



# QUALITY OF LIFE IN PATIENTS WITH TETRAPLEGIA AND PARAPLEGIA AFTER TRAUMATIC SPINAL CORD INJURY

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## Abstract

**Purpose:** The study compares the quality of life (QOL) in tetra- and paraplegic patients over the first 3 years after injury. An additional goal is to determine whether there is correlation between selected factors based on medical records, the WHOQOL-BREF (World Health Organization Quality of Life – short version of the questionnaire), and the SIP68 (Sickness Impact Profile – short version of the questionnaire) scales and these groups of patients.

**Methods:** A total of 72 patients with locomotor disability, following spinal cord injury (SCI), were involved in the study. Patients completed the WHOQOL-BREF and SIP68 scales. The comparative analysis between the paraplegic ( $n = 33$ ) and tetraplegic ( $n = 39$ ) group, and correlations between selected factors based on medical records and the above-mentioned scales was made.

**Results:** There were statistically significant differences in the assessment of SIP68 subscales: the somatic autonomy score was higher in paraplegic patients and the social behavior and mobility range scores were higher in patients with tetraplegia. Correlations between total WHOQOL-BREF score and ability to concentrate, refraining from any recreational activity, lack of gait and no professional activity were noticed in tetraplegia patients. Statistical significance was observed in correlations between total WHOQOL-BREF score and inability to bathe and get dressed without assistance, doing the washing, shopping and reduced socializing in paraplegia patients.

**Conclusions:** The presented differences in the assessment of QOL between both patient groups revealed the specific social, psychological and physical needs of patients. This is necessary for the development of effective treatment, depending on the level of injury, which may enable a faster return to optimal QOL for SCI patients.

**Key words:** quality of life, spinal cord injury, tetraplegia, paraplegia.

## INTRODUCTION

Spinal cord injury (SCI) leads to incommensurable individual and social effects [1], although it is not a common injury. SCI disrupts the functioning of body systems and causes enormous changes and limitations in many areas of life (psychological, social and socio-professional), resulting in disability. Those changes significantly affect the quality of life (QOL) of patients who are discharged from a rehabilitation ward.

Early comprehensive rehabilitation and progress in the treatment of SCI patients contribute to an improvement in the QOL and to prolonging the lifespan in SCI patients.

QOL assessment in SCI patients has been frequently analyzed. Numerous scales are used to assess the QOL, such as the WHOQOL BREF (World Health Organiza-

tion Quality of Life – short version of the questionnaire) and SIP68 scales (Sickness Impact Profile short form, 68 items drawn from the 136-item version) [2-8]. According to the literature, structure- and function-related factors influence QOL assessment following SCI [7]. QOL is positively correlated with younger age and employment, while a negative correlation occurs in the presence of secondary conditions (spasticity, pain, depression) [9-11].

The study presented aimed to assess and compare QOL in patients with locomotor impairment in the course of SCI of the cervical (C) and thoracolumbar (Th-L) level over the first 3 years after injury, when the patient has the greatest medical and psychosocial needs. An additional goal of this study was to determine whether there is any correlation between selected factors based on the WHOQOL-BREF scale, SIP68 scale and medical records (regarding structure, function, person-

**Table 1.** General description of patients included in the study ( $N = 72$ )

Parameter	Paraplegia ( $n = 33$ )		Tetraplegia ( $n = 39$ )		All	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Sex, $p = 0.03^*$ (Chi)						
Women	10	13.9	4	5.6	14	19.5
Men	23	31.9	35	48.6	58	80.5
Age, $p = 0.27$ (S)						
Mean age (minimum-maximum) $\pm$ SD	40.06 (18-78) $\pm$ 14.14		44.08 (17-78) $\pm$ 16.14		42.24 $\pm$ 16.28	
Place of residence, $p = 0.50$ (F)						
Village	10	13.9	17	23.6	27	37.5
Town (below 20 000 inhabitants)	7	6.9	6	8.3	13	18.1
Town/city (over 20 000 inhabitants)	16	22.2	16	22.2	32	44.4
Education, $p = 0.25$ (F)						
Primary	8	11.1	4	5.6	12	16.7
Secondary	20	27.8	26	36.1	46	63.9
Tertiary	5	7.0	9	12.5	14	19.4
Marital status, $p = 0.065$ (F)						
Unmarried	10	13.9	9	12.5	19	26.4
Married	17	23.6	24	33.3	41	56.9
Cohabitation	2	2.8	1	1.4	3	4.2
Separation	0	0	0	0	0	0
Divorced	3	4.2	4	5.6	7	9.7
Widowed	1	1.4	1	1.4	2	2.8
Injury level, $p = 0.37$ (Chi)						
Complete level	23	31.9	16	22.2	39	54.2
Incomplete level	16	22.2	17	23.6	33	45.8
Causes of traumatic SCI, $p = 0.13$ (F)						
Road traffic accident	13	18.1	16	22.2	29	40.3
Fall from a height over 1 m	12	16.7	8	11.1	20	27.8
Fall from a height below 1 m	0	0	3	4.2	3	4.2
Fall from body height	4	5.6	6	8.3	10	13.9
Jump into water	0	0	4	5.6	4	5.5
Crush injury	2	2.8	2	2.8	4	5.5
Others	2	2.8	0	0	2	2.8
Functional status according to the Barthel Index, $p = 0.13$ (F)						
18-20	8	11.1	12	16.7	20	27.8
5-17	23	31.9	19	26.4	42	58.3
0-4	2	2.8	8	11.1	10	13.9
Locomotor capacity according to WISCI-II, $p = 0.002^*$ (Chi)						
Lack of gait, transfer via wheelchair, WISCI-II 0 = 0	10	13.9	26	36.1	36	50.0
Functional gait, WISCI-II = 1-20	23	31.9	13	18.1	36	50.0
Discharge referral after completing rehabilitation, $p = 0.05$ (F)						
Home	31	43.0	36	50.0	67	93.0
Long-term care facility	0	0	2	2.8	2	2.8
Another hospital	2	2.8	1	1.4	3	4.2
Time between discharge from rehabilitation center and study entry, $p = 0.30$ (S)						
Average time (months) $\pm$ SD	25.81 $\pm$ 8.49		27.62 $\pm$ 10.15		26.79 $\pm$ 9.94	

AIS – American Spinal Cord Injury Impairment Scale, Chi –  $\chi^2$  test, F – Fisher's exact test, LCF – long-term care facility, *n* – number of respondents, *p* – statistical significance level, S – *t*-Student test, SD – standard deviation, WISCI-II – Walking Index Spinal Cord Injury, \*significant difference

al and environmental factors, activity and participation) and total WHOQOL-BREF score in paraplegia and tetraplegia patients.

To the best of our knowledge, no previous Polish study has analyzed QOL in patients with tetra- and paraplegia in this manner. Moreover, no Polish studies seem to tackle the issue of the use of the WHOQOL-BREF and SIP68 scales in QOL assessment in SCI patients.

Presenting the most sensitive factors influencing QOL assessment in tetra- and paraplegia patients over the first 3 years after discharge from a rehabilitation ward may be useful in working out the direction of changes that should be introduced in the care system of SCI patients.

## METHODS

Medical records, the authors' questionnaire, and the WHOQOL BREF [13] and SIP68 (a Polish version of SIP as translated by Wołowicka) [7, 8] scales were subjected to comparative analysis.

The authors' questionnaire was an extensive survey covering questions, comprising issues of socio-professional re-adaptation, compliance with hospital recommendations, and social, health-related, professional and financial problems. For the purposes of the study, only selected questions from the questionnaire were used, including age, place of residence, education, marital status, and location of rehabilitation provision. The WHOQOL BREF scale is a 26-item version of the WHOQOL-100 scale, which was initiated in 1991. These scales measure QOL based on questions covering the four domains of a patient's life: physical, psychological, social and environmental.

The SIP68 scale is a shorter version of the wider SIP scale, created by Bergner in 1981 and covering 136 questions [7, 8]. Sixty-eight of these questions are dedicated to SCI patients. It enables the assessment of the impact of the disease on physical and psychosocial functioning. It presents the issues of patient activity and participation in a more detailed manner than the WHOQOL-BREF scale.

From the aforementioned scales and records the authors chose selected issues (regarding patients' structure, function, personal and environmental factors, activity and participation) which – in their opinion – describe the QOL after SCI in the most accurate way. The study was approved by the Bioethics Committee. Signing an informed consent form was a necessary condition of participation in the study.

Initially, a total of 104 patients were invited to participate. The participants came from various parts of Poland and were discharged consecutively from the STOCER Mazovian Rehabilitation Centre (MRC) in Konstancin-Jeziorna in Poland 1 to 3 years before. Questionnaires were obtained from 72; 6 patients had

died, and 9 changed their contact details, since being discharged from hospital, and the rest did not respond to the survey. A general description of all patients included in the study is presented in Table 1. They had all experienced a traumatic SCI at C, Th or L level with motor impairment. The neurological assessment was done according to the guidelines of the American Society of Spinal Cord Injury, as AIS-A, B, C, D (American Spinal Injury Association Impairment Scale – A, B, C, D) [12]. Functional status was assessed with the Barthel scale and walking ability with the Walking Index Spinal Cord Injury (WISCI II) scale. All the information for this study was collected with use of telemedicine techniques. At first, all potential participants were sent letters by post. Patients who did not answer the letter were contacted by phone. A response sent by post was obtained from 60 persons, e-mail or personal contact were chosen by another 12. In some cases, the information was collected by telephone conversations, e-mails or during a personal meeting.

Patients with co-morbidities that could influence the quality of life (e.g. mental illness, severe head injuries) were excluded from the study. In the submitted questionnaires, the patients reported the following medical problems: spasticity (55 patients), pressure ulcers (10 patients), no control of the bladder (42 patients), and no control of intestinal function (39 patients).

The statistical, comparative analysis between the paraplegia and tetraplegia groups was based on the following methods: rate, percentage, arithmetic mean, minimum, maximum and standard deviation.

Correlations between selected factors based on medical records, the WHOQOL-BREF and SIP68 scales and total WHOQOL-BREF score were performed with the use of the Fisher exact test.

The analysis was performed with the use of the statistical software R 3.5.1 (R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>).

## RESULTS

### General description of the study groups

Questionnaires were obtained from 72 of the 104 individuals invited to participate in the study. As regards 32 non-responders (30.8% of patients included in the study) 6 patients had died, and 9 changed their contact details since their discharge from hospital. All those participating in the study had a locomotor disability after traumatic SCI. Sociodemographic characteristics and statistical comparisons of the participants from both groups are presented in Table 1.

**Table 2.** The comparison of the assessment of the quality of life in individual areas of physical, mental, social and environmental subjective assessment of the quality of life and health status in patients with an injury to the spinal cord at the cervical and thoracolumbar spine (based on WHOQOL-BREF scale)

WHOQOL-BREF scale	Paraplegia (n = 33)		Tetraplegia (n = 39)		p
	Means (SD) Scores 4-20	Means (SD) Scores 0-100	Means (SD) Scores 4-20	Means (SD) Scores 0-100	
Areas					
Physical	11.6 (1.6)	47.8 (9.8)	11.1 (2.3)	44.4 (14.2)	0.085 (F)
Mental	13.3 (1.7)	58.2 (10.5)	13.0 (1.8)	56.1 (11.5)	0.399 (F)
Social	13.6 (2.8)	59.4 (17.3)	12.7 (2.9)	54.6 (18.3)	0.191 (F)
Environmental	13.2 (2.2)	57.4 (4.0)	12.3 (2.2)	52.2 (13.9)	0.106 (F)
	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	
Quality of life assessment					
Poor and very poor	7	21.2	5	12.8	0.397 (F)
Neither good nor poor	12	36.4	20	51.3	
Good and very good	14	42.4	14	35.9	
Health status assessment					
Dissatisfied	17	51.5	12	30.8	0.202 (F)
Neither satisfied nor dissatisfied	12	36.4	20	51.3	
Satisfied	4	12.1	7	17.9	

F – Fisher's test, n – number of respondents, p – level of statistical significance

There was no significant relationship in QOL between both groups of patients and their clinical condition (neurological state based on the ASIA scale – American Spinal Injury Association Impairment Scale, the presence of pressure sores, spasticity) and sociodemographic factors (age, sex, place of residence, education, marital status).

### Quality of life assessment based on the WHOQOL-BREF

The general assessment of the QOL in the study population was at the level of  $3.22 \pm 1.46$  on a subjective five-grade scale (WHOQOL-BREF). The percentage of patients with paraplegia (complete and incomplete) who were satisfied and very satisfied with their health status was 12.1% ( $n = 4$ ), while the percentage of satisfied and very satisfied patients with tetraplegia (complete and incomplete) in this matter was 17.9% ( $n = 7$ ). 51.9% of all paraplegia patients ( $n = 17$ ) and 30.8% of all tetraplegia patients ( $n = 12$ ) were dissatisfied or very dissatisfied.

A total of 42.4% of paraplegia patients ( $n = 14$ ) assessed their QOL as good or very good; similar assessments were given by 35.9% of the tetraplegia patients ( $n = 14$ ). QOL as poor or very poor was assessed as such by 21.2% paraplegia patients ( $n = 7$ ) and 12.8% tetraplegia patients ( $n = 5$ ).

No statistical difference between C and Th/L impaired groups was seen (Table 2).

A summary of the QOL based on WHOQOL-BREF, including 4 domains of patient's life: physical, psychological, social and environmental are presented in Figure I.

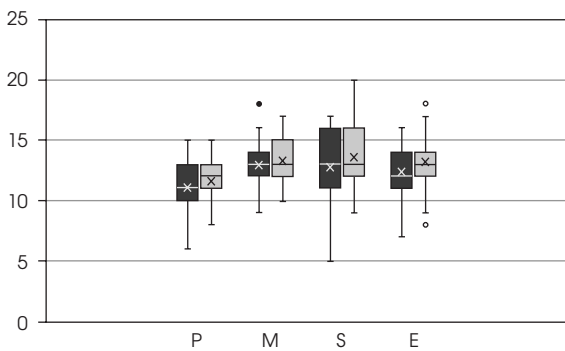
### Quality of Life assessment based on SIP68 scale

A comparative analysis of the QOL in patients with C versus Th impairment based on the SIP68 scale revealed statistically significant differences in the assessment of sub-scales: somatic autonomy, social behavior and mobility range (Figure II and Table 3). The mean score concerning somatic autonomy in patients with paraplegia was 10.8, in comparison to tetraplegia patients, where the mean score was 6.9. On the other hand, the mean score of social behavior and mobility range on the SIP68 scale were higher in tetraplegia patients compared to paraplegia patients (7.7 to 7.1 and 5.2 to 3.8 respectively). More detailed information with statistical analysis is given in Table 3.

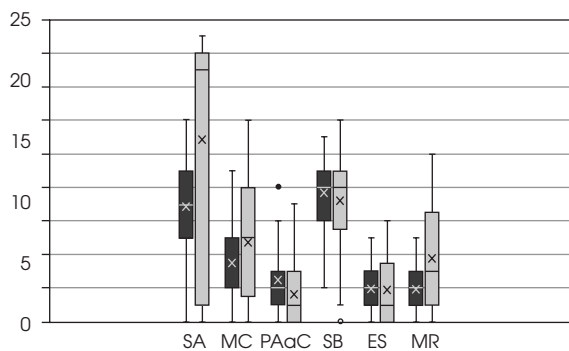
### Correlations between selected factors based on medical records, the authors' questionnaire, the WHOQOL-BREF and SIP68 scales and the total WHOQOL-BREF score

Correlations between total WHOQOL-BREF score and ability to concentrate were noticed in tetraplegia patients ( $p = 0.04$ ).

Both groups investigated presented correlations between total WHOQOL-BREF score and need of medical treatment to function in everyday life, self-acceptance, sense of security, satisfaction with one's sexual activity, interpersonal relations and ability to pursue one's interests.



**Figure I.** A summary of the quality of life in patients with spinal cord injury (dark grey – injury at the cervical level of the spine; light grey – injury at the thoracolumbar level of the spine) in the following areas (starting from the left): P – physical, M – mental, S – social, and E – environmental – based on WHOQOL-BREF scale



**Figure II.** A summary of individual components of the quality of life based on SIP68 scale in patients with spinal cord injury (dark grey – injury at the cervical level of the spine; light grey – injury at the thoracolumbar level of the spine). Starting from the left: SA – somatic autonomy, MC – movement control, PAaC – physical autonomy and communication, SB – social behavior, ES – emotional stability, MR – mobility range

Statistical significance was observed in correlations between total WHOQOL-BREF score and inability to bathe and get dressed without assistance, doing the washing, shopping, and reduced socializing (based on SIP68) in paraplegia patients. Correlations between total WHOQOL-BREF score and refraining from any recreational activity were noticed in tetraplegia patients ( $p = 0.007$ ).

Correlations between total WHOQOL-BREF score and lack of gait ( $p = 0.007$ ) and no professional activity ( $p = 0.013$ ) were noticed only in tetraplegia patients.

Correlations between the mentioned selected factors (based on medical records, the authors’ questionnaire, and the WHOQOL-BREF and SIP68 scales) and the total WHOQOL-BREF score in both study groups are presented in a more detailed manner in Table 4.

**Table 3.** The comparison of SIP68 scores in patients with spinal cord injury at the cervical and thoracolumbar level of the spine

SIP68 scale	Paraplegia						Tetraplegia						p
	Mean (SD)	Min/max	Median	% of positive answers	% of 0	% of max	Mean (SD)	Min/max	Median	% of positive answers	% of 0	% of max	
Somatic autonomy (0-17)	10.8 (7.1)	0/17	0.64	63.8	21.2	3.0	6.9 (3.3)	0/12	0.40	40.4	7.8	0.0	0.046* (F)
Control of movement (0-12)	4.7 (3.4)	0/12	0.40	39.65	12.1	3.0	3.5 (2.7)	0/9	0.29	29.1	12.8	0.0	0.780 (F)
Physical autonomy and communication (0-11)	1.6 (2.0)	0/7	0.15	14.9	39.4	0.0	2.5 (1.9)	0/8	0.23	22.6	10.3	0.0	0.079 (F)
Social behavior (0-12)	7.1 (2.8)	0/12	0.60	60.4	3.0	3.0	7.7 (2.3)	2/11	0.64	64.3	0.0	0.0	0.001* (F)
Emotional stability (0-6)	1.8 (1.9)	0/6	0.30	30.8	36.5	3.0	1.9 (1.5)	0/5	0.32	32.1	23.1	0.0	0.551 (F)
Mobility range (0-10)	3.8 (3.1)	0/10	0.38	37.9	15.2	3.0	5.2 (3.0)	0/10	0.52	52.1	5.1	7.8	0.005* (F)
Total score (0-68)	30.1 (11.2)	6/50	0.44	44.29	0.0	0.0	27.7 (8.0)	5/42	0.69	40.7	0.0	0.0	0.208 (F)

F – Fisher’s test, n – number of respondents, p – level of statistical significance, \*significant difference

**Table 4.** Correlation between selected factors associated with structures and functions – **A**, personal and environmental factors – **B**, activity and participation – **C** (based on medical records, authors' questionnaire, and the WHOQOL-BREF, SIP68 scales) and the total WHOQOL-BREF score

A. Structures and functions	Total WHOQOL-BREF score	
	Paraplegia	Tetraplegia
Neurological deficit-based on ASIA scale (medical record)		
<i>p</i> -value	0.579	0.131
AIS-A	85.2 ± 15.8	76.0 ± 13.9
AIS-B	75.0 ± 14.1	59.0 ± 0.0
AIS-C	78.7 ± 8.7	82.4 ± 9.2
AIS-D	84.4 ± 8.7	84.4 ± 9.7
Pressure ulcer(s) during the study (medical record)		
<i>p</i> -value	0.238	0.313
No	82.0 ± 12.4	79.9 ± 11.4
Yes	92.2 ± 13.9	69.8 ± 19.3
Spasticity at discharge (medical record)		
<i>p</i> -value	0.553	0.115
No	84.7 ± 11.5	92.0 ± 5.7
Yes	82.0 ± 14.1	77.9 ± 12.7
Control of bowel movement (question 13 subscale Somatic Autonomy, SIP 68)		
<i>p</i> -value	0.606	0.731
No	84.1 ± 12.3	79.8 ± 14.2
Yes	81.5 ± 14.2	78.1 ± 12.5
Control of urinary function (miction) (question 11 subscale Somatic Autonomy, SIP 68)		
<i>p</i> -value	0.308	0.942
No	85.3 ± 12.5	78.8 ± 14.2
Yes	80.7 ± 13.2	78.5 ± 12.4
Ability to concentrate (question 7 WHOQOL-BREF)		
<i>p</i> -value	0.148	0.040*
Not at all and a little	75.7 ± 11.5	70.5 ± 12.9
A moderate amount	84.1 ± 11.3	82.1 ± 10.6
Very much and extremely	89.8 ± 17.8	79.5 ± 17.8

B. Personal and environmental factors	Total WHOQOL-BREF score	
	Paraplegia	Tetraplegia
Age (medical record)		
<i>p</i> -value	0.283	0.375
> 40 yo	85.6 ± 11.4	80.7 ± 13.2
< 40 yo	80.7 ± 14.1	77.0 ± 12.5
Sex (medical record)		
<i>p</i> -value	0.362	0.125
Women	87.3 ± 18.5	92.0 ± 12.2
Man	81.4 ± 9.4	77.3 ± 12.4

**Table 4. Cont.**

B. Personal and environmental factors	Total WHOQOL-BREF score	
	Paraplegia	Tetraplegia
Place of residence (medical record)		
<i>p</i> -value	0.256	0.299
Village	86.9 ± 11.3	76.2 ± 11.8
Town/city	81.6 ± 13.3	80.5 ± 13.5
Education (medical record)		
<i>p</i> -value	0.233	0.902
Primary	87.8 ± 13.2	76.2 ± 13.7
Secondary	83.4 ± 12.9	79.2 ± 11.7
Tertiary	75.2 ± 10.0	77.9 ± 16.6
Marital status (medical record)		
<i>p</i> -value	0.053	0.845
In a relationship	79.5 ± 11.8	78.9 ± 11.6
Living on one's own	88.3 ± 12.8	78.0 ± 15.1
Time since injury sustained (months) (own questionnaire)		
<i>p</i> -value	0.185	0.899
< 20	87.1 ± 17.4	77.3 ± 12.2
20-30	86.2 ± 11.6	78.1 ± 6.3
> 30	78.4 ± 7.5	79.5 ± 15.1
Location of rehabilitation provision (own questionnaire)		
<i>p</i> -value	0.393	0.0957
Only at home	82.5 ± 12.6	74.4 ± 12.6
Home/rehabilitation facility	81.1 ± 9.2	85.0 ± 8.2
Only rehabilitation facility	89.7 ± 19.6	78.2 ± 18.3
Satisfaction with one's living conditions (question 23 WHOQOL-BREF)		
<i>p</i> -value	0.141	0.172
Very dissatisfied and dissatisfied	87.25 ± 0.0	65.0 ± 12.2
Neither satisfied and dissatisfied	75.4 ± 10.0	78.1 ± 9.5
Very satisfied and satisfied	86.2 ± 14.1	82.8 ± 16.5
Need of medical treatment to function in everyday life (question 4 WHOQOL-BREF)		
<i>p</i> -value	0.048*	0.006*
Not at all and a little	17.7 ± 7.8	72.0 ± 12.4
A moderate amount	88.9 ± 10.8	82.4 ± 10.6
Very much and an extreme amount	87.2 ± 23.0	91.7 ± 10.7
Self-acceptance (question 11 WHOQOL-BREF)		
<i>p</i> -value	< 0.001**	0.001*
Not at all and a little	73.8 ± 9.4	72.0 ± 12.4
Moderately	79.5 ± 7.0	82.4 ± 10.6
Mostly and completely	92.5 ± 13.2	91.7 ± 10.7
Sense of security (question 8 WHOQOL-BREF)		
<i>p</i> -value	0.001*	0.042*
Not at all and a little	67.0 ± 1.4	65.6 ± 9.9
A moderate amount	76.1 ± 8.9	79.8 ± 9.6
Very much and extremely	89.4 ± 11.8	84.2 ± 12.9

**Table 4. Cont.**

C. Activity and participation	Total WHOQOL-BREF score	
	Paraplegia	Tetraplegia
Severity according to the Barthel scale (medical record)		
<i>p</i> -value	0.587	0.349
≤ 17 pts	92.6 ± 13.9	77.7 ± 12.3
≥ 18 pts	85.0 ± 9.1	94.5 ± 14.8
Lack of gait-based on WISCI-II (medical record)		
<i>p</i> -value	0.329	0.007*
WISCI-II = 0	87.7 ± 19.0	75.3 ± 13.6
WISCI-II = 1-20	81.3 ± 8.8	85.2 ± 8.0
Transfer via wheelchair (medical record)		
<i>p</i> -value	0.698	0.275
Yes	84.3 ± 8.2	82.8 ± 14.0
No	82.7 ± 14.5	77.1 ± 12.1
No professional activity (medical record)		
<i>p</i> -value	0.867	0.013*
Yes	83.4 ± 12.8	77.0 ± 13.1
No	82.4 ± 13.7	87.2 ± 6.7
Inability to get dressed without assistance (question 2 subscale Somatic Autonomy, SIP 68)		
<i>p</i> -value	0.040*	0.379
Yes	84.1 ± 12.7	80.0 ± 14.1
No	69.0 ± 4.2	76.5 ± 10.7
Inability to bathe without assistance (question 10 subscale Somatic Autonomy, SIP 68)		
<i>p</i> -value	0.003*	0.137
Yes	84.4 ± 12.8	80.4 ± 12.8
No	71.3 ± 6.0	73.4 ± 12.0
Satisfaction with one's sexual activity (question 21 WHOQOL-BREF)		
<i>p</i> -value	0.001*	0.060*
Very dissatisfied and dissatisfied	78.1 ± 12.1	78.1 ± 25.0
Neither satisfied and dissatisfied	87.3 ± 4.9	73.8 ± 14.5
Very satisfied and satisfied	97.9 ± 16.0	88.8 ± 10.8
Inability to do the washing (question 6 subscale Mobility Range, SIP 68)		
<i>p</i> -value	0.019*	0.099
Yes	87.7 ± 14.4	84.2 ± 14.4
No	77.8 ± 8.2	76.1 ± 11.4
Inability to clean the house/flat (question 3 subscale Mobility Range, SIP 68)		
<i>p</i> -value	0.101	0.189
Yes	87.2 ± 11.8	82.2 ± 14.1
No	79.9 ± 13.0	76.3 ± 11.7
Inability to do the shopping (question 1 subscale Mobility Range, SIP 68)		
<i>p</i> -value	0.036*	0.140
Yes	87.5 ± 11.0	82.9 ± 14.1
No	78.1 ± 13.3	76.2 ± 11.6

**Table 4. Cont.**

C. Activity and participation	Total WHOQOL-BREF score	
	Paraplegia	Tetraplegia
Discontinuation of management of personal and home-related issues (e.g. paying bills, visiting banks, planning one's expenditures) (question 9 subscale Mobility Range, SIP 68)		
<i>p</i> -value	0.835	0.0558
Yes	83.5 ± 11.6	82.2 ± 12.7
No	81.0 ± 21.9	74.4 ± 12.0
Satisfaction with means of transport (question 25 WHOQOL-BREF)		
<i>p</i> -value	0.573	0.749
Very dissatisfied and dissatisfied	80.2 ± 13.3	77.3 ± 14.7
Neither satisfied and dissatisfied	83.2 ± 11.6	78.3 ± 13.4
Very satisfied and satisfied	86.6 ± 14.6	82.2 ± 5.3
Reduced socializing (e.g. meeting other people) (question 4 subscale Social Behavior, SIP 68)		
<i>p</i> -value	0.042*	0.409
Yes	91.9 ± 14.2	88.0 ± 17.0
No	80.0 ± 10.8	77.8 ± 12.4
Reduced participation in cultural life (entertainment) (question 6 subscale Social Behavior, SIP 68)		
<i>p</i> -value	0.130	0.384
Yes	94.8 ± 16.0	88.3 ± 16.5
No	81.1 ± 11.3	77.8 ± 12.4
Satisfaction with interpersonal relations (question 20 WHOQOL-BREF)		
<i>p</i> -value	0.035*	> 0.001**
Very dissatisfied and dissatisfied	0.0 ± 0.0	64.8 ± 6.3
Neither satisfied and dissatisfied	74.3 ± 10.4	68.9 ± 10.1
Very satisfied and satisfied	85.6 ± 12.5	83.5 ± 11.1
Lowered sexual activity (question 1 subscale Social Behavior, SIP 68)		
<i>p</i> -value	0.451	0.504
Yes	90.2 ± 18.3	82.7 ± 9.2
No	82.2 ± 12.0	78.2 ± 13.1
Refraining from any recreational activity (question 12 subscale Social Behavior, SIP 68)		
<i>p</i> -value	0.527	0.007*
Yes	85.3 ± 13.1	86.1 ± 10.9
No	82.2 ± 12.9	74.8 ± 12.2
Devoting less time to one's hobby (question 10 subscale Social Behavior, SIP 68)		
<i>p</i> -value	0.728	0.603
Yes	84.1 ± 13.3	77.8 ± 13.4
No	82.5 ± 12.8	80.0 ± 12.0
Ability to pursue one's interests (question 14 WHOQOL-BREF)		
<i>p</i> -value	> 0.001**	> 0.001**
Not at all and a little	75.3 ± 9.6	72.0 ± 10.9
Moderately	86.4 ± 2.8	82.5 ± 9.0
Mostly and completely	94.0 ± 16.6	93.8 ± 9.8

AIS – American Spinal Cord Injury Impairment Scale, *p* – level of statistical significance, WHOQOL-BREF – World Health Organization Quality of Life – Brief, WISCI-II Walking Index Spinal Cord Injury, \*significant difference, \*\*very significant difference

## DISCUSSION

To the best of our knowledge it is the first study conducted in Poland to compare QOL (based on the WHOQOL-BREF and SIP68 scales) between patients with traumatic SCI with tetraplegia and patients with paraplegia. At the same time, it is the first Polish publication to search for correlations between selected factors based on medical records, the WHOQOL-BREF and SIP68 scales and total WHOQOL-BREF score in these groups of patients.

To determine whether there are any health, psychological or social factors that influence the QOL of paraplegic and tetraplegic patients in a statistically significant manner, we searched for correlations between selected factors based on medical records, the authors' questionnaire, the WHOQOL-BREF and SIP68 scales and the total WHOQOL-BREF score (Table 4).

The neurological status of patients in both groups does not affect their quality of life, which is congruent with other studies [14, 15]. This is probably related to individuals' acceptance of their disability and changes in patients' expectations due to different functioning. Iorio-Morin *et al.* [14] present self-acceptance as the cause of living a happy life, referring to the phenomenon of "response shift" documented in the theoretical model of Sprangers *et al.* [16].

Pressure ulcers, spasticity and chronic pain are common complications after SCI that result in poorer QOL [17, 18], depression [19] and sleep disturbances [20]. In our study these complications did not influence the QOL of patients in both groups. The authors believe that our patients, due to the lack of continuous multidisciplinary care after the SCI, simply got used to the fact that their illness is related to these complications.

Although the neurological status of patients does not determine QOL in both groups, lack of gait has a different effect on QOL in patients with tetraplegia (Table 4). This, in turn, can be explained by the fact that lack of gait is associated with the limitation of many activities, including the ability to pursue one's own interests and recreation, and patients' activity and participation in social, public or cultural life. In addition, awareness of these restrictions is the cause of sadness, which affects the quality of mental health. This may manifest itself, e.g., in attention deficit disorder (worsened ability to concentrate). Perhaps the assessment of other parameters of depression parameters not mentioned would also provide statistically significant relationships with QOL in patients with tetraplegia.

Similarly, to the factors detailing clinical status, most sociodemographic factors (with the exception of professional activity) have no statistically significant effect on the QOL of both groups. This could also be associated with the change of patients' expectations from factors determining structure and function in favor of factors related to activity and participation.

The reduced professional activity of patients with SCI is responsible for changes in social status and may affect the financial situation of the family [1, 21, 22]. Returning to professional activity after SCI is very challenging for most of patients. According to the professional literature a higher unemployment rate is observed in people with SCI [23-26]. The present study shows that the professional inactivity of tetraplegic patients affects in a significant way their total WHOQOL-BREF score. This result corresponds with another Polish study, in which the absence of professional activity correlated with worse QOL and was observed in individuals with an injury at the C segment of the spine [8].

A comparative analysis revealed no significant differences in the assessment of individual QOL components of the WHOQOL-BREF scale. The results of our study do not differ from those of other authors [27].

Both groups presented correlations between total WHOQOL-BREF score and need of medical treatment to function in everyday life, self-acceptance, sense of security, satisfaction with sexual activity, interpersonal relations and ability to pursue one's interests (Table 4).

Self-acceptance is extremely important in the context of maintaining mental health and it significantly correlated with the assessment of QOL in both studied groups. Although the study did not assess depression according to specific scales, its individual components such as loss of interest or limitation of interpersonal relations are serious mental health problem in patients after SCI. This is similar to a loss of the sense of security, which may be interpreted as 'freedom from danger, fear or assault' [28]. A decreased sense of security may have a negative impact on other mental health factors associated with the activity and participation section of WHOQOL-BREF, and in that way may lead to a vicious circle paradox and/or domino effect.

The quality of sexual life with interpersonal relations becomes particularly important, especially in persons with a marked reduction of independence [29, 30]. Sexual functions are a very important factor in the QOL; recovery of these activities is the highest priority in patients with paraplegia and is in second place of priority in the tetraplegic patients after recovery of hand function [31, 32]. Numerous studies have shown that sexual life is one of lower-graded components of the WHOQOL-BREF scale [33-35], with lower scores compared to the general population [36]. Anderson *et al.* [37] attempted to answer the question of whether improvement of sexual function might significantly improve the QOL. The vast majority of post-SCI respondents gave a positive response. In our study a significant correlation was observed between the satisfaction with one's sexual activity and total WHOQOL-BREF score in both the paraplegic and tetraplegic groups ( $p = 0.001$  and  $p = 0.060$  respectively). The observed similarity of results in our study may result from the increasing sexual awareness of Polish society, improving sex



education and decreasing disproportion of general QOL between Poland and other European countries [21, 22].

Statistical significance was observed in correlations between total WHOQOL-BREF score and inability to bathe and get dressed without assistance, doing the washing, shopping and reduced socializing in paraplegia patients (Table 4).

Dependence on others may be a cause of demotivation, which can lead to a decrease in patients' daily living activity. The present study showed that the QOL of patients with paraplegia is influenced greatly by the ability to engage in activities connected with housework. Patients with paraplegia keep the complete function of the upper limbs, which gives them much greater functional capabilities compared to the patients with tetraplegia. Awareness of keeping hand function is connected with high expectations of the ability to perform most household activities. In the end, it turns out that paraplegia seriously affects household function in the confrontation with everyday reality. This can cause irritability, which correlates with the level of QOL of paraplegia patients. This correlation corresponds with other results from our study, where we observed a statistically significant difference in the assessment of mobility range and social behavior in the SIP68 scale, which was lower in paraplegia patients compared to tetraplegia patients.

The authors believe that the above results may be useful for many specialists working with SCI patients: neurologists, psychologists, neurosurgeons, orthopedists, physiotherapists and the health sector management staff in Poland.

Understanding the specific needs of patients with paraplegia and tetraplegia and the impact of these on QOL can help in planning an optimal and specific treatment and care system for patients of this kind. For example, to improve QOL paraplegia patients should learn, in particular, how to deal with housework, and receive some help with socializing programs, while tetraplegia patients could obtain more benefit from being helped to find satisfying work or a sports group with which to practice recreational activity.

## LIMITATIONS

The present study was conducted at one center and the majority of the population of patients with SCI presented in this study resided in central Poland. The study presents an outline of the QOL-related problems of Polish SCI patients, but a more thorough analysis would

require the conduct of multicenter or international research.

Polish rehabilitation wards do not offer programs of socio-professional care for patients with SCI, which may cause certain problems with comparing the present results to those obtained in other countries.

The present authors did not analyze all of the factors associated with structure and functions, environmental and personal aspects of patients with SCI. Elaborating on those aspects (which were beyond the range possible with the research tools that were used) might put the study in a slightly different light.

The inability to perform an objective assessment of the health status of patients with SCI undoubtedly limited the possibility of conducting a detailed assessment of other parameters regarding the structures and functions according to the ICF (The International Classification of Functioning, Disability and Health) concept. Further research on QOL assessment in SCI patients should deal with the above-mentioned limitations for the objectivization of QOL assessment in patients with SCI.

The authors are aware that having participated in a telephone conversation may have affected some patients' responses as it is considered easier to answer some questions by filling in a questionnaire yourself than during a telephone or face-to-face conversation (e.g. questions about sexual life, earnings, etc.).

## CONCLUSIONS

This study shows and helps to understand differences in the assessment of QOL between patients with paraplegia and tetraplegia. Based on the observed results, specific social, psychological and physical needs of both groups of SCI patients in Poland were revealed. Health sector management staff and specialists should take into consideration the differences between the two groups and plan optimal treatment and care plans for them. Changes to the Polish health care system should focus on increasing QOL by helping paraplegia patients to learn how to deal with everyday problems, and encourage their participation in socializing programs, while tetraplegia patients could obtain more benefit from being helped to find satisfying work or a sports group with which to practice recreational activity. In the authors' opinion, this knowledge could be used to develop an effective treatment and care system, depending on the level of injury.

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### Conflict of interest

Absent.

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