Glasnik Antropološkog društva Srbije / Journal of the Antropological Society of Serbia
Niš, vol. 56, str. 49 – 55, 2023, UDK 572, ISSN 1820-7936

Originalni naučni rad
Original Scientific Paper

UDK 616.71/.73+616.31-057.87:378(497.11 Niš)
https://doi.org/10.5937/gads56-45983

MUSCULOSKELETAL DISORDERS IN THE POPULATION OF DENTISTRY STUDENTS OF THE UNIVERSITY OF NIS, SERBIA

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Abstract Musculoskeletal disorders (MSD) are characterized by discomfort, occasional or permanent pain in the joints, muscles, tendons and other soft tissues caused by the repetition of certain body movements or uncomfortable and forced body posture. Dentistry is considered a high-risk profession for the development of these disorders. The aim of the research was to investigate the occurrence of MSD in the population of dental students of the Faculty of Medicine, University of Niš, Serbia. Total of 170 dental students participated in the research. In order to examine the emergence and distribution of MSD, students filled out a modified Nordic questionnaire. The results showed that 70.6% of students suffer from MSD. MSD were almost equally represented in both genders (69.7% in male and 71.1% in female). The most common localization of pain was in the area of the upper back in 32.3% of cases. A total of 54.1% of students declared that the pain intensity was moderate and that in 41.2% of cases it lasted as long as the work with the patient. In 49.4% of cases, the pain does not affect practical work, and as a relief measure in 53.3% of cases, students use rest. MSD appear already in the first years of studies and tend to intensify with the length of studies. Given that musculoskeletal pain occurs already in the early period of student practice, it is necessary to study ergonomic factors that are of great importance for the occurrence and intensification of these disorders.

Key words: Musculoskeletal disorders, dentistry, students, ergonomics.

Introduction

Musculoskeletal disorders (MSD) are characterized by discomfort, occasional or permanent pain in the joints, muscles, tendons and other soft tissues caused by the repetition of certain body movements or uncomfortable and forced body posture. Dentistry is considered a high-risk profession for the development of these disorders (Rising et al., 2005). Everyday work in dentistry is directly related to positions that involve long-term muscle loads, where more than half of the muscles in the body are contracted statically (Deka, 2016). The main reasons for this are the limited working field with insufficient light, which makes it inevitable to work in a forced static and uncomfortable position for a long period of time, which additionally burdens the muscles and joints, and with movements that are limited to the hand and wrist. These positions alone or in combination with grasping and holding instruments, vibration of implanted instruments as well as limited rest time, create a predisposition for the development of MSD (Thanatrornwong et al., 2014). MSD represent one of the most common professional health problems among dentists. Researchers were showed that their development begins already during studies, that it intensifies during clinical practice and that it can be the reason for early withdrawal from the profession (Vijay and Ide 2016).

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The aim of the research was to examine the occurrence of MSD in the population of dental students of the Faculty of Medicine, University of Niš, Serbia and to compare the results obtained in relation to gender and year of study.

Material and methods

Total of 170 dental students of the Faculty of Medicine of the University of Niš, Serbia participated in the research (66 male and 104 female). Students were divided into groups according to the years of study (Table 1). In order to examine the occurrence and distribution of MSD, students filled in a modified Nordic questionnaire, anonymously and without time limit (Kuorinka et al., 1987). The questionnaire contained sociodemographic data (gender, age, year of study) and data on musculoskeletal diseases (presence, localization, intensity, duration, impact on work, as well as relief measures that are applied). The results were presented descriptively and statistically. Statistical analysis was performed using the computer software package SPSS, version 20 and using chi-square and Fisher's exact test. A P value of less than 0.05 was considered statistically significant.

Table 1. Distribution of respondents according to gender and year of study.

Gender	Year of study				Total
	II	III	IV	V	
Male	11	11	18	26	66
Female	29	29	24	22	104
Total	40	40	42	48	170

Results

The analysis of the sample of the student population that participated in the study showed that there was a significant difference in the distribution of students according to gender in relation to the years of study (χ^2=9.364; p=0.024) (Table 1). In the second and third years, females predominated.

The results showed that 70.6% of students suffer from MSD. MSD were approximately equally represented in both genders (69.7% among male students and 71.2% among female students) (Table 2). The distribution of pain occurrence differed according to gender and years of study (χ^2=11.685; p=0.008). A significantly lower number of male compared to female in the second and third year of study had pain.

Table 2. Occurrence of musculoskeletal disorders in dentistry students in relation to gender and year of study.

Reported pain		II N (%)	III N (%)	IV N (%)	V N (%)	All students N (%)	Total N (%)	p
Pain	Male	4 (36,4)	4 (36,4)	16 (88,9)	22 (84,6)	46 (69,7)	120 (70,6)	0,008
	Female	11 (37,9)	24 (82,8)	17 (70,8)	22 (100)	74 (71,2)		

Table 3 shows the results obtained by analyzing the distribution of pain in relation to gender and year of study. The most common localization of pain was in the area of the upper back in 32.35% of cases, followed by the regions of the lower back (27.06%), shoulders (25.88%) and neck (24.71%), while pain in the hands (6.47%), legs (8.82) and spine (1.76) were less represented. No statistically significant difference was found in different localizations of pain according to gender among students by year of study.

Table 3. Localization of pain in dentistry students in relation to gender and year of study.

Localization		II N (%)	III N (%)	IV N (%)	V N (%)	All students N (%)	Total N (%)	p
Neck	Male	2 (18,18)	2 (18,18)	5 (27,77)	3 (11,54)	12 (18,15)	42 (24,71)	0,546
	Female	5 (17,24)	11 (37,93)	7 (29,17)	7 (31,82)	30 (28,85)		
Shoulders	Male	1 (9,09)	2 (18,18)	3 (16,66)	10 (38,46)	16 (24,24)	44 (25,88)	0,269
	Female	4 (13,79)	5 (17,24)	10 (41,66)	9 (40,91)	28 (26,92)		
Upper back	Male	1 (9,09)	1 (9,09)	7 (38,88)	14 (53,85)	23 (34,85)	55 (32,35)	0,081
	Female	3 (10,34)	9 (31,03)	9 (37,5)	11 (50)	32 (30,77)		
Lower back	Male	2 (18,18)	1 (9,09)	8 (44,44)	7 (26,92)	18 (27,27)	46 (27,06)	0,634
	Female	4 (13,79)	5 (17,24)	10 (41,66)	9 (40,91)	28 (26,92)		
Spine	Male	0 (0)	0 (0)	0 (0)	1 (3,85)	1 (1,51)	3 (1,76)	0,605*
	Female	0 (0)	2 (6,89)	0 (0)	0 (0)	2 (1,92)		
Hands	Male	3 (27,27)	0 (0)	0 (0)	2 (7,96)	5 (7,57)	11 (6,47)	0,084*
	Female	0 (0)	3 (10,34)	1 (4,16)	2 (9,09)	6 (5,77)		
Legs	Male	0 (0)	0 (0)	3	6	9 (13,64)	15 (8,82)	0,546*
	Female	1	0 (0)	1	4	6 (5,77)		

* Fisher exact test

A total of 72.5% of students declared that the intensity of pain was moderate, 17.5% declared that the pain was weak, while 10% of students reported intense pain (Table 4). There was no statistically significant difference in the intensity of pain in relation to the gender of the students and the year of study.

Table 4. Intensity of pain in dentistry students in relation to gender and year of study.

Pain intensity		II N (%)	III N (%)	IV N (%)	V N (%)	All students N (%)	Total N (%)	P*
Intens	Male	1 (25)	0 (0)	0 (0)	1 (4,5)	2 (4,3)	12 (10)	0,363
	Female	2 (18,2)	4 (36,7)	2 (11,8)	2 (9,1)	10 (13,5)		
Moderate	Male	3 (75)	4 (100)	12 (75)	15 (68,2)	34 (73,9)	87 (72,5)	0,088
	Female	6 (54,5)	18 (75)	11 (64,7)	18 (81,8)	53 (71,6)		
Low	Male	0 (0)	0 (0)	4 (25)	6 (27,3)	10 (21,7)	21 (17,5)	0,076
	Female	3 (27,3)	2 (8,3)	4 (23,5)	2 (9,1)	11 (14,9)		

* Fisher exact test

When asked whether the pain occurs occasionally, whether it lasts as long as the work, several hours, or the whole day, the largest number of students (38.3%) stated that the pain lasts as long as the work with the patient (Table 5). However, it was determined that there was a statistically significant difference in the duration of pain lasting several hours by gender according to the years of study (p=0.010). Among female students of the third year, pain lasting for several hours was more common in compare to male students, while among male students of the fourth year, pain lasting several hours was more present in compare to female. In the second and fifth year, the representation was the same.

Table 5. Duration of pain in dentistry students in relation to gender and year of study.

Duration of pain		II N (%)	III N (%)	IV N (%)	V N (%)	All students N (%)	Total N (%)	p*
All day	Male	0 (0)	0 (0)	0 (0)	1 (2,2)	1 (4,5)	3 (2,5)	1,00
	Female	0 (0)	0 (0)	1 (5,9)	1 (1,35)	2 (2,7)		
Sevaral hours	Male	2 (50)	3 (75)	9 (56,2)	7 (31,8)	21 (45,6)	42 (35)	0,01 0
	Female	3 (27,2)	10 (41,7)	1 (5,9)	7 (31,8)	21 (28,4)		
As long as the work	Male	1 (25)	0 (0)	4 (25)	7 (31,8)	12 (26,1)	46 (38,3)	0,06 4
	Female	4 (36,4)	11 (45,8)	10 (58,8)	9 (40,9)	34 (45,9)		
Periodically	Male	1 (25)	1 (25)	3 (18,8)	7 (31,8)	12 (26,1)	29 (24,2)	0,51 0
	Female	4 (36,4)	3 (12,5)	5 (29,4)	5 (22,7)	17 (23)		

* Fisher t test

A total of 73.3% of students declared that the occurrence of pain does not affect practical work (Table 6). No statistically significant difference in the impact of musculoskeletal pain on work was proven.

Table 6. Influence of musculoskeletal pain on clinical work in relation to gender and year of study.

Impact on work		II N (%)	III N (%)	IV N (%)	V N (%)	All students N (%)	Total N (%)
Affects	Male	2 (50)	0 (0)	6 (37,5)	3 (13,6)	11 (23,9)	32 (26,7)
	Female	2 (18,2)	8 (33,3)	5 (29,4)	6 (27,3)	21 (28,4)	
Does not affect	Male	2 (50)	4 (100)	10 (62,5)	19 (86,4)	35 (76,1)	88 (73,3)
	Female	9 (81,8)	16 (66,7)	12 (70,6)	16 (72,7)	53 (71,6)	
	p*	0,217	0,294	0,902	0,454	0,744	

* Fisher t test

When asked which of the measures to alleviate the problems students usually use, the largest number of them (66.6%) declared that they use rset (Table 7). The distribution of rest as a relief measure differs significantly by gender by years of study (χ^2=14.99; p=0.001). In the first and second year, female use rest more often, while among students in the fourth and fifth year, rest was equally represented.

Table 7. Pain relief measures applied by students in relation to gender and year of study.

Relief measures		II N (%)	III N (%)	IV N (%)	V N (%)	All students N (%)	Total N (%)	p
Stretching exercises	Male	1 (2)	3 (5,9)	2 (3,9)	5 (9,8)	11 (21,6)	38 (26,9)	0,549
	Female	5 (5,6)	7 (7,8)	9 (10)	6 (6,7)	27 (30)		
Medicines	Male	0 (0)	0 (0)	0 (0)	2 (3,9)	2 (3,9)	3 (2,1)	0,600
	Female	0 (0)	1 (1,1)	0 (0)	0 (0)	1 (1,1)		
Physical therapy	Male	1 (2)	0 (0)	0 (0)	0 (0)	1 (2)	6 (4,3)	1,00
	Female	0 (0)	0 (0)	3 (0)	2 (2,2)	5 (5,5)		
Rest	Male	3 (5,9)	1 (2)	14 (27,5)	19 (37,3)	37 (72,5)	94 (66,6)	0,001
	Female	9 (10)	18 (20)	11 (12,2)	19 (21,1)	57 (63,3)		

Discussion

According to data from the literature, disorders of professional origin, including musculoskeletal disorders, are the second most common cause of workplace disorders (Flemeban et al., 2021). Dentistry represents a profession of risk because it is associated with prolonged standing and forced body posture in a forced position (Deka 2016). Numerous authors in different countries have analyzed the occurrence of musculoskeletal disorders and proved their high prevalence among dental staff (Lietz et al., 2020). In order to determine the period in which the first signs of MSD begin in dental professionals, analyzes of the prevalence of MSD were made in dental students in different populations and at different universities, where it was proven that the first MSD symptoms appear already at the beginning of student practice (Presoto et al., 2016). For these purposes, various questionnaires are used, which should accurately collect data on the occurrence and characteristics of body pain. The largest number of studies examining the occurrence of musculoskeletal disorders in dental and other professions used the standardized Nordic questionnaire (Kuorinka et al., 1987). The questionnaire proved to be very reliable and valuable and seems to be the most adequate for the assessment of health-related factors at work (Crawford 2007).

The results of this study showed that a total of 70.6% of the students suffered from some form of MSD in one or more parts of the body. Data from the literature on the prevalence of MSD in the dental student population in other countries show that slightly lower prevalence was observed in Australia (64%) and Indonesia (63.5%), lower in the Czech Republic (39%), prevalence in the United States (46 -71%) and in the United Kingdom (54% - 76.5%) was variable, while in Saudi Arabia (91.2%) and the Netherlands (95%) it was significantly higher (Bruers et al., 2017; Felemban et al., 2021; Longridge et al., 2020). The results of this study showed that the prevalence of MSD in female was slightly more frequent than in male (71.2% vs 69.7%). Most of the data from the literature speaks in favor of the fact that female students suffer from MSD more often compared to male, with this difference being statistically significant (Deka 2016; Hashim et al., 2021).

This study demonstrated a slightly higher prevalence of musculoskeletal pain in the upper back region (32.35%) compared to other body regions, while approximately the same occurence was found in the lower back, shoulder and neck regions. Musculoskeletal complaints in the student population in the neck region were predominant in the studies by Londgridge et al. (2020) in the UK, Sezer et al. (2022) in Turkey, Hendy et al. (2021) and Felemban et al. (2021) in Saudi Arabia. Stambaugh et al. (2021) reported that the most common painful region was the shoulder part. However, studies by Deka (2016) and Vijay and Ide (2016) showed that the most frequently represented painful region was the lower back. Bearing in mind the literature data, it seems that the first musculoskeletal problems in students begin in the upper parts of the back, shoulders, and neck, and then descend to the lower back with age and length of service. Data from the literature regarding the localization of painful regions in relation to gender showed that females more often suffer from pain in the upper back, neck and shoulders, while males have more problems with the middle and lower back (Rising et al., 2005). The largest number of students (72.5%) in this study declared that musculoskeletal problems were of moderate intensity. There was no statistical difference in pain intensity between the genders. However, a study by Felemban et al. (2021) reported that female students had a higher degree of discomfort compared to male. When it comes to the duration of the pain, the largest number of students (38.3%) stated that the pain lasts as long as the work with the patient. In a study by Vijay and Ide (2016), 30% of students reported pain lasting up to four hours after work. A total of 73.3% of students in this study declared that the occurrence of musculoskeletal pain does not affect their practical work. In the study by Sezer

et al. (2022) inability to work due to lower back pain was reported by 19% of students. When it comes to relief measures that students use to relieve pain, the largest number of students declared that they use rest (66.6%), and a significant number of those who find stretching exercises useful (26.9%). More than half of the students in Vijay and Ide's (2016) study found stretching exercises helpful. In the study by Silva et al. (2016) 61.7% of students practiced physical exercises, which resulted in a significant reduction in shoulder pain. Less than 10% of the students in the study by Felemban et al. (2021) visited a physician for her MSDs. The same authors reported that one of the predisposing factors contributing to the occurrence of MSD is the height of the therapist. This is in line with a study done in Iran where it was proven that the incidence of neck pain increased by 1% for every centimeter of height increase (Madadizadeh et al., 2017). Further research is needed to examine and clarify the risk factors and the physical load to which dental students are exposed, and which could influence the early onset of musculoskeletal disorders that have an impact on work and daily life. It is also important that students become familiar with ergonomics from the first days of practice through education and practice for the prevention of musculoskeletal pain.

Conclusion

Musculoskeletal pain appears already in the early period of student practice, and tend to intensify with the length of the studies, which is why dentistry is placed among the high-risk professions for the development of musculoskeletal disorders. Therefore, it is necessary to include ergonomic education in regular studies, which is of great importance for the prevention of the occurrence and intensification of these disorders.

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MUSKULOSKELETNI POREMEĆAJI U POPULACIJI STUDENATA STOMATOLOGIJE UNIVERZITETA U NIŠU, SRBIJA

Apstrakt. Muskuloskeletni poremećaji (MSP) se karakterišu pojavom nelagodnosti, povremenog ili trajnog bola u zglobovima, mišićima, tetivama i drugim mekim tkivima izazvanih ponavljanjem određenih telesnih pokreta ili neugodnim i forsiranim telesnim držanjem. Stomatologija se smatra profesijom visokog rizika za razvoj ovih poremećaja. Cilj istraživanja je bio da se ispita pojava MSP u populaciji studenata stomatologije Medicinskog fakulteta Univerziteta u Nišu, Srbija. U istraživanju je učestvovalo 170 studenata stomatologije. U cilju ispitivanja pojave i distribucije MSP studenti su popunjavali modifikovani Nordijski upitnik. Rezultati su pokazali da 70,6 % studenata pati od MSP. MSP su bili gotovo jednako zastupljeni u oba pola (69,7% kod muškaraca i 71,1% kod žena). Najčešća lokalizacija bola bila je u predelu gornjeg dela leđa u 32,3% slučajeva. Ukupno 54,1% studenata se izjasnilo da je intenzitet bola bio umeren i da u 41,2% slučajeva traje koliko i rad sa pacijentom. U 49,4% slučajeva bol ne utiče na praktični rad, a kao meru olakšanja tegoba u 53,3% slučajeva studenti upražnjavaju odmor. MSP se javljaju već na prvim godinama studija i imaju tendenciju intenziviranja sa dužinom studija. Obzirom da se muskuloskeletni bol javlja već u ranom periodu studentske prakse neophodno je baviti se proučavanjem ergonomskih faktora koji su od velikog značaja za pojavu i intenziviranje ovih poremećaja.

Ključne reči: Muskuloskeletni poremećaji, stomatologija, student, ergonomija