ORIGINAL ARTICLE

Adv Psychiatry Neurol 2023; 32 (2): 68–75
DOI: https://doi.org/10.5114/ppn.2023.129053

Functional assessment and evaluation of health problems with the cervical spine among dental assistants and hygienists

Correspondence to:

Radosław Janczyk
Center of Osteopathy
25C/250 Tymienieckiego St.
90-350 Lodz, Poland
e-mail: radoslaw_janczyk@wp.pl

Submitted: 24.02.2023
Accepted: 05.05.2023

Radosław Janczyk[1], Małgorzata Janczyk[1], Marcin Sibiński[2], Marek Drobniewski[2]

[1] Center of Osteopathy, Lodz, Poland
[2] Clinic of Orthopedics and Pediatric Orthopedics, Medical University of Lodz, Poland

Abstract

Purpose: The aim of the study was to evaluate the mobility of the cervical spine, pain and function according to Neck Disability Index (NDI) scores among dental assistants and hygienists. Comparison between dental professionals and a control group was also performed.

Methods: In the study, 338 dental assistants and hygienists with a mean age of 35.8 were evaluated. Of these, 195 were measured with the CROM 3 device, and 143 with a classic tape measure, for the range of motion of their cervical spine. A non-dental professional group consisting of 60 women (whose work was not related to repetitive movements of cervical spine) was also tested, 30 with the CROM 3 device, and 30 with a classic tape measure. The dental and control groups were also surveyed with the NDI questionnaire and Visual Analogue Scale (VAS).

Results: Dental assistants and hygienists had significantly reduced functional ROM in all directions in comparison to the control group. Among the 338 volunteers form the study group the VAS pain score was higher than in the control group. NDI scores were also worse in the study group, compared to the control group. Functional results in all subgroups of the NDI questionnaire were better in the control group. Among dental workers the cervical spine typically demonstrated significantly greater mobility in right-rotation, resulting from the position occupied at the unit at which they work.

Conclusions: Our findings confirm a decrease in the mobility of the cervical spine, lower functional scores involving various everyday activities and greater intensity of pain among dental assistants and hygienists in comparison to participants whose work does not involve cervical spine overuse.

Key words: functional evaluation, dental team, cervical spine pain, functional vertebrae, static work.

INTRODUCTION

With the rise in the demand for professionally qualified dental care workers, the labor market has seen a rapid growth in interest in dental assistant or hygienist as career options. It is the duty of the dental assistant to reduce the distractions experienced by them, thus significantly easing their daily burden. Older guidelines for dental assistants, such as those described by Jańczuk, "forced" the assistant to work passively in a static position: all activities were performed from a sitting position, without any possibility of moving around [1]. This approach is contrary to the modern ergonomic principles of dynamic work. The professional activities of an assistant entail a very wide range of energy expenditure, with the level depending on the type of contraction in the working muscles, i.e., isometric and isotonic contractions; it is also related to the nature of the job related to repetitive movements.

In some situations, the assistant is required to perform dynamic movements, such as setting the lighting or preparing other specialized instruments needed at a given moment; these may be placed in cabinets located in the treatment room or sometimes in another room. When performed in an appropriate manner, these activities can improve the degree of comfort associated with the work, changing it, as described by Ćwirzeń *et al.*, into a more static-dynamic form [2].

Work-related musculoskeletal disorders (WMSD) among dental professionals have been well documented. As shown by Gandolfi *et al.* the most affected body areas are the neck (59.9%) and lumbar region (52.1%), followed by the shoulders (43.3%), dorsal spine (37.7%) and wrists

(30.6%) [3]. Also, Hayes *et al*. conclude that WMSD in this professional group ranges between 64% and 93% with the most prevalent regions for pain being the back and neck [4]. Knowledge of WMSD is crucial to the implementation of education in ergonomics among dental professionals, which may be achieved by teaching biomechanics, posturology, integrative functional therapies and by promoting the holistic health of dental operators.

Our hypothesis was that the group of dental professionals under investigation would have poorer cervical spine function (including more pain and limited range of motion) than the control group. The aim of the study was to evaluate the mobility of the cervical spine, pain and function according to NDI score among dental assistants and hygienists, for comparison with the control group.

METHODS

This study was conducted in the period from April 2018 to January 2020. The participants were recruited from the nationwide Asysdent conferences held in 2018 (1090 participants) and 2019 (1040 participants) and the patients of the Osteopathy Centre in Lodz, Poland. Participants that were assessed during the conference in 2018 were not included the following year. All participants of the study were assessed once. The conference attendees comprised a uniform professional group of dental assistants and hygienists. The purpose of the examination was the assessment of cervical spine function and comparison to the group of people without symptoms, whose work does not require extensive cervical spine use. Written informed consent was obtained from the participants before their participation. All participants were informed about the aim of the study, which is to say the analysis of health problems related to cervical spine among dental assistants. The second aim was an analysis of physical exercises and ergonomics at work, and how they influence cervical spine function. However, the results of this second part are the subject of another paper.

The study included 338 dental assistants and hygienists with a mean age of 35.8 years (range from 20 to 60 years) were evaluated. The mean length of service was 10.4 years, the longest was 37 years. All participants were female. No male participant volunteered for the study. Within this group, 195 women were measured with the CROM 3 (Cervical Range of Motion 3) device (mean age 35, range from 20 to 60 years), and 143 were measured using the classic tape measure (CM) (mean age 35.6, range from 20 to 59 years). During the first conference in 2018, the measurement was done with a CM, and during the second one with CROM 3.

The control group was formed of 60 females visiting the Osteopathy Centre for problems related only to the lower limbs. Their professions were not related to extensive cervical spine use, and none had any problems with the cervical spine. This group was divided in half, with 30 being measured with the CROM 3 device (mean age 36.3, range from 22 to 59 years) and the other 30 with a classic tape measure (mean age 38.7, range from 26 to 57 years). The difference in age between study and control group was not statistically significant (for CM and CROM 3, $p > 0.05$, and $p > 0.05$; respectively).

All of the women in both groups underwent the same repeatable test procedure. The test itself was performed in a sitting position, with the head in the intermediate position. The functional mobility of the cervical spine was tested by asking every participant to perform maximum flexion and extension of the cervical spine, as well as a lateral bend to the right and left, and rotations to the right and left.

During the conference in 2018 measurement was performed with classic tape measure. For measurement of maximal flexion of cervical spine, the tape was placed between spinous process of C7 and external occipital protuberance. Measurement of cervical spine extension was done placing the tape between the distal part of the chin and the proximal part of the sternal manubrium. Cervical spine lateral bent to the right and left was measured between the mastoid process of the temporal bone and the distal part of the acromion. For maximal rotations to the right and left distance between the distal part of the chin and the part of acromion was used. The differences in centimeters between intermediate position and maximal investigated positions were noted.

During the conference in 2019 the method of measurement was improved. The CROM 3 device was used instead of classic tape measure. The measurements were easier and faster to perform, as values in degrees were read from the clock face of the device. The device consists of 2 integrated inclinometers and a compass to measure moving components. The inclinometers and compass are firmly attached to human head by plastic holds. Inclinometers measure flexion/extension as well as lateral bent. The compass measures rotation. Inclinometers are

Figure 1. CROM 3 device for measuring range of motion of cervical spine

Table 1. Functional mobility (measured by CROM 3) in the study and control groups

	Study group, *n* = 195 (mean ± SD)	Control group, *n* = 30 (mean ± SD)	*p*-value
Flexion	54.87 ± 0.73°	65.05 ± 1.71°	< 0.001
Extension	65.48 ± 0.85°	81.87 ± 2.01°	< 0.001
Rotation to the right	65.96 ± 0.72°	77.53 ± 1.49°	< 0.001
Rotation to the left	61.06 ± 0.75°	76.43 ± 1.19°	< 0.001
Bend to the right	37.35 ± 0.55°	47.85 ± 1.34°	< 0.001
Bend to the left	40.02 ± 0.54°	49.03 ± 1.54°	< 0.001

Table 2. Functional mobility (CM) in the study and control groups

	Study group, *n* = 143 (mean ± SD)	Control group, *n* = 30 (mean ± SD)	*p*-value
Flexion	2.77 ± 0.04 cm	1.07 ± 0.05 cm	< 0.001
Extension	6.07 ± 0.14 cm	9.17 ± 0.47 cm	< 0.001
Rotation to the right	8.11 ± 0.13 cm	9.63 ± 0.39 cm	< 0.002
Rotation to the left	7.34 ± 0.13 cm	9.53 ± 0.49 cm	< 0.001
Bend to the right	3.50 ± 0.10 cm	6.93 ± 0.49 cm	< 0.001
Bend to the left	3.32 ± 0.10 cm	6.80 ± 0.41 cm	< 0.001

Table 3. Comparative analysis of NDI questionnaire between study (CROM 3 + CM) and control groups

	Study group, *n* = 338, mean (min-max) points	Control group, *n* = 60, mean (min-max) points	*p*-value
Pain intensity	1.6 (0-5)	0.08 (0-2)	< 0.001
Personal care	0.6 (0-3)	0.03 (0-1)	< 0.001
Weightlifting	1.4 (0-4)	0.2 (0-4)	< 0.001
Reading	1.0 (0-5)	0.2 (0-2)	< 0.001
Headache	2.4 (0-5)	1.4 (0-4)	< 0.001
Concentration	1.3 (0-4)	0.3 (0-2)	< 0.001
Work	0.7 (0-3)	0.02 (0-1)	< 0.001
Driving a car	1.1 (0-5)	0.05 (0-1)	< 0.001
Sleeping	1.1 (0-5)	0.5 (0-2)	< 0.001
Recreation	1.1 (0-5)	0.17 (0-1)	< 0.001
Total NDI score	12.3 (0-33)	2.95 (0-11)	< 0.001

adjustable in scale position 0°. The ROM measurements are presented in degrees (Figure I).

Additionally, the participants were surveyed using the Neck Disability Index (NDI) questionnaire [5]. The NDI is a self-report questionnaire, consisting of 10 sections representing 10 activities. For every section, a patient can get from 0 to 5 points (from 0 to 10%). It is used to determine how neck pain affects a patient's daily life and to assess the self-rated disability of patients with neck pain. A higher score means higher level of cervical spine disability. The subjective level of pain in the cervical region was scored on a ten-point visual analogue scale (VAS) pain score. Zero on the VAS pain score means no pain, higher scores indicate higher levels of pain. The VAS is the patient-reported outcome measure most frequently used to measure pain intensity in back pain trials [6].

The study was performed in accordance with the 1964 Declaration of Helsinki. The study protocol was accepted by the Bioethics Commission of the Medical University of Lodz (RNN/99/22/KE, 10 May 2022).

Statistica for Windows 13.3 Pl was used for statistical analysis. The comparison between groups for age was done with Student's *t*-test. The Shapiro-Wilk test was done for normality of distribution check. The Mann-Whitney *U* test was used to assess statistical significance of VAS pain score between groups. The comparison between the study and control groups for range of motion and NDI score (Tables 1-3) was performed with Mann-Whitney *U* test. The comparison between the two groups responses to the NDI questionnaire (Tables 4-11) was performed with χ^2 test and Yates's χ^2 test. For all tests, the level of significance was taken as $p < 0.05$.

RESULTS

First, a statistical comparison between study and control groups for VAS pain score was performed. In those measured with the CM in the study and control groups (mean 4.0 ± 2.4 and 0.8 ± 1.4; respectively) the difference was statistically significant ($p < 0.001$). The difference between the study and groups in CROM 3 measurements (mean 4.7 ± 2.1 and 0.3 ± 0.8; respectively) was also statistically significant ($p < 0.001$). When both groups were taken together (CROM 3 + CM) the difference was also statistically significant (mean 4.4 ± 2.2 and 0.5 ± 1.1; respectively, $p < 0.001$).

Both CROM 3 and CM measurements identified lower mobility in all measured directions among the dental assistants compared to the other group, as confirmed with statistical analysis (Tables 1 and 2).

The NDI score in the study group was 12.3 points, compared to 2.95 points among the control group ($p < 0.001$). Worse results were noted also in all subgroups of the NDI questionnaire among dental assistants and hygienists (Table 3).

The results indicate that only 28.7% of the dental professionals, i.e., the study group (total n = 338), indicated a complete absence of pain at the time of measurement, while 12.4% experienced constant, moderate pain as measured with the NDI questionnaire. These results differed significantly between the two groups (Table 4).

Only 31.7% of the study group reported being able to lift heavy objects without feeling pain. In addition, 36.1% reported the occurrence of pain while lifting heavy objects, and 19.8% reported being able to lift only

Table 4. Comparative analysis of pain intensity level in the study (CROM 3 + CM) and control groups (NDI questionnaire)

Pain intensity	Study group, *n* (%)	Control group, *n* (%)	*p*-value
I have no pain at the moment	97 (28.7)	57 (95.0)	< 0.001
The pain is very mild at the moment	69 (20.4)	1 (0.0)	< 0.001
The pain is moderate at the moment	90 (26.6)	0 (0.0)	< 0.001
The pain is fairly severe at the moment	42 (12.4)	0 (0.0)	< 0.01
The pain is very severe at the moment	33 (9.8)	2 (5.0)	> 0.05
The pain is the worst imaginable at the moment	7 (2.1)	0 (0.0)	> 0.05
Total	338 (100.0)	60 (100.0)	

Table 5. Comparative analysis of the weightlifting assessment in the study (CROM 3+CM) and control groups (NDI questionnaire)

Weightlifting	Study group, *n* (%)	Control group, *n* (%)	*p*-value
I can lift heavy weights without extra pain	107 (31.7)	54 (90.0)	< 0.001
I can lift heavy weights but it gives extra pain	122 (36.1)	5 (8.3)	< 0.001
Pain prevents me lifting heavy weights off the floor, but I can manage if they are conveniently placed, for example on a table	23 (6.8)	0 (0.0)	> 0.05
Pain prevents me from lifting heavy weights but I can manage light to medium weights if they are conveniently positioned	19 (5.6)	0 (0.0)	> 0.05
I can only lift very light weights	67 (19.8)	1 (1.7)	< 0.001
I cannot lift or carry anything	0 (0.0)	0 (0.0)	
Total	338 (100.0)	60 (100.0)	

Table 6. Comparative of work evaluation in the study (CROM 3+CM) and control groups (NDI questionnaire)

Work	Study group, *n* (%)	Control group, *n* (%)	*p*-value
I can do as much work as I want to	190 (56.2)	59 (98.3)	< 0.001
I can only do my usual work, but no more	87 (25.7)	1 (1.7)	< 0.001
I can do most of my usual work, but no more	50 (14.8)	0 (0.0)	< 0.01
I cannot do my usual work	11 (3.3)	0 (0.0)	> 0.05
I can hardly do any work at all	0 (0.0)	0 (0.0)	
I can't do any work at all	0 (0.0)	0 (0.0)	
Total	338 (100.0)	60 (100.0)	

Table 7. Comparative analysis of sleeping assessment in the study (CROM 3+CM) and control groups (NDI questionnaire)

Sleeping	Study group, *n* (%)	Control group, *n* (%)	*p*-value
I have no trouble sleeping	113 (33.4)	36 (60.0)	< 0.001
My sleep is slightly disturbed (less than 1 hr sleepless)	121 (35.8)	19 (31.7)	> 0.05
My sleep is mildly disturbed (1-2 hrs sleepless)	65 (19.2)	5 (8.3)	> 0.05
My sleep is moderately disturbed (2-3 hrs sleepless)	28 (8.3)	0 (0.0)	< 0.05
My sleep is greatly disturbed (3-5 hrs sleepless)	10 (3.0)	0 (0.0)	> 0.05
My sleep is completely disturbed (5-7 hrs sleepless)	1 (0.3)	0 (0.0)	> 0.05
Total	338 (100.0)	60 (100.0)	

light objects. These results differed significantly between the study and control groups (Table 5).

More than half of the respondents in the study group (56.2%) reported free movement and pain-free work in the dental surgery. Of the remainder, 25.7% reported moderate pain during their duties and 14.8% intermittent pain (Table 6). In addition, only 33.4% in the study group reported not having any problems with sleeping: 8.3% reported two to three hours of insomnia each night, and 3% reported up to three to five hours of insomnia (Table 7).

Table 8. Comparison of headache assessment between the study (CROM 3+CM) and control groups (NDI questionnaire)

Headaches	Study group, *n* (%)	Control group, *n* (%)	*p*-value
I have no headaches at all	15 (4.4)	15 (25.0)	< 0.001
I have slight headaches, which come infrequently	47 (13.9)	18 (30.0)	< 0.01
I have moderate headaches, which come infrequently	107 (31.7)	18 (30.0)	> 0.05
I have moderate headaches, which come frequently	79 (23.4)	6 (10.0)	< 0.05
I have severe headaches, which come frequently	87 (25.7)	3 (5.0)	< 0.001
I have headaches almost all the time	3 (0.9)	0 (0.0)	> 0.05
Total	338 (100.0)	60 (100.0)	

Table 9. Comparison of concentration assessment between study (CROM 3 + CM) and control groups (NDI questionnaire)

Concentration	Study group, *n* (%)	Control group, *n* (%)	*p*-value
I can concentrate fully when I want to with no difficulty	72 (21.3)	48 (80.0)	< 0.001
I can concentrate fully when I want to with slight difficulty	125 (37.0)	7 (11.7)	< 0.001
I have a fair degree of difficulty in concentrating when I want to	109 (32.2)	5 (8.3)	< 0.001
I have a lot of difficulty in concentrating when I want to	10 (3.0)	0 (0.0)	> 0.05
I have a great deal of difficulty in concentrating when I want to	22 (6.5)	0 (0.0)	> 0.05
I cannot concentrate at all	0 (0.0)	0 (0.0)	
Total	338 (100.0)	60 (100.0)	

Table 10. Comparative assessment of activity between the study (CROM 3+CM) and control groups (NDI questionnaire)

Recreation	Study group, *n* (%)	Control group, *n* (%)	*p*-value
I am able to engage in all my recreation activities with no neck pain at all	117 (34.6)	57 (95.0)	< 0.001
I am able to engage in all my recreation activities, with some pain in my neck	119 (35.2)	3 (5.0)	< 0.001
I am able to engage in most, but not all of my usual recreation activities because of pain in my neck	61 (18.0)	0 (0.0)	< 0.001
I am able to engage in a few of my usual recreation activities because of pain in my neck	32 (9.5)	0 (0.0)	< 0.05
I can hardly do any recreation activities because of pain in my neck	8 (2.4)	0 (0.0)	> 0.05
I can't do any recreation activities at all	1 (0.3)	0 (0.0)	> 0.05
Total	338 (100.0)	60 (100.0)	

Table 11. Comparative driving assessment of the study (CROM 3 + CM) and control groups (NDI questionnaire)

Driving	Study group, *n* (%)	Control group, *n* (%)	*p*-value
I can drive my car without any neck pain	107 (32.4%)	50 (83.3%)	< 0.001
I can drive my car as long as I want with slight pain in my neck	99 (30.0%)	7 (11.6%)	< 0.01
I can drive my car as long as I want with moderate pain in my neck	78 (23.6%)	3 (5.0%)	< 0.01
I can't drive my car as long as I want because of moderate pain in my neck	36 (10.9%)	0 (0.0%)	< 0.05
I can hardly drive at all because of severe pain in my neck	9 (2.7%)	0 (0.0%)	> 0.05
I can't drive my car at all	1 (0.3%)	0 (0.0%)	> 0.05
Total	330* (100.0%)	60 (100.0%)	

**Eight out of 338 participants were not driving cars.*

In addition, 13.9% of respondents in the study group reported mild headaches, and 23.4% moderate headaches. Only 4.4% reported the absence of headaches, while 25.7% indicated frequent, severe headaches (Table 8). Significant problems with concentration were reported by 32.2% of respondents, while only 21.3% indicted that they could fully concentrate on a topic without any problems (Table 9).

The data regarding recreational physical activity are interesting. Out of 338 respondents, only 34.6% did not experience any problems, such as neck pain, during exercise. The remainder indicated feeling neck pain during this kind of activity in various intensities (Table 10).

Furthermore, 10.9% of the respondents in the study group reported being prevented from driving because of moderate neck pain, while 30% could drive with mild neck pain and 23.6% with moderate neck pain. Only 32.4% reported being able to drive a car for as long as they wanted, without feeling pain in the cervical spine (Table 11).

DISCUSSION

Modern dentistry has become increasingly sophisticated, and requires strong, complicated and repetitive efforts by the entire dental team. Indeed, while the efforts of the team can be painful for the patient, this pain is often shared by the dental staff themselves. Studies have noted a growing incidence of cervical spine pain in dentistry, similar to that associated with the overuse of smartphones [7]. A key component of the dental team is the dental assistant. However, the conditions faced by the assistant in the modern dental surgery result in a greater risk of fatigue, decreased concentration, muscle tension and pain, especially in the cervical spine. This is not surprising, as such duties are characterized by the need to assist for long hours, delivering instruments, working in artificial lighting conditions and small spaces. They are affected by wearing harmful aerosols, protective clothing that restricts movement, as well as risk of needle stick injuries, possible damage to equipment and the responsibility associated with the work [7].

Regarding the increasingly common incidence of degenerative disease of the cervical spine, the position of the Polish Society of Spine Surgeons is that surgical treatment should be offered only after a six-week period of ineffective conservative treatment. Indeed, a review found insufficient evidence to indicate that the benefits of surgical procedures outweigh the risk of complications [8]. Cervical spine pain disorders are one of the most common problems among the adult population, ranking second only to lower back pain. Piątkowska *et al.* report the occurrence of pain significantly reducing quality of life in 44% of the Polish population. Long-term static overload and forced head positions have a negative impact on the articular cartilage, resulting in the premature, gradual development of degenerative changes in the cervical segment [9]. These findings confirm ours. We found that patients working as dental assistants had significantly reduced range of cervical spine motion as well as lower results in the majority of the 10 NDI questionnaire sections including: pain, weightlifting, working, sleeping, concentration, physical recreational activity, headache or driving a car.

Our findings are in agreement with other authors, that by assessing health problems, it is possible to determine how an assistant "works" [10-12]. Is the profession of assistant, once that of a helper, ergonomically safe and free of health problems in the neck area? A study of 24 dentistry students found that bending the cervical spine, a position commonly adopted by the dental team, causes pain in the shoulder muscles and the trapezius muscle in 63% of respondents, in the suboccipital muscles in 50%, and in the levator muscles of the shoulder blades in 36% [10], which is consistent with our present findings. A Polish study also found dental practice to have considerable ergonomic shortcomings. Among the 79 dentists surveyed, only 4% took breaks at work after each procedure, 84% sat in a forced position during the procedure, and 54% maintained a forced tilt and head rotation to one side [11].

Previous studies have noted that patients with chronic cervical pain demonstrate altered patterns of local muscles recruitment, tending to abuse the polyarticular muscles by engaging them with high contraction force and speed, resulting in an increased activity of the more superficial muscles and lower activity of the deeper ones. Such postural compensations lead to the inhibition of single-joint muscles (stabilizers), which should dominate under light load conditions, i.e., in low-threshold conditions [13, 14]. Women are more prone to strain on the cervical spine, due to their muscles tending to be thinner and softer. The work of the assistant, consisting in the forced positioning of the head, with eyes focused on a bright, small treatment area, combined with various posture errors that appear unconsciously during office work, may result in profound changes to the cervical spine. When in a sitting position, the natural physiological curves of the spine should dynamically adjust so that the line of gravity falls on the support surface. Often, however, the natural cervical lordosis begins to lift, which causes the line of gravity to fall beyond the proper support surface, thus disturbing the balance. This can happen when the assistant tilts the torso and head excessively forward, accompanied by a component of rotation and lateral bends [13, 14].

Our observations indicate the significance of the reduction of the functional range of motion of the cervical spine. Poorer NDI results and VAS pain scores were found among the dental assistants and hygienists in comparison to the control group whose work was not related to cervical spine overuse. In the study group, a greater range of movements was also observed to the right side compared to the left side and this may be closely related to the nature of the space occupied at the dental unit. Similarly, Nowotny-Czupryn *et al.* report that assistants were more likely to work with the cervical segment rotated more to one side than the dentist herself: 57.5% more often to the right and 42.5% more often to the left [15].

Currently, the most commonly used global classification used to assess the cervical spine is the NDI [6]. NDI have been used in previous studies assessing clinical patterns affecting disability in patient fitness questionnaires [16-18]. Previous studies have also noted that the pathologies associated with the cervical junction become more severe with length of service [15]. A Swedish study of male and female workers identified neck pain in 29.7% of the doctors studied and 24.2% of the assistants. However, as many as 48% of female dentists reported strong pain in the cervical region compared to 32% of assistants [19].

This study has some limitations. First, this is a non-experimental design. Second, two groups of participants were compared (dental professionals versus a control group of non-dental professionals) in which the number of participants were not equal. Third, the two different measurements methods used (CM and CROM3) makes this group non-homogenous for comparison of ROM and different statistical calculations were done for both methods. However, the NDI questionnaire results were not dependent on the measurement methods used.

The results of our study indicate that cervical spine WMSD among dental professionals is a problem we should focus on, to improve their quality of life. Special attention should be paid to improving ergonomics at work and introducing rehabilitation programs together with physical exercises. This knowledge may also help to form educational programs for those professionals. This study will be continued to evaluate the influence of physical exercises and ergonomics, but the results of this will be a subject for another publication.

CONCLUSIONS

Our findings confirm a decrease in the mobility of the cervical spine, lower functional scores involving various everyday activities and greater intensity of pain among dental assistants and hygienists in comparison to research participants whose work does not involve cervical spine overuse.

Conflict of interest

Absent.

Financial support

Absent.

References

1. Jańczuk Z. Podręcznik dla asystentek i higienistek stomatologicznych. Warszawa: PZWL; 2012.
2. Ćwirzeń W, Wagner L, Piróg P. Obciążenie kręgosłupa szyjnego w praktyce zawodowej higienistki stomatologicznej. e-Dentico 2013; 46: 86-91.
3. Gandolfi MG, Zamparini F, Spinelli A, Risi A, Prati C. Musculoskeletal disorders among Italian dentists and dental hygienists. Int J Environ Res Public Health 2021; 18: 2705. DOI: 10.3390/ijerph18052705.
4. Hayes M, Cockrell D, Smith DR. A systematic review of musculoskeletal disorders among dental professionals. Int J Dent Hyg 2009; 7: 159-165.
5. Young BA, Walker MJ, Strunce JB, Boyles RE, Whitman JM, Childs JD. Responsiveness of the Neck Disability Index in patients with mechanical neck disorders. Spine J 2009; 9: 802-808.
6. Chapman JR, Norvell DC, Hermsmeyer JT, Bransford RJ, DeVine J, McGirt MJ, Lee MJ. Evaluating common outcomes for measuring treatment success for chronic low back pain. Spine (Phila Pa 1976) 2011; 36 (21 Suppl): S54-S68. DOI: 10.1097/BRS.0b013e31822ef74d.
7. Thongtipmak S, Buranruk O, Eungpinichpong W, Konharn K. Immediate effects and acceptability of an application-based stretching exercise incorporating deep slow breathing for neck pain self-management. Health Inform Res 2020; 26: 50-60.
8. Łątka D, Miekisiak G, Jarmuzek P, Lachowski M, Kaczmarczyk J. Treatment of degenerative cervical spondylosis with radiculopathy. Clinical practice guidelines endorsed by The Polish Society of Spinal Surgery. Neurol Neurochir Pol 2016; 50: 109-113.
9. Piątkowska K, Wnuk B, Blicharska I, Rychlik M, Durmala J. Cervical pain in young professional musicians – quality of life. Ortopedia Traumatologia Rehabilitacja 2016; 18: 21-29.
10. Stambaugh JE, Calleros C, Siegel P, Nathe C. Evaluating the prevalence of musculoskeletal neck pain in dental hygiene students. J Dent Hyg 2021; 95: 58-62.
11. Kuciel N, Demczyszak I, Sutkowska E, Sokołowski M, Mazurek J, Kaczmarz K, Lurbiecki J. Ergonomia pracy a schorzenia narządu ruchu wśród lekarzy stomatologów. Bezpieczeństwo Pracy 2018; 9: 22-26.
12. Morse T, Bruneau H, Dussetschleger J. Musculoskeletal disorders of the neck and shoulder in the dental professions. Work 2010; 35: 419-429.
13. Falla DL, Jull GA, Hodges PW. Patients with neck pain demonstrate reduced electromyographic activity of the deep cervical flexor muscles during performance of the craniocervical flexion test. Spine (Phila Pa 1976) 2004; 29: 2108-2114.

14. O'Leary S, Falla D, Jull G. The relationship between superficial muscle activity during the cranio-cervical flexion test and clinical features in patients with chronic neck pain. Man Ther 2011; 16: 452-455.
15. Nowotny-Czupryna O, Czupryna K, Skucha-Nowak M, Szymańska J. Ustawienie kręgosłupa podczas pracy w pozycji siedzącej a dolegliwości bólowe u stomatologów i asystentek medycznych. Medycyna Pracy 2018; 69: 509-522.
16. Mikołajczyk E, Jankowicz-Szymańska A, Guzy G, Maicki T. Wpływ kompleksowej fizjoterapii na stan funkcjonalny pacjentek z dolegliwościami bólowymi odcinka szyjnego kręgosłupa. Hygeia. Public Health 2013; 48: 73-79.
17. Szostak L. Ocena aktywności mięśniowo-powięziowych punktów spustowych w zespołach bólowych w okolicy połączenia głowowo-szyjnego i szyi. Poznań; 2016.
18. Toman M, Rutkowska M, Dąbrowska-Galas M, Król T, Michalik P, Michalski T. Dolegliwości bólowe odcinka szyjnego kręgosłupa wśród studentów fizjoterapii. Polski Przegląd Nauki o Zdrowiu 2019; 59: 109-113.
19. Wahlström J. Prevalence and Risk Factors of Neck Pain Among Dentists and Dental Hygienists. Work and Environmental Medicine. Sweden: Umeå; 2014.