

## The occurrence of back pain in young paramedics

### Występowanie dolegliwości bólowych kręgosłupa u młodych ratowników medycznych

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#### ABSTRACT

**BACKGROUND:** The occurrence of back pain is associated with many factors, which include among others, workloads such as: the type and time of work execution as well as repetitive work. The work of a paramedic must also take into account the impact of stress on the increased tension of soft tissues. Overload often occurs due to the shearing forces of forced static positions, as well as dynamic loads during the handling of sick and injured people.

**AIM:** The aim of the study was to evaluate the effect of the work and work-time of paramedics on the occurrence of back pain.

**MATERIAL AND METHODS:** The study included 89 men aged 20 to 45 years (mean age = 29.30 ± 4.56) actively engaged in the paramedic occupation. The respondents were divided into two groups – men working in the profession for five years, and over. The study authors used a questionnaire and the Visual Analogue Scale.

**RESULTS:** Among the males from group A, the intensity of back pain showed a positive correlation with the number of years working in the profession. No co-variability between the intensity of back pain and their age was observed among the examined paramedics. Back pain affects their daily duties, the efficiency of their work and the mood of the respondents.

**CONCLUSIONS:** The occurrence and severity of back pain among paramedics increases in the first few years of their careers. Back pain in paramedics affects the activities they perform in everyday life.

#### KEY WORDS

repetitive work, back pain, VAS scale, ergonomics, work experience, pain

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## STRESZCZENIE

**WSTĘP:** Występowanie dolegliwości bólowych kręgosłupa u ratowników medycznych jest związane m.in. z obciążeniem pracą zawodową, jej rodzajem, czasem trwania i monotypią ruchową. Stres dodatkowo może potęgować te dolegliwości poprzez wzmoczenie napięcia tkanek miękkich. Nierzadko przeciążenia powstają ze strony sił ścinających statycznego przyjmowania wymuszonych pozycji, a także dynamicznych obciążeń podczas przenoszenia chorych i uszkodzonych osób.

**CEL PRACY:** Celem pracy była ocena wpływu pracy zawodowej na występowanie dolegliwości bólowych kręgosłupa u ratowników medycznych.

**MATERIAŁ I METODY:** Badaniami objęto 89 mężczyzn w wieku od 20 do 45 lat ( $x = 29,30 \pm 4,56$ ) czynnie wykonujących zawód ratownika medycznego. Badanych podzielono na dwie grupy w zależności od stażu pracy – grupę pracujących do 5 lat oraz powyżej. Do badań użyto autorskiego kwestionariusza ankiety oraz skali VAS.

**WYNIKI:** Ratownicy z mniejszym stażem pracy częściej wskazywali na dolegliwości bólowe, a ich intensywność była wprost proporcjonalna do stażu pracy. W obu grupach wiek nie miał wpływu na występowanie tych dolegliwości ( $p > 0,05$ ). Ból kręgosłupa rzutował na codzienną pracę, efektywność wykonywanych czynności oraz nastroj badanych.

**WNIOSKI:** Występowanie i nasilenie dolegliwości bólowych kręgosłupa u ratowników medycznych narasta w pierwszych kilku latach ich pracy zawodowej. Ból kręgosłupa ma wpływ na wykonywane przez nich czynności życia codziennego.

## SŁOWA KLUCZOWE

monotypia, dolegliwości bólowe kręgosłupa, skala VAS, ergonomia, staż pracy, ból

## INTRODUCTION

The occurrence of back pain is a symptom commonly recognized in different occupational groups. Among the exo- and endogenous causes of this ailment, only exogenous ones are modifiable (improper movement habits, lack of or low-active physical exertion, poor ergonomics, stress, obesity) [1].

Work factors such as lifting heavy objects, assuming a forced body position and their repeatability, or repetitive work movements have a large impact on the incidence of spinal pain. They lead to the formation of shearing forces, microtraumas, fibrosis and adhesions, and reduced flexibility of the soft tissues. The described factors result in both local overloads, as well as dysfunctions that may radiate to other parts of the body, mimicking the problem of overload in a different structure and location of the body [2]. In addition, too much burden per employee while carrying objects as well as long time body burden often translate into the development of overuse syndromes [3].

Requirements specifying the number of hours of work and the implementation of agreements by emergency medical service providers are regulated by Ordinance No. 65/2012/DSM, signed by the President of the National Health Fund on 17 October 2012. [4]. Appendix 3 of the above-mentioned ordinance explains that the average weekly working time should be in the range of

12 to 72 hours. While being on duty, the continuous working time should not exceed 24 hours and shall be followed by an eleven-hour break [5]. This means in fact that a paramedic can perform three shifts in a week after 24 hours of continuous work. From the point of view of circadian rhythm, different dimensions of time can cause "jet lag" – a syndrome of time debt, or disruption of circadian rhythm due to a time difference, or shift work. This may result in reduced speed of reaction, fatigue and loss of concentration [6].

In carrying out the work of a paramedic, shift work and the stress of sudden departures to save lives under time pressure and often in difficult conditions associated with heavy traffic seem important. Accordingly, the occurrence of PTSD (Post-Traumatic Stress Disorder) as a state occurring in people exposed to the view of or partaking in drastic events (cases) is not uncommon [7]. It is estimated that 10% of people suffering from chronic pain can have PTSD symptoms [8,9], and occupational stress is considered as the second disease after symptoms reported with reference to the musculoskeletal system [10]. Due to these factors and fluctuations in the circadian cycle in relation to the nature of work, it was reasonable to conduct studies to assess the impact of work and work-time of paramedics on the occurrence or increase in existing back pain. In addition, attempts to assess the relationship of back pain with activities of daily life were made.

## MATERIAL AND METHODS

### Participant

The study was conducted among 89 men aged 20 to 45 (mean age =  $29.30 \pm 4.56$ ) years, working in the position of a paramedic. The surveyed people were divided into two groups based on the years of service in the profession. Group A consisted of 45 men working in the profession from 1 to 5 ( $2.91 \pm 1.42$ ) years, while Group B included 44 males working in the profession from 6 to 15 ( $9.44 \pm 2.74$ ) years. The criterion for inclusion in the study was the years of service to qualify for the appropriate group. The criterion for exclusion from the study were: under 21 years of age and over 45 years, an incidence of back pain before starting work as a paramedic, female sex, degenerative diseases of the spine and cancer as well as other diseases affecting the incidence of back pain for example ankylosing spondylitis, rheumatoid arthritis, a post-operative condition of the spine.

**Table I.** General characteristics of the respondents  
**Tabela I.** Charakterystyka ogólna badanych osób

Variable	Examined group			
	A ( $\leq 5$ years of work) (n = 45)		B ( $> 5$ years of work) (n = 44)	
	(average $\pm$ SD)	Scope	(average $\pm$ SD)	Scope
Age [years]	26.5 $\pm$ 3.3	21–37	32.2 $\pm$ 3.9	24–45
Height [m]	1.81 $\pm$ 0.07	1.69–2.07	1.8 $\pm$ 0.07	1.65–1.95
Weight [kg]	84.6 $\pm$ 12.1	63–115	86.5 $\pm$ 13.8	60–120
BMI [kg/m <sup>2</sup> ]	25.9 $\pm$ 3.1	20.1–32.9	26.7 $\pm$ 3.3	19.6–34.7

### Methods

The study consisted in respondents filling out the authors' own questionnaire consisting of 28 questions, of which fourteen were closed questions and five open, eight half-open and one diagram. In the diagram a visual-analogue scale (VAS = Visual Analogue Scale) was presented. The questions concerned among others the occurrence of back pain, its initial location, nature, intensity, as well as common ways of dealing with the pain. The next questions were about the frequency of positions assumed during the day and the interference of pain in daily life. Subsequently, the subjects were also asked about the time spent in certain positions assumed in the past day. All the examined persons had their height and weight measured

and body mass index (BMI) calculated. The characteristics of the population are presented in Table I.

### Statistical analysis

The obtained results were subjected to descriptive analysis based on the percentage distribution of the studied variables, means and standard deviations. The measurable parameters were also examined with the use of a Pearson correlation test by an unmeasurable  $X^2$  test. Comparisons were made between the group using Student's t-test and  $X^2$ . The level of significance was  $p \leq 0.05$ . For statistical analysis Statistica v.12 and Excel 2010 programs were used.

## RESULTS

In both groups we observed the occurrence of back pain usually in the lumbosacral section (Tab. II). The second incidence of back pain was the thoracic segment. It was found that the location of the occurrence of back pain showed no correlation with age ( $p < 0.729$ ) or work experience ( $p > 0.589$ ) subjects.

**Table II.** Occurrence of back pain in paramedics  
**Tabela II.** Występowanie dolegliwości bólowych kręgosłupa u ratowników medycznych

Spine segment	Examined group		Statistical significance of the difference (p)
	A ( $\leq 5$ years of work) (n = 45)	B ( $> 5$ years of work) (n = 44)	
	n (%)	n (%)	
Cervical	0 (0)	3 (6.8)	$> 0.05$
Thoracic	5 (11.1)	6 (13.6)	$> 0.05$
Sacral – lumbar	38 (84.4)	36 (81.8)	$> 0.05$
The whole spine	0 (0)	1 (2.3)	$> 0.05$

It has been shown that the occurrence of the first symptoms of musculoskeletal pain affected the spine in 66.7% of the respondents in group A and comparably in 75% of group B ( $p > 0.05$ ). Back pain in conjunction with other pain in the motor system (joints foot, knee, hip, shoulder, elbow and wrist) appeared for the first time in 20% of respondents in group A and in 18.2% in group B. The first pain in a place within the musculoskeletal system other than the spine was indicated by 13.3% of respondents in group A and 6.8% in group B ( $p > 0.05$ ).

The declared prevalence of back pain is shown in Table III. The occurrence of back pain was significantly higher among the paramedics in group B than in group A ( $p < 0.05$ ).

**Table III.** Incidence of back pain in paramedics  
**Tabela III.** Częstość występowania dolegliwości bólowych kręgosłupa u ratowników medycznych

Feeling of spinal pain	Examined group		Statistical significance of the difference (p)
	A (≤ 5 years of work) (n = 45)	B (> 5 years of work) (n = 44)	
	n (%)	n (%)	
Often	7 (15.6)	24 (54.6)	0.008
Not so often	35 (77.8)	15 (34.1)	0.005
Rarely	2 (4.4)	3 (6.8)	> 0.05
At all	1 (2.2)	2 (4.6)	> 0.05

The first pain affecting the entire musculoskeletal system of the body in group A appeared  $14.5 \pm 5.5$  (range 1–36) months prior to this study and in group B  $42 \pm 25.1$  (1–180) months preceding the study. The first back pain appeared an average of  $23 \pm 16.9$  months prior to the conducted survey in group A, while in Group B it was  $43.7 \pm 32.9$  months before the survey.

With the use of VAS the average and maximum intensity of back pain was determined. It has been shown that the value of the average intensity of back pain was significantly higher in rescue group B than in group A (Tab. IV;  $p < 0.001$ ). In the area of maximum intensity of pain in the spine, the VAS values were comparable in both groups ( $p > 0.05$ ). The occurrence of the strongest back pain during the entire period of service appeared in group A from 0 to 20 times ( $x = 2.71 \pm 3.21$ ), and group B from 0 to 30 times ( $x = 4.30 \pm 5.10$ ). Despite comparable values of the strongest pain, the frequency their occurrence in group B was greater than in group A ( $p = 0.02$ ).

The level of pain showed a correlation with years of service only among the respondents in group A ( $r = 0.36$ ;  $p < 0.01$ ).

**Table IV.** The Intensity of spinal pain among paramedics  
**Tabela IV.** Intensywność poziomu bólu kręgosłupa u ratowników medycznych

Intensity of spinal pain	Examined group				p
	A (≤ 5 years of work) (n = 45)		B (> 5 years of work) (n = 44)		
	(average ± SD)	Scope	(average ± SD)	Scope	
Average	$(4.02 \pm 2.24)$	0–10	$(5.68 \pm 2.22)$	0–10	< 0.0007
Maximum	$(6.24 \pm 3.35)$	0–10	$(6.5 \pm 3.27)$	0–10	> 0.05

The paramedics were asked about medical consultations in the event of back pain. We found that 44.4% of those in group A and 36.4% of the group B did not seek medical advice due to emerging pain. In the remaining respondents, most people used advice from a

physician (31.1% in group A and 54.6% in group B), fewer people used the services of physiotherapists (in group A and 28.9% in group B 22.7%). The respondents least often took advantage of recommendations from nurses (only 2.2% in group A) and the Internet: in group A, 4.4% in group B 6.8%.  $3.07 \pm 3.03$ ), while in group B it was similar ( $x = 2.84 \pm 2.69$ ), ( $x = 2.89 \pm 3.16$ ) and ( $x = 3.07 \pm 3.03$ ).

However, both groups recognize that spinal pain affected the relations of the respondents with other people the least, both in group A in the range of 0–10, ( $2.53 \pm 2.81$ ) and group B in the range of 0–10, ( $2.55 \pm 2.71$ ).

The methods of dealing with pain were evaluated. The most common treatment method was the use of oral analgesics, which was used by 61.4% of group B and 24.4% of group A. Commonly used methods for pain were physical exercise (group A – 37.8% in group B – 36.6%), massage (group A – 35.6%, in group B – 38.6%), postural positions (group A – 35.6%, in group B – 40.9%), swimming (in group A – 26.7%, in group B – 25%), the use of ointments and gels (in group A – 28.9% in group B – 25%), packs (group A – 11.1% in group B – 9.1%) kinesio taping (group A – 4.4% in group B – 6.8%).

The time during the day spent sitting or standing and intended for additional physical activity were comparable among the members of both groups (Tab. V).

This showed no dependence between the average time spent in the standing position in the study groups ( $p > 0.123$ ). It did not depend on years of work in the profession in either group ( $p > 0.05$ ) nor did it depend on the age of the respondents (RA = -0.12,  $p > 0.39$ ; RB = -0.12;  $p > 0.44$ ).

**Table V.** Time during day spent in sitting or standing position and additional physical activity of paramedics  
**Tabela V.** Czas przebywania w ciągu dnia w pozycji siedzącej i stojącej oraz dodatkowa aktywność ruchowa u ratowników medycznych

Variable	Examined group				p
	A (≤ 5 years of work) (n = 45)		B (> 5 years of work) (n = 44)		
	(average ± SD)	Scope	(average ± SD)	Scope	
Sitting position [hour]	$(5.4 \pm 2)$	0.5–8	$(5.8 \pm 2)$	0.5–8	> 0.27
Standing position [hour]	$(5.3 \pm 2.6)$	0.5–8	$(4.4 \pm 2.7)$	0.5–8	> 0.12
Additional physical activity [h.]	$(6.1 \pm 2.4)$	0.5–8	$(5.3 \pm 2.7)$	0.5–8	> 0.13

The respondents assessed three aspects which are mostly affected by the back pain. The first is the mood, in group A it was on average  $4.22 \pm 2.89$  and in group B it was in third place ( $x = 3.64 \pm 2.93$ ). The second aspect for both group A and group B was the efficien-

cy of their operations in group A ( $x = 4.13 \pm 3.03$ ) and group B ( $x = 3.75 \pm 3.54$ ). Another aspect in group A which is affected by back pain is their daily work ( $x = 3.89 \pm 2.78$ ), while in group B the respondents considered it the greatest impact factor among all the studied aspects with an average of  $4.07 \pm 3.34$ .

Back pain also affected group A during walking ( $x = 3.13 \pm 2.90$ ), sleeping ( $x = 2.89 \pm 3.16$ ), the joy of life ( $x = 3.07 \pm 3.03$ ), while in group B the replies were similar ( $x = 2.84 \pm 2.69$ ) ( $x = 2.89 \pm 3.16$ ) and ( $x = 3.07 \pm 3.03$ ).

However, both groups recognize that spinal pain affects the relations of the respondents with other people the least, both in group A in the range of 0–10, ( $2.53 \pm 2.81$ ) and group B in the range of 0–10, ( $2.55 \pm 2.71$ ).

In correlational research it was demonstrated that the severity of back pain correlates significantly with daily activities, mood and the effectiveness of work among rescuers from group A and mood, relationships between people, sleeping and the efficiency of work among the paramedics from group B (Tab. VI).

**Table VI.** Correlation coefficients ( $r$ ) between severity of back pain and selected aspects of daily life of paramedics.

**Tabela VI.** Współczynniki korelacji ( $r$ ) pomiędzy stopniem nasilenia dolegliwości bólowych kręgosłupa a wybranymi aspektami życia codziennego u ratowników medycznych

Variable	Examined group			
	A ( $\leq 5$ years of work) (n = 45)		B ( $> 5$ years of work) (n = 44)	
	the severity of pain		the severity of pain	
	R	p	R	p
Daily activity	0.52	0.02	0.25	0.09
Mood	0.35	0.02	0.32	0.03
Walking	0.25	0.09	0.17	0.26
Everyday work	0.26	0.08	0.17	0.26
Human relationships	0.23	0.12	0.32	0.036
Sleeping	0.13	0.4	0.29	0.05
Joy of life	0.19	0.2	0.26	0.08
Effectiveness of performed activities	0.44	0.002	0.25	0.01

In conclusion, the influence of the presence of pain on different aspects of life namely its intensity, has a direct impact on daily life activities, mood and the effectiveness of activities, regardless of the years practicing the occupation. It turned out that in group A the intensity of the pain does not affect relationships with others or the joy of life ( $p > 0.05$ ), whereas in the group no longer working in the profession it has a significant impact on relationships ( $p < 0.036$ ) and sleeping (Tab. IV).

The presence of pain and the level of pain did not affect the ergonomic principles of daily activities (all

$p > 0.05$ ) nor the ergonomics of carrying objects ( $p < 0.02$ ) in group B. In the group of paramedics working for five years in the profession, the severity of pain did not affect the application or lack of application of ergonomic principles in everyday life.

## DISCUSSION

The occurrence of back pain is fairly common, especially among people performing professions exposed to significant burdens of this body part. According to our research, men who work as paramedics, despite their young age and not long service, almost all of them (approx. 97% of respondents) declared the occurrence of back pain. In other medical professions the incidence of back pain varied, but it was lower than that observed in the present study. Among professionally active nurses aged 22–56, back pain was felt by approx. 70% of respondents [11] and in another study, lumbosacral and cervical back pain occurred respectively in 51.6% and 14.1% of nurses [12]. It turned out that the occurrence of spinal pain did not differentiate significantly regarding the work of nurses between the day and night shift [1]. In turn, a study of midwives in the age of 21–50, 67% of women experienced back pain [13]. It should be noted that approx. 80% of people across the examined population suffers from back pain [14,15].

The most common overload syndromes associated with back pain ailments included primarily a change in the cross section of the lumbar and cervical spine [3]. Topolska et al. [16] predicted that in the adult population 70–95% of people will feel pain in the lumbosacral spine segment. The basis for the development of back pain can be many factors, e.g. age, lack of balance between the forces of body anatomy trains, stress and rotational movements of the trunk, especially with an external load. According to the Central Statistical Office in 2011, due to the inability to work associated with back pain as many as 122 000 men aged 30 to 49 received a disability pension [17]. In 2012, this number decreased to 113 000 men in Poland [18]. By contrast, in 2013 disability pension due to the inability to work was received by 103 000 men aged 30 to 49 [19]. Surprisingly, among the respondents there was also a large group of people who did not use the help of specialists at all (in the case of group A it was 44.44%, and in the case of group B 36.36%). The reason for this fact should be discussed. Perhaps the medical knowledge acquired by paramedics during their studies and then perfected in the course of work means that there is a phenomenon of self-medication. The second explanation is the variability of time and lack of free time for settling their private affairs. Another reason could be the repetition

of the same movement patterns within working time (so-called repetitive work). The pain ranged from 0 to 10, and it was assessed by the respondents as mild or of moderate intensity.

Analyzing the incidence of pain, depending on the part of spine, it turns out that according to Szczygieł et al. the cervical spine is the second most common place of pain immediately after the lumbar region [20,21]. In this paper, the research results do not confirm the studies cited by the authors mentioned above. In our study, the cause of the appearance of pain in the thoracic spine as the second most common place is the fact that paramedics often raise and transport heavy objects and people in tight or difficult spatial places where the only solution was to adopt a stable position by bending the spine. This involves a number of static and dynamic overloads. The combination of flexion and rotation is the worst combination of movements of the spine causing a substantial overload of the entire spine is also crucial. Nowotny-Czupryna et al., studying the static overload of midwives noticed that the pain in the spine occurred in both the younger and older group of professionals but certainly back pain will develop in older workers. Given the nature of the work habits of the respondents, it is difficult to clearly determine overload, but both sections of the spine - cervical and lumbar-sacral were the most likely to be affected by overload [13].

Epidemiological studies indicate that the highest percentage of the population with frequent spinal pain concerns countries with a high socio-economic status. For comparison, chronic back pain in the lumbar section of the spine was found in more than 27% of the British [22], 23% of Swedes [22,23] and 19% of Americans [22,24].

Depa and Drużbicki quoted Grochmal's research which shows that lumbar-sacral pain associated with

congestion caused by the performance of professional activities usually occurred in people exposed to lifting and carrying heavy objects [25]. They tried to prove that pain of the lower spine occurred in men working physically [25]. In our study therefore, we attempted to verify the locus of the first pain in men working psycho-physically. The studies have confirmed not only the precedence of pain in the lumbar-sacral spinal section but also the pain as the first dysfunction within the musculoskeletal system. It is known that trunk flexion combined with its rotation negatively affects the perception of pain.

## CONCLUSIONS

Among paramedics in the early years of their work, back pain becomes more intense, which is not correlated with age. Spinal pain in paramedics tends to affect many aspects of daily living such as daily activity, mood, relationship between people, sleeping, as well as the efficiency of their work.

### Implications for Practice

Furthermore, there is a need to rethink postural positions and the ergonomics of paramedic behaviors every day in work and free time.

### Conflict of Interest

The authors report no conflicts of interest.

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#### Author's contribution

Study design – E. Grabska, A. Brzęk

Data collection – E. Grabska

Data interpretation – E. Grabska, A. Brzęk, A. Knapik, D. Ziaja

Statistical analysis – E. Grabska

Manuscript preparation – E. Grabska, A. Brzęk, A. Knapik, A. Famuła, C. Marcisz, R. Plinta, D. Olko, D. Ziaja

Literature research – E. Grabska, D. Olko

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