality of life after spinal cord injury. *J Neurol Physical Therapy*, 29 (3): 139–46.

21. Drulovic J, Pekmezovic T, Matejic B, Mesaros S, Manigoda M, Dujmovic I, Stojsavljevic N, Kocev N, Gavric-Kezic M, Nikic P, Dragojlovic M (2007). Quality of life in patients with multiple sclerosis in Serbia. *Acta Neurol Scand*, 115 (3): 147–52.

22. Kreuter M, Siösteen A, Erkholm B, Byström U, Brown DJ (2004). Health and quality of life of persons with spinal cord lesion in Australia and Sweden. *Spinal Cord*, 43 (2): 123–9.

23. Elfstrom M, Rydén A, Kreuter M, Taft C, Sullivan M (2005). Relations between coping strategies and health-related quality of life in patients with spinal cord lesion. *J Rehabil Med*, 37 (1): 9–16.

24. Elfström ML, Kreuter M, Persson LO, Sullivan M (2005). General and condition-specific measures of coping strategies in persons with spinal cord lesion. *Psychol Health Med*, 10 (3): 231–42.

25. Westgren N, Levi R (1998). Quality of life and traumatic spinal cord injury. *Arch Phys Med Rehabil*, 79 (11): 1433–9.

26. Leduc BE, Lepage Y (2002). Health-related quality of life after spinal cord injury. *Disabil Rehabil*, 24 (4): 196–202.

27. Jain NB, Sullivan M, Kazis LE, Tun CG, Garshick E (2007). Factors associated with health-related quality of life in chronic spinal cord injury. *Am J Phys Med Rehabil*, 86 (5), 387–96.

28. Silver J, Ljungberg I, Libin A, Groah S (2012). Barriers for individuals with spinal cord injury returning to the community: A preliminary classification. *Disabil Health J*, 5 (3): 190–6.