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# Assessment of Mobility and Pain Intensity among Patients with Cervical Discopathy Treated Conservatively at the Neurosurgical Outpatient Clinic

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## Summary

## Introduction

Discopathy of the cervical spine is becoming an increasingly common problem among the entire population, assuming the status of a civilization disease.

## Aim of this paper

The aim of the paper was to assess the functional efficiency and pain intensity among patients treated conservatively due to the degenerative disc disease of the cervical spine.

## **Materials and methods**

The study included 100 patients treated conservatively in the neurosurgical outpatient clinic. A self-prepared questionnaire, the NRS (Numerical Rating Scale) pain scale and the NDI (Neck Disability Index) performance evaluation scale were used to conduct the research.

## **Findings**

Differences in pain severity were found in the respective Neck Disability Index scale groups. There was no significant correlation between the type of work and the degree of disability on the Neck Disability Index scale and the relationship between the mode of work and the perceived pain.

## **Conclusions**

On the basis of the conducted research, it was found that there was a significant relationship between cervical spine pain and the degree of disability defined in the Neck Disability Index. The type of work performed did not show any relationship with the degree of Neck Disability Index disability, and the mode in which the work is performed has no significant impact on pain.

**Keywords:** Neck Disability Index, disability, pain, Numerical Rating Scale

## **Introduction**

Discopathy, called the degenerative disc disease of the spine, is one of the most important forms of spinal degenerative disease [1]. Spinal degenerative disease is accompanied by pain that affects the functioning of patients. It can lead to anxiety-depressive disorders, and both these factors significantly affect the patients' quality of life [2]. Pain is a subjective, personal experience that cannot be directly experienced by other people. One of the problems associated with the occurrence of pain is the problem with the determination of

clinically significant levels of pain intensity and frequency [3]. Pain is one of the most characteristic symptoms of cervical spine discopathy. This is due to the fact that the most important nerves run within the cervical spine structures, and any non-physiological changes can cause irritation or pressure on them [4]. Discopathy of the cervical spine is an increasingly common disease in the society. Pain and other associated disorders affect the daily functioning of people affected by this ailment. To a greater or lesser extent, they impede active participation in everyday life, entertainment and work.

### **Materials and methods**

The research was carried out at the Neurosurgical Outpatient Clinic of the Provincial Hospital in Bielsko-Biała after obtaining a written consent of the director of the institution. The research was carried out from March 2017 to February 2018. It involved 100 patients of the neurosurgery clinic with cervical discopathy. The questionnaire with which the NDI (Neck Disability Index) scales were performed.

### **Statistical methodology**

The statistical calculations were carried out using the statistical package PQStat 1.6.6, PSPP 1.0.1 and MS Office (Excel 2007). The quantitative variables were characterized by median, minimum and maximum values, standard deviation. The qualitative variables were presented by means of percentages and numbers. To check whether there is a statistically significant relationship between the qualitative variables, the chi-square test was used. In the case when the assumption of the minimum expected numbers necessary for the chi-square test was not fulfilled, the Fisher test was used. The Shapiro-Wilk test was used to check whether the quantitative variable came from a population with normal distribution. The Mann-Whitney test was used to examine the significance of the differences between the two groups, it was used when the conditions for the Student's t-test were not met. To test the differences between more than two groups, the Kruskal-Wallis test was used when the conditions for the use of the one-way ANOVA analysis were not met. In all the analyses, the relevance level was set at  $p < 0.05$

### **Findings**

The characteristics of the study group are presented in Table I.

The age structure of the studied population is presented in Table II.

**Table I. Characteristics of the test group**

Footer		Total		Sex			
		N	%	Female		Male	
				N	%	N	%
Sex	Female	50	50,0	50	100	-	-
	Male	50	50,0	-	-	50	100
Age	19-44	63	63,0	34	68,0	29	58,0
	45-68	37	37,0	16	32,0	21	42,0
Place or residence	Town/city	53	53,0	30	60,0	23	46,0
	Countryside	47	47,0	20	40,0	27	54,0
Education	None	1	1,0	1	2,0	0	0,0
	Elementary	4	4,0	2	4,0	2	4,0
	Vocational	28	28,0	9	18,0	19	38,0
	Secondary	44	44,0	26	52,0	18	36,0
	Higher	23	23,0	12	24,0	11	22,0
Financial situation	Employed	84	84,0	42	83,0	42	83,0
	Unemployed	5	5,0	4	8,0	1	2,0
	Retirement/disability pension	10	10,0	2	4,0	8	16,0
	Other benefits	3	3,0	3	6,0	0	0,0
Work mode	Standing	52	61,9	23	54,8	28	68,3
	Sitting	32	38,1	19	45,2	14	31,7
	Other	0	0	0	0,0	0	0,0
Work type	Blue-collar	44	52,4	19	45,2	25	59,5
	White-collar	40	47,6	22	54,8	16	40,5
Social situation	I live alone	18	18	8	16,0	10	20,0
	I live with my family	82	82	42	84,0	40	80,0

*N - number, % - percentage*

**Table II. Age structure of the study group**

	Average	-95% CI'	+95% CI'	Median	SD	Min	Max
Age	40,82	38,30	43,34	39,00	12,704	20	68

*-95% CI', + 95CI' - confidence range, SD - standard deviation, Min - minimum value, Max - maximum value*

Clinical characteristics are presented in Table III.

**Table III. Clinical characteristics of the test group**

Clinical characteristics of pain complaints		Total		Sex			
		N	%	Female		Male	
				N	%	N	%
Duration	Over 3 months	80	80	39	78,0	41	82,0
	Under 3 months	20	20	11	22,0	9	18,0
Coping with pain	Pharmacologically	61	61	30	60,0	31	62,0
	Kinesiotherapy	22	22	15	30,0	7	14,0
	Physiotherapy	17	17	5	10,0	12	24,0
Using the physiotherapist's help	Yes	20	20	8	16,0	12	24,0
	No	80	80	42	84,0	38	76,0
Doing exercises on one's own	Yes	32	32	18	36,0	14	28,0
	No	68	68	32	64,0	36	72,0

*N - number, % - percentage*

Among the studied population, the largest group according to the Neck Disability Index (60%) were people with moderate disability. There were no people with the lack of disability, though. In the remaining groups of the Neck Disability Index scale the results presented in Table IV were collected.

**Table IIV. The results obtained in individual Neck Disability Index groups**

The NDI group	NDI scale	
	N	%
No disability (0-4)	0	0
Mild disability (5-14)	25	25
Moderate disability (15-24)	60	60
Severe disability (25-34)	13	13
Complete disability (<35)	2	2

*N - number, % - percentage*

The average value of the Neck Disability Index score was 18.99, with the minimum value of 7, and the maximum of 46. Table 6 presents the results concerning the minimum, maximum, mean, standard deviation, median and confidence level of 95% CI, obtained on the Neck Disability Index scale(table V)

**Table V. The characteristics of the results in Neck Disability Index scale**

NDI						
Average	-95% CI'	+95% CI'	Median	SD	Min	Max
18,99	17,74	20,24	19,00	6,284	7	46

*SD - standard deviation, Min - minimum value, Max - maximum value, -95% CI', + 95CI' - confidence range*

Table VI presents the results (mean, SD) obtained within the respective areas of the Neck Disability Index, taking into account the degree of disability.

**Table VI. The results obtained in the respective areas of the Neck Disability Index**

Areas of the NDI scale	Disability level							
	Mild		Moderate		Heavy		Complete	
	Average	SD	Average	SD	Average	SD	Average	SD
<b>Pain intensity</b>	2,8	0,58	3,3	0,75	4,4	0,51	3,5	0,71
<b>Care (washing, dressing up, etc.)</b>	1,8	0,47	2,5	0,70	2,7	0,63	3,0	1,41
<b>Lifting items</b>	2,5	0,65	3,4	1,01	4,5	0,78	5,0	0,00
<b>Reading</b>	2,5	0,87	2,8	0,84	3,1	0,86	2,5	2,12
<b>Headache</b>	2,0	0,79	3,4	0,93	4,6	1,39	4,0	2,83
<b>Concentration</b>	1,6	0,57	2,3	0,76	2,2	0,56	2,5	0,71
<b>Work</b>	2,4	0,50	2,7	0,72	4,1	1,17	3,5	2,12
<b>Driving a car</b>	2,2	0,78	3,0	0,73	4,2	1,41	4,0	1,41
<b>Sleeping</b>	2,0	0,74	3,0	0,92	4,0	1,16	4,5	0,71
<b>Rest</b>	2,1	0,60	3,0	0,78	4,2	0,83	4,0	2,83

*SD - standard deviation*

The analysis of pain complaints assessed on the Numerical Rating Scale indicated a minimum value of 2, and the maximum of 7 while the average was 4.16, the general characteristics are presented in Table VII. Table VIII presents the characteristics of pain complaints in the respective groups of Neck Disability Index scale.

**Table V. Results characteristics of the Numerical Rating Scale**

NRS						
Average	-95% CI'	+95% CI'	Median	SD	Min	Max
4,16	3,89	4,43	4,00	1,369	2	7

*SD - standard deviation, Min - minimum value, Max - maximum value, -95% CI', + 95CI' - confidence range*

**Table VIII.** Pain complaints were found in the respective groups of the Neck Disability Index scale.

The NDI group	NRS				
	Average	Median	SD	Min	Max
Mild disability	3,4	3	1,08	2	6
Moderate disability	4,1	4	1,245	2	7
Severe disability	5,769	6	1,092	4	7
Complete disability	5	5	1,414	4	6

*SD - standard deviation, min - minimum value, max - maximum value*

Significant differences between the Neck Disability Index scale groups were observed in the context of perceived pain ( $p < 0.05$ ). The test results are shown in Table IX.

**Table IVI.** The comparison of results obtained on the Neck Disability Index scale and the Numerical Rating Scale

The NDI group	The NRS scale			Test results Kruskal - Wallis
	Me	Min	Max	
Mild disability	3,00	2	6	$\chi^2 = 24.261$ $df = 3$ $p = 0.547$
Moderate disability	4,00	2	7	
Severe disability	6,00	4	7	
Complete disability	5,00	4	6	

$\chi^2$  – statistics tests  $df$ – degrees of freedom  $dyp$  –relevance,  $me$  – median,  $min$  – minimum value,  $max$  – maximum value

Analysing the relationship between the work mode (sitting, standing) and pain complaints assessed on the Numerical Rating Scale, after checking normality with the Shapiro-Wilk test, the Mann-Whitney test was used. The test results did not show statistically significant differences between the study groups ( $p > 0.05$ ). The results are shown in Table X.



**Table X. Evaluation of the relationship between the work mode and pain complaints**

	Work type						Test results Mann-Whitney
	Sitting			Standing			
	Me	Min	Max	Me	Min	Max	
Pain complaints on the NRS scale	4,00	2	6	4,00	2	7	$U = 754.00$ $p = 0.547$

*U* - test statistics; *p* - significance, *min* - minimum value, *max* - maximum value, *me* - median

Considering the relationship between the mode of occupational work and the degree of disability on the Neck Disability Index scale, no statistically significant result was obtained. To carry out the analysis the Fisher's test was used, and the level of significance was adopted at  $p = 0.05$ . The results are shown in Table XI.

**Table XI. Relationship between the degree of disability on the Neck Disability Index and the mode of work**

			Work mode (if working):		Test results
			Standing	Sitting	
Degree of disability in the NDI scale	Mild disability	N	10	10	$p = 0.537$
		%	19,2%	31.3%	
	Moderate disability	N	34	20	
		%	65.7%	62.5%	
	Severe disability	N	6	2	
		%	11,5%	6.3%	
	Complete disability	N	2	0	
		%	3,8%	0.0%	
Total		N	52	32	
		%	100.0%	100.0%	

*p* - significance;  $\chi^2$  - test statistics; *df* - degrees of freedom

The relationship between the degree of disability resulting from the Neck Disability Index and the type of work performed (physical, mental) was checked with the Fisher test, assuming a significance level of  $p = 0.05$ . The test result turned out to be statistically insignificant  $p > 0.05$ , which indicates that there is no significant relationship between the considered variables. The results are shown in Table XII.

**Table XII. Assessment of the relationship between the type of work and the degree of disability according to the Neck Disability Index**

The NDI group	Work type		Test results
	Physical	White-collar	
Mild disability	N	12	8
	%	27.3%	20.0%
Moderate disability	N	28	26
	%	63.6%	65.0%
Severe disability	N	3	5
	%	6.8%	12.5%
Complete disability	N	1	1
	%	2.3%	2.5%
Total	N	44	40
	%	100.0%	100.0%

$p = 0.789$

*p* - significance;  $\chi^2$  - test statistics; *df* - degrees of freedom

## 6. Discussion

In the described observation, all the participants were treated conservatively in the neurosurgical outpatient clinic. They were assessed once, and the tests were to be used to assess their everyday functional fitness and pain. The largest group of the patients were those with moderate disability in the NDI (Neck Disability Index). The results of our own research have shown that there is a correlation between the different Neck Disability Index groups in the context of felt pain discomfort. The research showed that pain is more intense in the case of increasing disability assessed in the NDI (Neck Disability Index). Kozłowski et al., [5] carried out research to assess the frequency of spine pain and the quality of life of people affected by these ailments. The study also took into account the lifestyle and level of pain intensity. The study group consisted of 103 people. The study was conducted in the period from January to March 2016 using the standardized interview method. The tool used to collect the data was the original, anonymous questionnaire, consisting of 43 questions with the possibility of a single choice, including three multiple-choice questions. These questions concerned the areas included in the Neck Disability Index. The research showed that pain affects the daily functioning, and its severity is significantly related to the degree of disability. Due to pain, patients report problems with lifting, walking, sitting, sleeping. Most patients perform daily activities, but they cause additional discomfort. These results coincide with the presented own results.

The research carried out by Kamper et al. [6]. Its aim was to assess pain in patients with cervical spine pain syndrome. The pain was measured using a verbal, numerical and analogue scale to assess its intensity. The group of respondents consisted of 361 people after cervical spine injury. The research confirms the varied level of pain, measured by the pain intensity assessment scales in the numerical rating scale according to the neck disability index. Our research is confirmed by the fact that pain symptoms intensify with the increase of the degree of disability.

Analysing the relationship between the work mode and the degree of disability obtained on the Neck Disability Index scale and pain complaints on the NRS scale (Numerical Rating Scale), there was no relationship between the variables considered. The groups were not significantly different from each other in the statistical context which probably resulted from the small size of the study group. Taking into account the fact that pain may have and as a rule has a significant relationship with the mode or type of work performed, there are other questionnaires used to assess pain complaints from the skeletal system in the professional context. An example of such a questionnaire is the Nordic Questionnaires focusing on the main symptoms occurring in a given professional environment.

The research carried out in state institutions in Warsaw and Katowice by Zejde et al. [7], whose aim was to assess the frequency and severity of pain in the upper limbs, neck and back muscles of employees who regularly use their computers while performing professional work and check the relationship between these types of ailments and the time and conditions of this type of work. It confirmed that the mode of professional work has an impact on the pain in the neck area. In these studies a modified Nordic Questionnaire was used, and the visual analogue scale was used to assess the ailments. The study group in this case constituted 477 people performing sedentary office work. Neck pain was reported by 258 people working in sedentary mode, including 61.5% of women and 34.3% of men. These results are divergent from those presented in our own research, showing that the sedentary work can be combined with the occurrence of pain in the spine.

In the study conducted by Bugajska et al. [8], whose aim was to determine the frequency of occurrence of pain intensity in the locomotor system, upper limb overload syndromes, among people performing repetitive work, in various occupations, in Polish conditions. The study group consisted of 1112 people, 801 of whom did sedentary work. To assess the ailment the Nordic Questionnaire was used in the same way as in the previous example and VAS visual-analogue scale to assess pain. The study indicated, as in the previous study, that women

reported pain more frequently. Among the surveyed people doing sedentary work, 60.8% of women and 32.9% of men reported neck pain. In this study, results were also obtained that neck pain in work performed in the standing mode is 23.9% among women and 29% among men. Summing up the comparison between the studies available and presented in the above work, one should consider extending the analyses to more complex correlates with regard to gender. The main differences in results may concern the size of the study groups. These studies do not confirm the results of own research.

The results of our own research regarding the relationship between the type of work performed and the degree of disability on the Neck Disability Index scale did not show statistically significant relationships. The study groups turned out to be too similar. Therefore, the hypothesis was not reflected and confirmed in the results.

Solecki [9] carried out his research on a group of 58 farmers from the area of 7 communes in the Lubelskie Voivodeship, dealing in mixed agricultural production. The mean age of the respondents was 54.9. The comparative group consisted of research workers from the University of Life Sciences in Lublin and the Institute of Rural Medicine named after W. Chodźko in Lublin - 41 people in the average age of 48.9 years. The basic research tool used to obtain the necessary data was a survey based in part on the standardized Nordic questionnaire. It showed that the pain complaints reported by farmers regarding the cervical area are statistically significantly more frequent ( $p = 0.0012$ ) than in the comparative group. These results are divergent with our results presented.

There are studies describing the nurses' professional group. This work is associated with overloads within the musculoskeletal system. The type of work undoubtedly is of physical status associated with lifting a large weight and often enforced body posture inappropriate for the spine. An example of such research is the work of Juraszek et al. [10] in which the impact of professional work on the occurrence of back pain on the example of nurses was assessed. The study group consisted of 205 professionally active nurses from the Kuyavian-Pomeranian Voivodship. The data for the study was obtained using an original questionnaire containing 25 open and closed questions. The research showed that the location and occurrence of pain in the spine depends on the type of position occupied related to the performance of specific activities resulting from the nature of the work, which was not confirmed by our own research.

Other studies also carried out within the Kuyavian-Pomeranian Voivodship were presented by Baumgart et al. [11]. The examined group in this case constituted of 60 randomly chosen

nurses. In order to assess the disability caused by lumbar and cervical spine, the Polish version of the Oswestry Disability Scale (ODI) and Neck Disability Index (NDI) were used. In these studies, the correlation of NDI results with the type of work performed was demonstrated, which was not demonstrated by our own research. Moreover, it was shown that the body mass index assessed with Body Mass Index (BMI) had an impact on the severity of pain in the spine and that the pain in the spine in the study group concern people with shorter seniority and increase accordingly in people with longer periods of work.

Summing up, it should be stated that the conducted studies demonstrated significant connections between pain and the degree of disability resulting from diseases of the cervical spine, namely they showed that pain symptoms intensify with increasing disability. In our own research, there was no significant influence of the type and mode of professional work on the degree of disability, and the mode of work did not show any dependence on the perceived pain complaints, which were demonstrated by other persons examining the above variables.

## **Conclusions**

1. The declared level of pain among patients varies depending on the degree of disability resulting from cervical spine disease. The more severe the disability, the greater the intensity of pain.
2. The results did not show that the type (physical, mental) and mode (seated, standing) of professional work was a significant factor differentiating the degree of disability.
3. No relationship was found to exist between the mode (standing, sitting) of performed professional work, and pain ailments experienced by patients.

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