ORIGINAL ARTICLE

The Relationship between Stress Levels and Musculoskeletal Pain Levels in Dentists during the COVID-19 Pandemic

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ABSTRACT

Introduction: During the COVID-19 pandemic many dentists state that they are more stressed and that there is an increase in muscle pain, especially in the neck and back. **Materials and methods:** Stress levels were measured using the Perceived Stress Scale (PSS-10), and musculoskeletal pain using the Nordic Musculoskeletal Questionnaire (NMQ). Correlation test using the Spearman test. **Results:** 46.3% respondents experienced low-stress levels, 52.4% moderate stress levels, and 1.3 % severe stress levels. A total of 80.7% respondents experienced musculoskeletal pain with low complaints, 15.8% had moderate complaints and 3.5% had high complaints. Some parts of the body that most often experience pain range from slightly painful to very painful, namely: the upper neck (60.1%); lower neck (57.9%); upper buttocks (50.8%); waist (48.6%); right shoulder (45.7%); back (45.3%) and left shoulder (40.5%). The results of the Spearman correlation test were p: 0.222 with an rs value: 0.069 (no correlation). **Conclusion:** Dentists who were respondents to this study continued to work during the COVID-19 pandemic, using complete PPE in a sitting position. Statistically, there is no relationship between the level of stress and the level of musculoskeletal pain. Still, respondents stated they were more stressed and experienced musculoskeletal pain, especially in the neck, shoulders, back, and upper buttocks.

Keywords: Dentists, Stress level, Musculoskeletal pain, PSS-10, NMQ, COVID-19

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INTRODUCTION

Working as a dentist during the COVID-19 pandemic provides a special experience for dentists in the world, including in Indonesia. Even now, dentists still need to be alert to various infectious diseases caused by viruses, especially the 2019-nCoV virus. Dentists are susceptible to 2019-nCoV transmission because this virus is found in the oropharynx and oral cavity including saliva.[1,2,3] Therefore, based on experience working during the pandemic, dentists must use PPE, one component of the COVID-19 prevention management system.[4,5]

The professional responsibility of dentists who have to make their own decisions, awkward positions during work constantly, demands perfection of work, limited physical work area, number of patients, diversity of cases, emergency conditions, workload, physical pressure, and routine are triggers for stress and at the same time musculoskeletal disorders in dentists.[6,7] Chronic musculoskeletal disorders in dentists are more caused by muscle fatigue due to awkward postures, repetitive movements, and vibrations of work tools in daily practice.[8] Repetitive movements and positions while working will cause muscles to become unbalanced. Movements that are carried out repeatedly include rounded shoulders, the head is positioned forward at an uncomfortable angle to the neck, and the left and right arms are always raised. The associated muscles work excessively and become tense, and the muscles even lengthen until they become very weak.[9] The use of PPE in practice during a pandemic will aggravate these conditions because it causes overheating, putting dentists at risk of dehydration.

The prevalence of musculoskeletal disorders in the dental profession is 63-93% worldwide, varying from discomfort, pain, and functional limitations up to loss of ability to work.[10] The musculoskeletal pain most often complained of by dentists is neck, back, and shoulder pain.[11,12] Continuous stress and musculoskeletal pain can reduce the dentist's quality of life. To find out the resilience of dentists working during the pandemic can be done by measuring stress levels and musculoskeletal pain levels and whether there is a relationship between the two.

MATERIALS AND METHODS

This research was conducted using a questionnaire on Google Form and the respondents were Indonesian

dentists, both general dentists and specialist dentists. Research was conducted in almost all regions in Indonesia, namely: North Sumatra, West Sumatra, South Sumatra, Riau, Bengkulu, Bangka-Belitung, Lampung, Jakarta, West Java, Banten, Central Java, East Java, Bali, West Nusa Tenggara, East Nusa Tenggara , West Kalimantan, Central Kalimantan, East Kalimantan, North Sulawesi, Central Sulawesi, South Sulawesi, Maluku and Papua. The sample size for correlative analysis uses the formula:

$$n=[((Z\alpha+Z\beta))/(0,5\ \ln((1+r)/(1-r))\ )]^2+3$$

Based on the formula above with α= 0.05 and test power of 80%, the required sample size is a minimum of 193 samples.[13] Measurement of stress levels uses the Perceive Stress Scale (PSS) and measurement of musculoskeletal disorders uses the Nordic Musculoskeletal Questionnaire (NMQ). Measurement of perceived stress levels uses the Perceive Stress Scale (PSS-10) questionnaire and measurement of musculoskeletal disorders uses the Nordic Musculoskeletal Questionnaire (NMQ). The PSS-10 questionnaire consists of 10 questions and is used for adolescents and adults aged over 12 years. The results of this questionnaire evaluate how a person perceives their life as unpredictable, uncontrollable and difficult in the past month.

The questions are about how often you have certain feelings and thoughts on a five-point scale from 'never' to 'very often'. Answer scores are as follows: 0 (never); 1 (almost never /1-2 times); 2 (sometimes/3-4 times); 3 (almost often/5-6 times) and 4 (very often/more than 6 times). To calculate the total PSS score, the answers to the four question items that were declared positive (items 4, 5, 7, and 8) need to be reversed first (0 becomes 4; 1 becomes 3; 2 remains 2; 3 becomes 1; 4 becomes 0) . The PSS score is obtained by adding up all the scores on the respondent's responses. If the total ranges between 0-13 = low stress level; 14-26 moderate stress levels and 27-40 high stress levels. [14,15,16]

The NMQ examines the reported prevalence of MSD in various body regions. In this study, reported musculoskeletal symptoms were limited to the past twelve months. MSD complaints were made in 28 body parts in 28 questions, as follows: upper-lower neck (question number 1,2); left-right shoulder (question number 3,4); left-right upper arm (question number 5,6); left-right elbow (question number 7,8); left-right forearm (question number 9,10); left-right wrist (question number 11,12); left-right palm/back of hand (question number 13,14); back of body (question number 15); waist (question number 16); buttocks up-down (questions number 17,18); left-right thigh (question number 19,20); left-right knee (question number 21,22); left-right calf (question number 23,24); left-right ankle (question number 25,26); left and right soles/insteps of the feet (questions number 27,28).).[17,18]

Each question consists of the answers of no pain was given a value of 1; slightly pain was given a score of 2; pain is given a value of 3; and very pain was given a score of 4. The scores for each question will be added up and categorized into low complaints (total score between 28-49) which will be given a score of 0, medium complaints (total score between 50-70) which will be given a score of 1, high complaints (total score between 71-91) which will be given a score of 2, and very high complaints (total score between 92-112) will be given a score of 3.[17,18] The Spearman correlation test was carried out, if the Spearman rho (rs) value is 0.00, it means there is no correlation; 0.01-0.19 very weak correlation; 0.20-0.39 weak correlation; 0.40-0.59 moderate correlation; 0.60-0.79 strong correlation and 0.80-1.0 very strong correlation. The non-parametric test of differences between two independent data uses the Mann-Whitney test while performing analysis on k independent data using the Kruskal-Wallis test. [19]

Ethical clearance

The research protocol has been approved by the Health Research Ethics Commission, Faculty of Dentistry Universitas Trisakti (Number: 414/S3/KEPK/FKG/10/2020).

RESULTS

In this study, 311 respondents were obtained consisting of 216 women and 95 men with an age range of 24 years to 75 years, the average age; is 41.958±11.2861 years. Based on their competency, there were 197 general dentists and 114 specialist dentists. The specialist dentists recruited include 11 orthodontic specialists, 8 oral medicine specialists, 5 pediatric dentistry specialists, 24 conservation dentistry specialists, 33 periodontal specialists, 2 radiology specialists, 25 prosthodontic specialists and 6 oral and maxillofacial surgery specialists. Table I and Tabel II show the differences in the number of practice days per week and the number of practice hours per day both before and during the Covid-19 pandemic.

Table I: Comparison of the number of practice days per week before and during the Covid-19 pandemic

Number of practice days/week	Before the Pandemic		During the Pandemic	
	Frequency	Percent	Frequency	Percent
1 day	4	1.3	46	14.8
2 days	13	4.2	41	13.2
3 days	28	9.0	55	17.7
4 days	35	11.3	44	14.1
5 days	88	28.3	49	15.8
6 days	131	42.1	71	22.8
7 days	12	3.9	5	1.6
Total	311	100.0	311	100.0

Table II: Number of working hours per day before and during the Covid-19 pandemic

Number of working hours per day	Before the Pandemic		During the Pandemic	
	Frequency	Percent	Frequency	Percent
< 3 hours	22	7.1	125	40.2
3-6 hours	194	62.4	157	50.5
> 6 hours	95	30.5	29	9.3
Total	311	100.0	311	100.0

Of the 311 general dentists and specialist dentists, it was found that 46.3% experienced low stress; 52.4% moderate stress, and 1.3% high stress. The Kruskal Wallis test results stated that there was no difference in stress levels between age groups (p: 0.080). Of the 216 female dentists, 95 respondents stated that they experienced low stress (30.55%); 117 respondents experienced moderate stress (37.62%) and 4 respondents experienced severe stress (1.29%). Of the 95 male dentists, 49 respondents stated that they experienced low stress (15.75%); 46 respondents experienced moderate stress (14.79%) and none experienced severe stress; but there was no significant difference in stress levels between female and male dentists (p: 0.170).

The level of musculoskeletal disorders showed that 80.7% of dentists experienced low levels of pain; 15.8% moderate pain levels; 3.5% experienced high levels of pain and there were no respondents who experienced very high levels of pain. The results of the NMQ analysis among female dentists showed that 170 respondents experienced low pain (54.66%); 37 respondents had moderate pain (11.9%) and 9 respondents had high pain (2.89%). The results of the NMQ analysis among male dentists showed that 81 respondents experienced low pain (26.05%); 12 respondents had moderate pain (3.86%) and 2 respondents had high pain (0.64%).

There was no difference in musculoskeletal pain between female and male (p: 0.168). Based on the assessment of the NMQ (Table III), there are several parts of the body that most often experience pain, ranging from mild pain to severe pain, namely: upper neck (60.1%); lower neck (57.9%); upper buttocks (50.7%); waist (48.6%); right shoulder (45.6%); back (45.4%), left shoulder (40.5%). Spearman correlation test results between musculoskeletal pain levels and stress levels (p: 0.222) with rs value: 0.069 (no correlation).

Table III: The distribution of musculoskeletal pain among dentists

Item	Body Areas	Pain Level Percentage (%)			
		No pain	Slightly pain	Pain	Very pain
1	Upper neck	39.9	37.3	19.9	2.9
2	Lower neck	42.1	32.8	22.8	2.3
3	Left shoulder	59.5	24.1	14.8	1.6

CONTINUE

Table III: The distribution of musculoskeletal pain among dentists (CONT.)

Item	Body Areas	Pain Level Percentage (%)			
		No pain	Slightly pain	Pain	Very pain
4	Right shoulder	54.3	27.3	15.4	2.9
5	Left upper arm	78.1	16.1	5.1	0.6
6	Back	54.7	27.7	15.8	1.9
7	Right upper arm	72.0	18.3	8.7	1.0
8	Waist	51.4	25.1	20.9	2.6
9	Buttock	49.2	26.0	21.5	3.2
10	Bottom	70.7	17.4	10.9	1.0
11	Left elbow	87.5	9.0	3.5	0
12	Right elbow	82.3	12.5	4.8	0.3
13	Left lower arm	84.9	12.5	1.9	0.6
14	Right lower arm	77.5	15.4	6.4	0.6
15	Left wrist	81.4	12.2	6.1	0.3
16	Right wrist	73.0	16.1	10.0	1.0
17	Left hand	79.7	13.5	5.8	1.0
18	Right hand	71.7	18.3	8.4	1.6
19	Left thigh	81.7	14.1	3.9	0.3
20	Right thigh	80.7	14.5	4.2	0.6
21	Left knee	82.6	13.2	3.5	0.6
22	Right knee	81.7	14.1	4.2	0
23	Left calf	80.1	16.1	3.5	0.3
24	Right calf	78.1	17.4	4.2	0.3
25	Left ankle	86.2	11.3	1.9	0.6
26	Right ankle	85.9	11.6	2.3	0.3
27	Left foot	84.9	9.6	4.8	0.6
28	Right foot	84.2	10.0	5.1	0.6

DISCUSSION

This research was conducted on dentists who wore PPE and all respondents stated that they worked in a sitting position. The recommended type of complete PPE consists of: goggles or face shield, hair cap/nurse cap, N-95 face mask or equivalent, disposable rubber surgical gloves, non-absorbent hazmat suit, boot or shoe cover. [20,21,22] The majority of dentists experience tension and stress before starting work.[23] Dentists work as single-oriented practitioners, focused on patient satisfaction and safety as well as the dentist's job satisfaction.

High levels of stress indicate that the dental profession is stressful.[24] The pressure that comes from work is good because it can keep dentists alert. However, if stress occurs over a long period, it will cause work fatigue which has a negative impact on the dentist's health. [25] Signs and symptoms of work fatigue can include low activity capacity, psychologically the dentist feels that he does not have enough energy to handle the work, depression, inability to relax, and sleep disorders. [26,27]

Based on statistical analysis, it shows that there is no

relationship between stress levels and musculoskeletal pain levels. However, this research shows that several areas of the body often experience musculoskeletal pain, namely: the neck, shoulders, back, waist, and upper buttocks. Musculoskeletal pain will have an impact on psychological and social aspects that cause various levels of stress in dentists. [28] Working with a poor ergonomic system causes many musculoskeletal disorders. [29,30] The most common musculoskeletal disorders in dentists are in the spine area in the form of back, neck, and shoulder pain; high tension of the trapezius muscle; tendinitis; carpel tunnel syndrome; pinched nerve; early arthrosis; myopia, and auditory changes. [31,32]

Dentists work with precision and high body control, in a sitting position more than half of the body's muscles contract to hold the body static and fight the earth's gravity. Static contractions cause more muscle fatigue compared to dynamic contractions, because intramuscular pressure occurs, thereby reducing blood flow in the muscles. [33,34] Pain in the neck, shoulders, back, waist and upper buttocks can be caused by bending movements when the dentist needs to optimize the appearance of the patient's teeth.

This bent posture causes the head to be positioned forward so that it places a burden on the neck which causes tension in the trapezius muscles, other neck muscles, and chest muscles to support the head. [35] On the other hand, there is a contraction of the vertebral column muscles to compensate for the weight of the head, the result is neck and upper back pain. [36,37] Static postures on the neck, back, waist, and upper buttocks that occur continuously and repeatedly, cause pressure on the intervertebral discs. The pressure on the discs will increase when the dentist sits in a rotated and bent position. [38] The traction of the rubber straps on the N-9 mask, the weight of the tight-fitting respirator, and emotional stress also increase the tension in the neck and upper back muscles.

Shoulder pain is often related to prolonged elevation of the scapula by isometric contraction of the upper trapezius and levator scapulae muscles. As a result of static elevation of the scapula for a long time, it will inhibit blood circulation and cause micro trauma and adaptive shortening of these two muscles. The lower trapezius muscle, which is the antagonist of these two muscles, becomes elongated and weak. [39] The position of the shoulders forward so that the shoulders appear rounded, causes shortening and tension of the anterior muscles of the body, such as the pectoralis minor and pectoralis major muscles. The stiffness of these muscles can cause compression of the brachial plexus, especially the ulnar nerve along with the axillary artery and vein, if this condition occurs continuously, dentists are vulnerable to musculoskeletal injuries in the future.[40,41]

CONCLUSION

Dentists who were respondents in this study continued to work during the COVID-19 pandemic. All dentists stated that they work on patients using full PPE in a sitting position. Female and male dentists say the same thing about stress and musculoskeletal pain, especially in the neck, shoulders, back, and upper buttocks. Even though statistically there is no relationship between stress levels and musculoskeletal pain levels, dentists are very susceptible to stress and musculoskeletal pain related to the tense pandemic conditions at that time.

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