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PREVALENCE, PREVENTION AND RISK FACTORS FOR LUMBAR SPINE PAIN IN DENTAL PRACTITIONERS

PREVALENCIJA, PREVENCIJA I FAKTORI RIZIKA ZA POJAVU LUMBALNOG BOLA KOD ZAPOSLENIH U STOMATOLOŠKOJ PRAKSI

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Summary

Introduction. Lumbar spine pain is among the most common conditions affecting daily activities in modern-day societies, as well as the second most common cause of absenteeism from work. The aim of the paper was to determine the incidence of lumbar spine pain in dental professionals of the Dental Clinic of Vojvodina, the effects of lumbar spine pain on their general health and work ability, their attitude to treatment options, as well as potential etiological factors for the appearance of lumbar spine pain. **Material and Methods.** A prospective study included 45 employees of the Dental Clinic of Vojvodina. We investigated the association between the appearance of lumbar spine pain and the work of dental professionals. The data were gathered via a questionnaire analyzing musculoskeletal disorders, and the probable risk factors for their appearance. **Results.** There were 75.6% (34/45) of women and 24.4% (11/45) of men, aged from 22 to 64 years, with a total work experience of 13±9.6 years. Lumbar spine pain was recorded in 60% of examinees. They were mostly localized in the lower back (52.2%), but also spreading down along both legs (17.4%) and into the right hip (13%) ($p < 0.01$). The incidence of low back pain was higher in dentists (72.4%) than in dental assistants (45.5%) and dental technicians (20%) ($p < 0.05$). **Conclusion.** Lumbar spine disorders are among the most frequent occupational diseases in dental practice, associated with multifactorial causes. Ergonomics and ergonomic education are primary factors in the prevention and therapy of lumbar spine conditions. **Key words:** Dentistry; Occupational Diseases; Work Performance; Risk Factors; Low Back Pain; Safety Management; Treatment Outcome

Introduction

The main characteristic of lumbar pain syndrome (LPS) is pain in the lower part of the spine, which differs in intensity, character and duration, and with progression it decreases the functional capacity of the lumbosacral part of the spine [1]. Due to their occupational activities, even dental professionals are not

Sažetak

Uvod. Tegobe u slabinskoj kičmi među najzastupljenijim su činiocima koji remete savremenog čoveka u svakodnevnim aktivnostima, a i drugi su najčešći razlog odsustvovanja sa radnog mesta. Cilj ove studije bio je da se utvrdi zastupljenost tegoba u slabinskoj kičmi kod stomatološkog osoblja na Klinici za stomatologiju Vojvodine, uticaj tegoba u slabinskoj kičmi na opšte zdravlje i radnu sposobnost, stavovi u vezi sa lečenjem ovih tegoba, kao i potencijalni etiološki faktori za nastanak ovih tegoba. **Materijal i metode.** Prospektivna studija je obuhvatila 45 zaposlenih u stomatološkoj praksi na Klinici za stomatologiju Vojvodine. Analizirana je povezanost pojave tegoba u slabinskoj kičmi sa načinom i vrstom rada. Podaci u vezi sa ovim tegobama prikupljeni su upitnikom za analizu mišićno-koštanih tegoba. Analizirani su mogući faktori rizika za njihov nastanak. **Rezultati.** Bilo je 75,6% (34/45) žena i 24,4% (11/45) muškaraca, uzrasta od 22 do 64 godine, ukupnog radnog staža 13 ± 9,6 godine. Tegobe u slabinskoj kičmi zabeležene su kod 60% zaposlenih. Najčešće su lokalizovane samo u krstima (52,2%); ukoliko se bolovi šire, najčešće su prisutni duž obe noge (17,4%) i u desnom kuku (13%) ($p < 0,01$). Stomatolozi (72,4%) češće od stomatoloških sestara (45,5%) i zubnih tehničara (20%) imaju tegobe u predelu krsta ($p < 0,05$). **Zaključak.** Tegobe u slabinskoj kičmi su među najučestalijim bolestima u vezi sa radom zaposlenih u stomatološkoj praksi, čiji su uzroci multifaktorski. Ergonomija i ergonomska edukacija su primarni činioci u prevenciji i terapiji tegoba u slabinskoj kičmi. **KLjučne reči:** stomatologija; profesionalna oboljenja; radna sposobnost; faktori rizika; lumbalni sindrom; sigurnosne mere; ishod lečenja

spared, because of the exposure to additional and often improper spinal overload [2]. According to the literature data, there are about 130 different causes of LPS, such as inflammatory diseases, neurological diseases, vascular disorders, tumors, and even psychogenic bone pain; still, around 80% of bone pain is caused purely by mechanical reasons [2]. The main mechanism of mechanical bone pain are torsional movements, espe-

Abbreviations

LPS – lumbar pain syndrome
 DCV – Dental Clinic of Vojvodina

cially when connected to compression [3]. Most dentists lean down towards their patients during work, with their right side rested upon the patient's right side. When they need to reach for their tools or materials from the working desk, they have to turn in the direction opposite from their working position to reach them. During the process of performing torsional movements, they turn the upper part of the body with only partial leg turning, and all that just to save time. Frequent repetition of this type of movements, together with strained, so called S-position of cervical part of the spine during work, leads to overstrain in the lumbar part [4]. In dentists, overstrain during work may cause discomfort and occasional pain in the lumbar part of the spine. If the pain is constant in the lower part of the back, reducing the work ability, the condition is probably in the acute phase and requires certain therapeutic measures [4]. It is considered that 80% of adults experience acute lumbar pain at least once in their lifetime, and in 30% the acute lumbar pain evolves into chronic lumbar pain [5]. The results of clinical examinations show that efficient treatment with ergonomic measures decrease the recurrence rate of bone pain, which calls for therapy optimization and ergonomic working conditions and education.

The paper aimed to determine the presence of LPS in dental healthcare workers, the effects of LPS on quality of life, views connected to treating these disorders, as well as potential etiological factors for appearance of these conditions. Gathered information will help raise the awareness about the significance of correct approach to lumbar syndrome, its

prevention and fast recovery in working age population, especially in dentistry.

The Ethics Committee of the Dental Clinic of Vojvodina has approved the research.

Material and Methods

The research sample included 45 employees of the Dental Clinic of Vojvodina (DCV): dentists, dental technicians and dental assistants. The voluntary and anonymous analysis of LPS was performed by using a modified "Standardized Nordic questionnaire for the analysis of musculoskeletal symptoms", which included 9 sections of questions related to presence of pain in specific areas of the body: neck, shoulders, elbows, wrists, hands, upper back, lower back, hips, knees, ankles and feet [6]. In addition, another questionnaire was made, including socio-demographic questions related to potential etiological factors, pain and its treatment if it was present, as well as questions related to gender, age, weight, height, profession, years of service, working hours during the day and week, body position during work, presence and intensity (visual-analog scale of pain) of pain, intensity of pain during different periods of the day; functional, psychological and emotional problems caused by the pain; factors causing the increase of pain; use of drug and/or physical treatment; and effects and outcome of treatment. The questionnaires were self-administered and delivered in person. For each department of DCV one poll taker was determined to collect filled questionnaires in a closed box.

All the gathered information were processed by statistical program International Business Machines (IBM) Statistical Package for the Social Sciences (SPSS) Statistics 20. The results were displayed via tables and graphs alongside textual comments. Stand-

Table 1. Characteristics of patients
Tabela 1. Karakteristike pacijenata

Characteristics/ <i>Karakteristike</i>		Number/ <i>Broj</i> (%); $\bar{X} \pm SD$
Gender/ <i>Pol</i>	Male/ <i>Muški</i>	11 (24.4)
	Female/ <i>Ženski</i>	34 (75.6)
Age (years)/ <i>Starost (godine)</i>	Mean/ <i>Srednja vrednost</i>	37.8±9.3
Dentist staff/ <i>Stomatološko osoblje</i>	Dentists/ <i>Stomatolog</i>	29 (64.5)
	Dental assistant/ <i>Stomatološka sestra</i>	11 (24.4)
	Dental technician/ <i>Zubni tehničar</i>	5 (11.1)
Body weight/ <i>Telesna težina (kg)</i>	Male (mean)/ <i>Muškarci (srednja vrednost)</i>	80.8±8.9
	Female (mean)/ <i>Žene (srednja vrednost)</i>	64.2±10.7
Body height/ <i>Telesna visina (cm)</i>	Male (mean)/ <i>Muškarci (srednja vrednost)</i>	182.3±5.8
	Female (mean)/ <i>Žene (srednja vrednost)</i>	170.5±7
Years of service/ <i>Radni staž</i>	Mean/ <i>Srednja vrednost</i>	13.2±9.4
Working hours per day/ <i>Dnevno radno vreme</i>	Mean/ <i>Srednja vrednost</i>	7.3±1.5
Breaks during work/ <i>Trajanje dnevne pauze (min)</i>	Mean/ <i>Srednja vrednost</i>	30±9
Body position during work <i>Položaj tela u toku rada</i>	Standing/ <i>Stojeći</i>	9 (20)
	Sitting/ <i>Sedeći</i>	8 (17.8)
	Changing/ <i>Promenljivo</i>	28 (62.2)

Table 2. The results of the questionnaire used in the study
Tabela 2. Rezultati upitnika korišćenih u istraživanju

Characteristics <i>Karakteristike</i>		Number <i>Broj (%)</i>	p-value <i>vrednost</i>	
Low back pain <i>Tegobe u donjem delu leđa</i>	Dentists <i>Stomatolozi</i>	No/ <i>Ne</i> Yes/ <i>Da</i>	8 (27.6) 21 (72.4)	
	Dental assistant <i>Stomatološka sestra</i>	No/ <i>Ne</i> Yes/ <i>Da</i>	6 (54.5) 5 (45.5)	
		Dental technician <i>Zubni tehničar</i>	No/ <i>Ne</i> Yes/ <i>Da</i>	4 (80) 1 (20)
	Low back pain in the past 12 months <i>Tegobe u donjem delu leđa u poslednjih 12 meseci</i>	Male/ <i>Muškarci</i>	No/ <i>Ne</i> Yes/ <i>Da</i>	5 (45.5) 6 (54.5)
		Female/ <i>Žene</i>	No/ <i>Ne</i> Yes/ <i>Da</i>	13 (38.2) 21 (61.8)
Most common complaints during the day <i>Najizraženije tegobe u toku dana</i>	Morning/ <i>Ujutru</i>		7 (25.9)	
	Afternoon/ <i>Popodne</i>		8 (29.6)	
	Evening/ <i>Uveče</i>		9 (33.3)	
	All day/ <i>Celog dana</i>		3 (11.1)	
Functional problems caused by low back pain <i>Funkcionalni problemi uzrokovani tegobama u donjem delu leđa</i>	No complaints/ <i>Bez smetnji</i>		14 (31.2)	
	With temporary pain during full work time <i>Sa privremenim bolom tokom punog radnog vremena</i>		29 (64.4)	
	With difficulties and therapy during full work time <i>Sa poteškoćama uz terapiju u punom radnom vremenu</i>		2 (4.4)	
	With difficulties and therapy during part time work <i>Sa poteškoćama uz terapiju u skraćenom radnom vremenu</i>		0 (0.0)	
The pain is localized in... <i>Tegobe su lokalizovane u...</i>	Lower back/ <i>Krstima</i>		15 (55.5)	
	Lwer back and spreading towards the right hip <i>Krstima i šire se prema desnom kuku</i>		3 (11.1)	
	Lower back area and spreading alongside the left leg <i>Krstima i šire se niz levu nogu</i>		2 (7.4)	
	Lower back area and spreading alongside the right leg <i>Krstima i šire se niz desnu nogu</i>		2 (7.4)	
	Lower back area and spreading alongside both legs <i>Krstima i šire se niz obe noge</i>		5 (18.5)	
Low back pain is intensified with.../ <i>Tegobe u donjem delu leđa se intenziviraju pri...</i>	Coughing/ <i>Kašljanju</i>		2 (7.4)	
	Strain/ <i>Naporu</i>		22 (81.5)	
	All the above/ <i>Sve pomenuto</i>		3 (11.1)	
Low back pain and associated symptoms <i>Tegobe u donjem delu leđa i prateći simptomi</i>	Anxiety/ <i>Nervoza</i>		4 (28.6)	
	Bad sleep/ <i>Lošiji san</i>		1 (7.1)	
	Bad concentration/ <i>Slabija koncentracija</i>		1 (7.1)	
	Problems with everyday activities <i>Smetnje u svakodnevnom aktivnostima</i>		5 (35.7)	
	Anxiety and problems in everyday activities <i>Nervoza i smetnje u svakodnevnom aktivnostima</i>		1 (7.1)	
	Anxiety, low threshold tolerance and problems in everyday activities/ <i>Nervoza, snižen prag tolerancije i smetnje u svakodnevnom aktivnostima</i>		1 (7.1)	
	Bad sleep and problems in everyday activities <i>Lošiji san i smetnje u svakodnevnom aktivnostima</i>		1 (7.1)	

ard descriptive methods were used in analysis of the information – determining the average value (X) and standard deviation (SD). For testing the differences of average values between results, Students t-test and

t-test of pairs, non-parameter method Pearson's χ^2 test (test of independence and matching) were used. Statistical significance was defined at $p < 0.01$.

Results

The research included 45 healthcare workers from 6 different dental departments: Department of Dental Prosthetics (26.7%), Department of Dental Diseases with Endodontics (22.2%), Department of Child and Preventative Dentistry (15.6%), Departments of Periodontics and Oral Medicine (13.3%), Department of the Jaw Orthopedics (13.3%), Department of Oral Surgery (8.9%). Out of 45 examinees, 34 were women (75.6%) and 11 were men (24.4%). The average age was 37 years. The youngest examinee was 22, and the oldest 64. Most examinees were aged from 30 - 34 and 35 - 39 years.

The average body weight was 80.8 ± 8.9 kg in male examinees and 64.2 ± 10.7 kg in the female examinees. The average height of males was 182.3 ± 5.8 cm, and 170.5 ± 6.9 cm of females. The questionnaires were filled out by 29 (64.5%) dentists, 11 (24.4%) dental assistants, and 5 (11.1%) dental technicians. On average, the employees were at current position for at least 13 years. Most employees had a work experience of 6 - 10 and 11 - 15 years.

The most of examinees (62.2%) answered that they changed their body position during work. The clinical characteristics of patients are shown in **Table 1**.

Dentists (72.4%) experienced low back pain more frequently than dental assistants (45.5%) and dental technicians (20%). Significant statistical difference was determined in the occurrence of low back pain in regard to the type of work done by healthcare workers ($\chi^2 = 6.2$, $df = 2$, $p = 0.046$) (**Table 2**).

During the previous 12 months, women (61.8%) reported more low back pain episodes (pain, irritation) than men (54.5%) ($\chi^2 = 0.005$, $df = 1$, $p = 0.671$) (**Table 2**). Due to low back pain in the last 12 months, women (32.4%) experienced more pain and discomfort than men (27.3%) in performing their usual activities at home or elsewhere ($\chi^2 = 0$, $df = 1$, $p = 1$).

Almost half of the examinees (48.2%) suffered from low back pain up to 5 years. Approximately $\frac{1}{4}$ of examinees had low back pain up to 10 years (25.9%), four patients (14.8%) suffered for more than 10 years, and three of them up to 1 year (11.1%).

Regardless of profession, LPS is always temporary, appearing in 94.4% of dentists, in 50% of dental assistants, and 100% of dental technicians. There is no statistically significant difference in the incidence of low back pain in relation to the type of work of the employees ($\chi^2 = 5.856$, $df = 2$, $p = 0.053$). In men (80%) and women (88.9%) LPS was most commonly temporary ($\chi^2 = 0.273$, $df = 1$, $p = 0.602$).

Regardless of position, LPS is most commonly temporary. In standing position, LPS is present in 71.4% of the cases, 100% in sitting position, and 93.3% in interchanging positions ($\chi^2 = 2.176$, $df = 2$, $p = 0.337$).

Low back pain intensity was rated via visual-analog scale for pain. The score „0“ meant absence of pain, whereas the score „10“ stood for the most severe pain. None of the examinees rated their pain with „10“. The pain was most commonly rated as „4“, which was also the average score ($X = 4 \pm 1.5$).

Functional problems due to low back pain in the 65 examinees were of such type that working activities were performed with temporary pain during the full work period, while 31% of the examinees declared they performed activities without problems. None of the examinees declared they performed activities with difficulties and using therapy during part time work (**Table 2**).

The chi-square test indicated that the number of the examinees who performed activities with temporary pain during full work period (64.4%) was significantly different ($\chi^2 = 10.9$, $df = 2$, $p = 0.004$) from the number of examinees who declared that they performed activities without problems (31.2%) and using therapy (4.4%).

Low back pain is most commonly localized only in the lower back region (55.5%). If the pain spreads, it is most commonly localized along both legs (18.5%) and in the area of the right hip (11.1%). It is statistically significant ($\chi^2 = 15.478$, $df = 4$, $p = 0.004$) that low back pain is localized in the lower back area more frequently compared to the pain spreading from the lower back to hips and legs (**Table 2**).

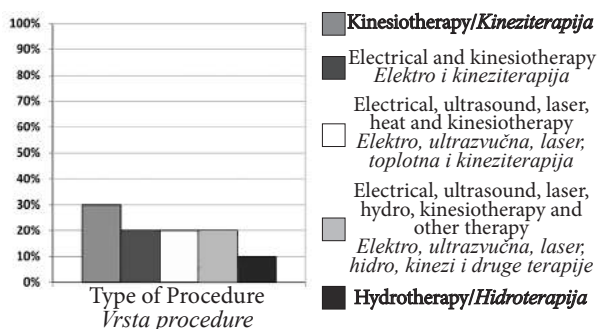
In case of low back pain, the examined employees most commonly (57.7%) did not see a doctor. Those who did, mostly visited a physician (70%). About $\frac{1}{3}$ of the employees with LPS do not take medications (33.3%), and if they do, they (81.2%) occasionally take non-steroidal anti-inflammatory drugs (NSAIDs) (37.5%) or some other medications (29.2%). In most cases (63%) examinees take medications for LPS, on their own, without physical therapy (63%). The most common reason for not having physical therapy was the lack of time. Ten employees (37%) said that they had physical therapy in case of LPS and kinesitherapy was the most frequent (90%). Kinesitherapy is most commonly used in combination with electrotherapy (60%) (**Graph 1**).

Most of the employees (50%) stated they did not know whether physical therapy decreased low back pain, 40% of examinees answered that physical therapy had positive effects, and 10% that it had no effects on reducing symptoms of the low back pain (**Graph 2**).

Discussion

The research and analysis of LPS was done using a “Standardized Nordic questionnaire for the analysis of musculoskeletal symptoms”, as well as an additional questionnaire on socio-demographic, etiological factors, and factors related to pain and its treatment, if there was any. The “Standardized Nordic questionnaire for the analysis of musculoskeletal symptoms” is internationally acclaimed and one of the most commonly used standardized tests for evaluation of musculoskeletal pain [7–10].

The prevalence of LPS among the examinees was 60%. A similar prevalence rate was recorded in Australia, Denmark, Izrael, United States and Pakistan [11, 12]. Lower prevalence rate was recorded in Southern Iran (54.6%), Belgium (54%),



Graph 1. Physical therapy procedures used in low back pain
Grafikon 1. Fizikalne procedure koje se koriste kod bola u donjem delu leđa

and China (52.5%), while higher prevalence rate was recorded in Taiwan (66%), Nigeria (77.1%) and Lithuania (91%) [2, 7, 8, 13–15].

The majority of examinees in our research were women (75.6%) with a lumbar syndrome prevalence of 61.8% that was higher compared to men (54.5%). Also, due to LPS, women had more difficulties (32.4) in doing everyday activities (at home or elsewhere) than men (27.3%). The most examinees were aged from 30 to 39 indicating that the biggest percentage of examinees with LPS was in this age group. These results are in agreement with researches conducted in United States, Pakistan and Taiwan [7, 12, 16].

According to some researches, the risk factors for LPS include the type of profession, years of service, age of dentists, and number of patients treated per day [8, 12]. The prevalence of low back pain is affected by the dentists' body weight and body height [17]. Our research showed that LPS is more common in dentists (72.4%) than dental assistants (45.5%) and technicians (20%), because during work dentists spend time in forced positions and positions straining spinal structures and thus indirectly affecting appearance of pain which is proven by researches of Thornton et al., Ake-sson, Balogh and Hansson, as well as two case series of Sanders and Turcotte [18–20].

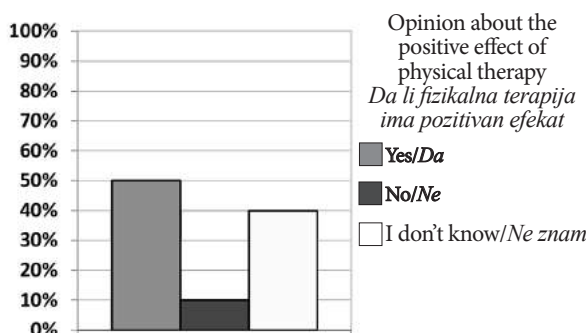
The usual position of dentists is sitting or standing and it is associated with extreme flexion of the neck above 30 degrees with rotation and/or side flexion to the right or left, flexion of shoulders in protraction and abduction greater than 45 degrees and flexion of torso in kyphosis [20]. This position of dentists causes increased strain on spinal unit which along with movement, rotation, flexion and torsion of torso, in time leads to instability of spinal unit and consequential changes on spinal discs such as herniation and compressions on nerve roots, and development of lumbar radiculopathy [18, 20]. Along with body position, another risk factor is length of intervention [17]. It is proven that low degree of strain that lasts for a long time can cause muscle fatigue and chronic pain [21].

Some studies suggest taking 10 minute brakes during interventions [7, 20]. A greater number of shorter brakes during working hours (not longer

than 5 seconds) is much more practical and provides full recovery to fatigued muscles. During these micro brakes muscles receive more blood and time to recover [17]. Static positions that distort neutral posture must be avoided; it is helpful to adjust the seat and have a rest from time to time, so that the strain can be transferred from one tissue to another, minimizing the micro trauma [17].

The ideal posture during work means: neck in flexion from 0 to 10 degrees, without rotation or side flexion; shoulders relaxed and in retraction; elbows in the level of patient's mouth and in flexion of up to 90 degrees; lumbar part of the spine in neutral position with preserved physiological lordosis with leg support in mild abduction and outside rotation; knees slightly above the hip level; the feet should be flat on the floor, or rested upon the seat bar to decrease the strain on the lumbar spine [20].

The results have shown that in dental practice adequate ergonomic conditions are the most important for the prevention of LPS. From the ergonomic point of view, the most important thing is posture during work in the office, both in sitting and standing positions. For a dentist, the most important thing in his office is the chair [17, 20]. The chair should keep the body in a neutral position. The back support should keep physiological lumbar lordosis with its concavity during sitting, and is thus called lumbar support. When it comes to large back supports, the upper part should not press the thoracic spine and push it forward. The back supports that don't cross the bottom edge of a shoulder blade can decrease the effect of lumbar support by transferring the pressure to the shoulder blades, and they should be 6 cm below the bottom edge of the shoulder blade. Wide back supports should be avoided, because they can obstruct lateral movements of torso and upper limbs [22]. Due to the nature of the profession, dentists cannot always keep contact with lumbar support of the chair; occasionally they lean forward to see a specific surface of the teeth. The pressure on intervertebral disc is highest in this position, which requires dentists to properly stabilize and protect lumbar spine with stabilizing muscles (primarily transverse abdominal muscles) whenever they leave the



Graph 2. Opinions about the effects of physical therapy in low back pain

Grafikon 2. Mišljenje o uticaju fizikalne terapije u slučaju tegoba u donjem delu leđa

chair support. When used properly, these muscles prevent and decrease the low back pain [22].

Conclusion

The prevalence of lumbar pain syndrome is greater in dentists than in dental assistants and technicians. During work, dentists spend long periods of time in forced positions which create a risk for appearance of spinal issues. The low back pain is of higher intensity

in women who have more difficulties in doing everyday activities than men. Low back pain affects the quality of life in the employees of the Dental Clinic of Vojvodina. The results of this study showed that adequate (ergonomic) working conditions are required, as well as education of dentists and dentistry students, on the risk factors, prevention of lumbar pain syndrome, and therapeutic modalities. Timely and adequate prevention of lumbar pain syndrome ensures longer and more comfortable working life, and a nice and painless retirement.

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