



The Influence Of Working Posture On Musculoskeletal Disorders Among Dentists Of Public Health In The Deli Serdang Area

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Abstract

Dentists are professionals who provide services to patients. In providing this service, patient comfort and safety are of paramount importance, so dentists often sacrifice their natural body posture while working. As a result, dentists are particularly susceptible to musculoskeletal disorders. This research uses a cross-sectional design with a sample consisting of 60 dentists working in the Deli Serdang Health Center area, obtained using a total sampling technique. The research instruments used were questionnaires, photos, and videos for measuring RULA. The

research results indicate that the regression coefficient value of working posture (β_1) is 1.045, which is positive. This means that the work posture variable has a positive effect, and the p-value is 0.000 (<0.005), indicating it is significant for the emergence of musculoskeletal disorders. This implies that if the work posture value increases, musculoskeletal disorders will increase significantly. There was an increase in the R-square value for the age variable from 0.484 or 48.4% to 0.53 or 53%, with the F test at a significance level of 0.00. The age variable parameter coefficient value is -0.038 with a significance level of 0.04 (<0.05), indicating that age is a moderating variable in this study. For the BMI variable, the R-square value also increased from 0.484 or 48.4% to 0.52 or 52%, with the ANOVA test or F significance of 0.00. However, the t-test with a significance level of 0.04 (>0.05) suggests that the BMI variable is also a moderate variable for musculoskeletal disorders in this study.

It is hoped that dentists will pay more attention to their work posture during activities to prevent the risk of musculoskeletal disorders.

keywords : musculoskeletal; dentist; Public health center; working posture

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Introduction

Dentists are a work profession that provides services to patients. When providing services, patient comfort and safety during treatment is of paramount importance, so dentists often ignore their natural body posture when working. This makes dentists very vulnerable to musculoskeletal disorders. According to *the World Health Organization* (WHO) in 2022, musculoskeletal disorders are disorders of the muscles, bones, tendons, joints and connective tissue. Musculoskeletal disorders are characterized by pain, stiffness, numbness, fever, swelling, and a temporary to permanent decrease in movement function. Musculoskeletal disorders are associated with micro-trauma that occurs in the musculoskeletal system during daily activities which results in damage to muscle and bone tissue, causing pain (Valachi, 2008) .

Data in 2019 from *the Global Burden of Disease* (GBD) in *the World Health Organization* (WHO) shows that 1.71 billion people in the world experience musculoskeletal disorders. Musculoskeletal disorders have a major impact on productivity, premature career termination, decreased well-being, and barriers to socialization (WHO, 2022) . Based on Basic Health Research (Riskesdas) in 2018, the number of cases of musculoskeletal disorders in Indonesia was (7.3%), dominated by those aged > 75 years by (18.95%) and those aged 15-24 years by (1.23%), where the number of cases of musculoskeletal disorders that have been diagnosed among health workers is (7.9%) (Indonesian Ministry of Health, 2018) .

Musculoskeletal disorders have been widely researched and identified as the most important occupational health problem in the dental profession. The prevalence of musculoskeletal disorders among dentists in Australia ranges from 64% to 93%, thus proving that dentists have occupational health problems in the form of musculoskeletal disorders that are higher than other professions. The physical load of a dentist's work affects muscles, tendons, ligaments, cartilage, joints, nerves and blood vessels, resulting in complaints of pain or soreness (Hayes et al., 2010) .

The causes of musculoskeletal disorders in dentists are individual factors which include age, gender, and body mass index; working postures are especially static and unnatural postures; repetitive movements; excessive use of energy; lighting in dental chairs that is not optimal; lack of exercise so that muscle flexibility is not optimal; and the use of equipment that is not ergonomic. Dentist posture is a topic that is often researched and is considered the key to preventing musculoskeletal disorders in dentists. The patient's comfort and safety during treatment is given



such priority that dentists do not pay attention to natural body posture when working for long periods of time (Valachi, 2008 ; Yui et al., 2019) .

The results of research on dentists in Jakarta showed that (65%) of 1645 dentists experienced musculoskeletal disorders with a higher presentation in dentists over 45 years of age. The high level of musculoskeletal disorders is an occupational risk factor due to work posture, length of work activity, repetitive movements, and other ergonomic problems (Andayasari & Anorital, 2002) .

Puskesmas as the technical implementation unit of the health service provides public health services, one of which is dental and oral health services. Data from the Deli Serdang Central Statistics Agency (BPS) shows that the population is 1,791,677 people. The number of Community Health Centers in the Deli Serdang area is 34, and has 60 functional dentists. Based on an initial survey conducted by researchers of 29 dentists aged 30-54 years, 21 dentists (72.4%) had complaints about body parts and 8 dentists (27.5%) had no complaints. . Complaints experienced by dentists at the time of the interview were 5 people on the right arm, 3 people on the right shoulder, 4 people on the waist, 2 people on the back, 3 people on the right shoulder and waist, 2 people on the right shoulder and back, 1 person on the lower neck and upper arm, 1 person on the lower neck and wrist. Based on observations and interviews at the work of dentists, more tooth extraction procedures are performed compared to other treatments. Unnatural work postures are repeatedly carried out by dentists, such as lifting their shoulders to their elbows for long periods of time, lowering their heads, tilting their heads back, and tilting their necks to the side during work. The results of the interviews showed that 21 dentists felt pain, numbness and cramps after treating patients. Therefore, researchers are interested in finding out how much influence work posture has on musculoskeletal disorders in dentists who work at the Deli Serdang area health center.

Methods

Types of research

This research study uses a quantitative research method *with* a Cross Sectional approach *where there are* independent and dependent variables that *are* studied at the same time.

Research Location and Time

This research was carried out in all Community Health Centers in the Deli Serdang district working area, namely 60 dentists . The research was conducted from December 2021 to September 2023.



Research Population and Sample

The population in this study consisted of 60 dentists who worked at the Deli Serdang area health center. The research sample included all 60 dentists from this population. The sampling method used was total population sampling, meaning all dentists working in the Deli Serdang Community Health Center area were included in the study.

Method of collecting data

Primary data . Data The primary is the result of filling out form attachment B SNI 9011:2021 which was collected and observed regarding complaints of musculoskeletal disorders from respondents. For analyze there are complaints of musculoskeletal disorders with a complaint survey in appendix B SNI 9011:2021 and assessment of dentists' sitting and standing postures in appendix D SNI 9011:2021.

Secondary data. Secondary data is a general description obtained from the Community Health Center in the Deli Serdang area.

Results

Characteristics of Puskesmas dentists in the Deli Serdang area

The number of dentists in this study was 60 people who worked as functional dentists. The characteristics of dentists in this study include gender, age , body mass index (BMI). The following are the results of the frequency distribution of Puskesmas dentists in the Deli Serdang area.

Table 1. *Dentist Frequency Distribution*

Variable	n	%	Variable	n	%
Gender			46-55	27	45.0
Man	11	18.3	< 55	3	5.0
Woman	49	81.7	Body mass index		
Age			Thin	2	3.3
≤ 25	1	1.7	Normal	30	50
26-35	15	25.0	Excessive	20	33.3
36-45	14	23.3	Obesity	8	13.3

Musculoskeletal complaints to the dentist

Complaint assessment is based on the results of the attached questionnaire to SNI 9011:2021. This questionnaire includes time and tasks, length of work, dominant hand, mental fatigue, physical fatigue, and pain that may be felt . The following are the results of the frequency distribution:



Working hours and duties of Puskesmas dentists in the Deli Serdang area. Puskesmas dentists in the Deli Serdang area work 6 days a week. Actions carried out by Puskesmas dentists in the Deli Serdang area include filling teeth, cleaning tartar (*scaling*) and extractions. Most extraction activities were carried out during the research. 42 people (70%) had tooth extractions, 9 people (15%) had scaling activities and 9 people (15%) had filling activities .

The GOTRAK questionnaire musculoskeletal complaints also looks at work period, dominant hand, mental fatigue and physical fatigue. In this research, the following results were obtained:

Table 2. *Frequency Distribution of GOTRAK Questionnaire Results*

Variable	N	%	Variable	N	%
Years of service			Never	10	16.7
1-5 years	8	13.3	Sometimes	36	80.0
5-10 years	8	13.3	Often	10	16.7
< 10 years	44	73.3	Always	4	6.7
Dominant hand			Physical exhaustion		
Right	60	100	Never	2	3.3
Left	-	-	Sometimes	27	45.0
Bilateral	-	-	Often	28	46.7
Mental fatigue			Always	3	5.0

GOTRAK musculoskeletal complaints. The following are the results of a questionnaire to see the parts of the body that match the body map, the severity, frequency and possibility of work that is suspected of causing complaints of musculoskeletal disorders. The map of body parts that dentists experience Musculoskeletal Disorders can be seen in the following table.

Table 3. *GOTRAK body map*

Parts of body	N	%	Parts of body	N	%
Neck			Left	6	10
Right	34	56.6	Lower back		
Left	3	5	Right	21	35
Elbow			Left	1	1.6
Right	21	35	Hand		
Left	-	-	Right	42	70
Arm			Left	2	3.3
Right	39	65	Hips		
Left	2	3.3	Right	44	73.3
Upper back			Left	11	18.3
Right	41	68.3			



Parts of body	N	%
Thigh		
Right	2	3.3
Left	-	
Knee		
Right	7	11.6
Left	1	1.6

Parts of body	N	%
Calf		
Right	5	8.3
Left	-	-
Foot		
Right	-	-
Left	-	-

It is known that dentists experience musculoskeletal disorders in certain parts of the body. Each dentist experiences complaints according to the activities they experience when carrying out procedures. The work that causes musculoskeletal disorders in the Community Health Center area is scaling and extracting teeth, especially difficult teeth.

The identification results of the GOTRAK questionnaire can calculate the risk level by looking at the color table which is based on the results of the severity and frequency of musculoskeletal disorders. The following are the results of calculating the level of musculoskeletal disorders experienced by Puskesmas dentists in the Deli Serdang area.

Table 4. GOTRAK Initial Identification Measurement Results

The calculation results	N	%
Green (1-4): low risk	18	30.0
Yellow (6): moderate risk	26	43.3
Red (8-16): high risk	16	26.7

Based on table 4 above, 18 dentists experienced a low risk of musculoskeletal disorders (30.0%), 26 people experienced a moderate risk (43.3%), and 16 people experienced a high risk (26, 7%).

Body posture assessment. The results of this body posture assessment aim to evaluate exposure to ergonomic risks related to musculoskeletal carried out by dentists while working. The following are the results of the RULA scores for dentists at the Deli Serdang area health center.

frequency distribution of respondent categories based on RULA values, workers with unergonomic postures were in the medium category as many as 12 people (20.0%), workers with the highest unergonomic postures were in the high category as many as 28 people (46.7%) and workers with low postures were in the high category. not ergonomic in the very high category as many as 20 people (33.3%).



Working posture. Overall, the distribution of unergonomic work postures used by dentists when carrying out their work can be seen in table 14 below.

Table 5. *Frequency Distribution of Dentists Based on Work Posture*

Variable	n	%
Work Posture		
Sitting working posture	28	46.7
Standing working posture	32	53.3

The description regarding the work posture used by dentists when carrying out their work with an assessment of posture and the level of risk for Musculoskeletal Disorders experienced by dentists can be seen in table 6 below.

Table 6. *Accuracy results of work posture with RULA and GOTRAK values*

Risk	Posture			
	Sit		Stand	
	N	%	N	%
RULA value				
Currently	11	91.7	1	8.3
Tall	11	39.3	17	60.7
Very high	6	30.0	14	70.0
GOTRAK Value				
Low	14	77.8	4	22.2
Currently	12	46.2	14	53.8
Tall	2	12.5	14	87.5

Bivariate Analysis Results

The results of the bivariate analysis are intended to determine the relationship between work posture variables and musculoskeletal disorders in Puskesmas dentists in the Deli Serdang area. The analysis used is the *Pearson correlation test* at a significance level of 0.05 , so that if the statistical analysis results find $p < 0.05$ then the variables are declared significantly related. The test results between working posture and musculoskeletal disorders can be seen in the following table:

Table 7. *Correlation Test Results between Work Posture and Musculoskeletal Disorders*

Variable	Musculoskeletal Disorders			P Value	Decision
	Low	Currently	Tall		
Working posture					



Currently	7	5	6	0,000	Ho was rejected
Tall	2	15	9		
Very high	3	8	5		

The results of the correlation test between the work posture variable and musculoskeletal disorders show a value of $p = 0.000$ ($p < 0.05$), so H_0 is rejected so there is a relationship between work posture and musculoskeletal disorders.

Multivariate Analysis Results

The results of this multivariate analysis are intended to determine the effect of working posture variables on musculoskeletal disorders in dentists at the Deli Serdang Community Health Center. The analysis used was a linear regression test and the following results were found.

Table 8. *Linear Regression Test Results*

Influence of Variables	R square	(β)	t_{hitung}	Sig.
working posture against musculoskeletal disorders	0.484	1,045	7,375	0.00

The regression coefficient value of working posture (β_1) is 1.045, which is positive. This means that the work posture variable has a positive effect and a p value of 0.00 (< 0.005) means it is significant on the incidence of musculoskeletal disorders. This means that if the work posture value increases, there will be musculoskeletal disorders will increase significantly, and vice versa.

Moderated regression analysis test results. This test aims to see whether there is a moderating variable influence on the dependent and independent variables. The following are the results of the *moderated regression analysis (MRA) test* on work posture variables on musculoskeletal disorders and indirect factors, namely age and BMI as moderating variables.

In this research, the value of the coefficient of determination (*Adjusted R²*) measures how far the model's ability to explain the dependent variable. The results of the coefficient of determination test in the research obtained an *R square value* of 0.484. This can be interpreted that the independent variable, namely work posture, influences musculoskeletal disorders by 48.4%, while 51.6% is influenced by other factors. The following are the results of the MRA test in this study.

Table 9. *Moderated Regression Analysis Test Results*

Variable	R square	Enhancement (%)
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Working posture	0.484	
Working posture x Age	0.530	0.046
Work posture x BMI	0.520	0.036

Discussion

Characteristics of Puskesmas dentists in the Deli Serdang Region

Characteristics of dentists by gender . Based on the results of research on dentists in the work area of the Deli Serdang District Health Center, out of 60 dentists, female dentists dominate. There are only 11 men (18.3 %) of the population, while there are 49 female dentists (81.7%). And the percentage of musculoskeletal disorders is also higher in women.

This is in line with research conducted by Aljara, Novianus and Muzakir (2022) which suggests that there is a significant relationship between gender and musculoskeletal disorders. The results of the study showed that women experienced musculoskeletal disorders $PR < 1$, which means that male workers had a 0.531 times lower risk or 46.9% reduced risk of experiencing severe musculoskeletal disorders compared to women.

Physiologically, women have lower muscle strength than men. The muscle strength possessed by women is only 60% of the muscle strength of men, especially in the muscles of the arms, back and legs. So, in terms of dividing the workload, it is necessary to consider gender (Tarwaka, 2015).

Dentists' work often uses muscles in the arms, where dentists carry out procedures using their hands for a long time and continuously. Apart from that, dentists also often perform procedures in a standing posture, which means using the muscles in the legs. This shows the higher risk of musculoskeletal disorders experienced by female dentists in the work area of the Deli Serdang Community Health Center.

Characteristics of dentists by age . Based on research results obtained from the results of questionnaires distributed to dentists, it was found that the age of workers according to the Indonesian Ministry of Health (2009) was in the late teens (≤ 25 years) age group of 1 person (1.7%), the adult age group. early (26-35 years) as many as 15 people (25%). In the late adult age group (36-45 years) there were 14 people (23.3 %), in the early elderly age group (46-55 years) in the work area of the Deli Serdang Health Center there were 27 people (45%). In the late elderly age group (56-65 years) there were 3 people (5%).

age for a dentist is 25 years and the highest age is 55 years before retirement. The dominant age group among dentists is the early elderly age group (46-55 years) with 27 people (45%). At this age there is a decrease in physical capacity, be it vision, hearing, the body's response to something, endurance and even muscle strength which is related to musculoskeletal disorders. Muscle complaints usually begin to be felt at the age of 35 years and will continue to increase with



age (Tarwaka, 2019). Judging from the age of dentists in the Deli Serdang Community Health Center working area, it was found that as many as 44 people (73.3 %) were over 35 years old.

Respondent characteristics based on BMI. Based on the distribution of BMI categories, dentists with a thin BMI (<18.5) were 2 people (3.3%). Dentists with normal BMI ($18.5 -24.99$) were 30 people (50%), excessive BMI ($25-29.99$) were 20 people (33.3%), and obese BMI ($30-34.99$).) as many as 8 people (13.33%).

According to the Indonesian Ministry of Health (2017), BMI is a simple way to assess the nutritional status of adults. In this study the BMI index was good because 50% was in the normal category. However, the rate of excess and obesity is also high with a percentage of 46.66 % . This category is very vulnerable and at risk of experiencing musculoskeletal disorders. When obese, the occurrence of low muscle strength is modulated by a state of systemic inflammation due to fat deposition in adipose tissue and causes high levels of pro-inflammatory cytokines in the circulation. This has a negative impact on the skeletal muscle by stimulating muscle protein degradation, causing muscle atrophy and decreased muscle protein synthesis so that muscle strength can become low.

Respondent characteristics based on length of service. Based on the distribution of work period categories, dentists with a work period of 1-5 years were 8 people (13.3%), 5-10 years were 8 people (13.3%) and the most with a work period of more than 10 years were 44 people. (73.3%).

The results of research conducted by Aprianto, Hidayatulloh & Zuchri (2021) stated that there was a relationship between work experience and musculoskeletal disorders, with a chi square test result of $p = 0.014$. Working period influences the length of exposure in the workplace which can increase the risk of musculoskeletal disorders. The longer exposure related to activities, duration and repetition every day, the more various kinds of physical complaints related to musculoskeletal disorders will arise.

At the research location, it showed that the majority of dentists had worked for more than 10 years, which meant that dentists had long been exposed to the consequences of their activities while carrying out procedures on patients. This affects the risk of musculoskeletal disorders in dentists.

Dentist work activities

Dentists at the Deli Serdang regional health center are one of the first level health service officers who provide direct services to the community in their working area. Therefore dentists work within 7 working hours starting at 08.00 WIB until 15.00 WIB. Inpatient health centers do not provide special services for dental examinations and treatment, so there are no 24-hour dentists available at the health centers.



A dentist's work begins with consultations regarding complaints experienced by patients. Next, the dentist will ask the patient to climb into a *dental chair* for a dental examination to assess the condition experienced by the patient. The time required for each action varies greatly, depending on the patient's cooperation in starting treatment, especially in pediatric patients and the severity of the patient's case. The dental and oral consultation and examination process takes around 5 to 10 minutes depending on the patient's case. The time required for the tooth extraction process ranges from 10 to 40 minutes depending on the condition and location of the tooth to be extracted. In the scaling process, the time required ranges from 15 to 35 minutes, this also depends on the condition of the teeth to be cleaned and the amount of plaque or *stain* on the teeth, and the patient's sensitivity to pain which may be caused by vibrations of the tools used by the dentist. The time required for the tooth filling process ranges from 25 to 40 minutes, depending on the size of the hole, position of the hole, and the patient's sensitivity.

At the time of the research, the activities of dentists at the Deli Serdang area Health Center were dominated by 44 people (73.3%) tooth extraction, 9 people (15%) scaling activities and 7 people (11.7%) filling activities. Dentists at the Deli Serdang Community Health Center usually treat 6 to 10 patients, sometimes even more, depending on the number of visitors at the Community Health Center.

The number of patients treated by a dentist is the dentist's workload. The more the number of patients increases, the higher the workload felt by dentists and this will cause work fatigue which is related to the incidence of musculoskeletal disorders.

This is in line with Aprilia & Rifai's (2022) research that using the chi square test, the value of $p = 0.000$ was obtained, which means there is a relationship between physical workload and complaints of musculoskeletal disorders experienced by workers. The results of the analysis stated that a heavier workload would increase 3,500 times greater risk of musculoskeletal disorders .

The procedure carried out by a dentist can be done in two postures, and each dentist can do it differently. When the research was conducted, there were 32 dentists who carried out their work in a standing working posture (53.3 %). And there are 28 dentists who do their work in a sitting posture (46.7 %). Dentists do more work standing because it makes their work mobility easier. Standing posture and doing work using hand muscles are associated with musculoskeletal disorders. This is in line with research by Putu, Masayuki & Pramita (2022), the results of a *literature review* stated that carrying out work activities in a standing and static posture and followed by an awkward hand posture on the shoulder will cause fatigue and inflammation in the muscle and nerve tissue which causes complaints of pain in the shoulder.

Musculoskeletal complaints to the dentist



The characteristics of dentists in this study consisted of the use of their dominant hand. Based on the distribution of dominant hand use categories, all 60 dentists (100%) use their right hand. This causes all dentists to feel more complaints about their right hand than their left hand. Continuous use of the right hand over a long period of time will greatly influence the incidence of musculoskeletal disorders.

Research conducted by Nasar, Rubab, Shahzad (2020) states that there is a relationship between work duration and repetitive work and the incidence of musculoskeletal disorders. The longer the duration of use and the more repetitions carried out, the more musculoskeletal disorders the dentist will experience when carrying out their work.

Based on the distribution of mental fatigue categories experienced by dentists after work, namely, never as many as 10 people (16.7%), sometimes as many as 36 people (60.0%), often as many as 10 people (16.7%) and always as many as 4 people (6.7%). This explains that more dentists at the Deli Serdang Community Health Center experience work stress.

Work stress is caused by psychological and social factors which can have an impact on stressors for individuals. Stress is also any stimulation or action of the body that can cause various detrimental effects, from poor health to suffering from disease. According to Gravelling (2019) mental fatigue or stress will cause tension in the musculoskeletal system, especially the muscles, resulting in poor blood flow, especially in the neck and shoulders.

The distribution of categories of physical fatigue experienced by dentists after work is never as much as 2 people (3.3%), sometimes as much as 27 people (45.0%), often as much as 28 people (46.7%) and always as much as 3 people (5.0%). Research by Zuraida, Rakhmat & Tanser (2023) states that using the *chi square test*, the value of $p=0.018$ is obtained, which means there is a relationship between musculoskeletal complaints and fatigue experienced by workers. Workers may experience the negative impact of fatigue, but it can be avoided with worker and company awareness. Small steps such as stretching the muscles by moving the head, arms and legs and preventing the body from remaining static for a long time play a very important role in preventing the risk of musculoskeletal disorders.

Non ergonomic working posture

The work posture adopted by dentists when carrying out their work influences the incidence of musculoskeletal disorders that are often experienced by dentists. The working postures used by dentists are sitting and standing. Both working postures have the same risk of musculoskeletal disorders.

Judging from their working position, dentists often adopt unergonomic postures, so the RULA method is used to evaluate exposure to ergonomic risks related to the musculoskeletal



system of the dentist's upper extremities. The results of the RULA method calculation for dentists were 12 people with unergonomic postures in the medium category (20.0%), 28 dentists in the high category (46.7%) and dentists with unergonomic postures in the very high category. as many as 20 people (33.3%).

Dentists who did their work in a sitting posture had a moderate RULA score of 11 people (91.7%), a high RULA score of 11 people (39.3%) and a very high score of 6 people (30.0%). Dentists who did their work in a standing posture had a moderate RULA score of 1 person (8.3%), a high RULA score of 17 people (60.7%) and a very high RULA score of 14 people (70.0%). Both sitting and standing postures have ergonomic risks for musculoskeletal disorders.

The results of this evaluation with RULA show that there is a need for direct investigation and treatment by dentists regarding work posture to minimize the level of complaints from dentists regarding musculoskeletal disorders. Another factor that can increase the high rate of musculoskeletal disorders is that aspects of the work environment and workplace design in the dentist's office, such as aspects of lighting, chairs and work systems, are still not optimal.

At the research location, it was found that several Community Health Centers in the Deli Serdang area on average had adequate tools and equipment, but not all Community Health Centers were equipped with *dental units* with LED lights which provide better light to help dentists see the condition of the patient's teeth and mouth. . The dental unit is operated electrically, problems often occur when the lights go out, the dentist will have difficulty carrying out patient treatment, and it is impossible to postpone the action if the patient's case has already been treated before the lights go out. When this happens , the dentist will only rely on lighting from ordinary flashlights which cannot properly illuminate the teeth in the mouth. This causes dentists to have to make unergonomic movements such as bending and bending their necks to look closely at the teeth to avoid errors in diagnosis and procedures. If this is left for a long time, it will cause complaints to the dentist's back and neck. Global Burden Disease (2023) also reveals that exposure to risks from work such as bending, awkward postures and tasks that are considered physically demanding are associated with an increased risk of pain in the lower back and other musculoskeletal tissues.

Musculoskeletal Disorders

The work process of dentists when carrying out their work often makes unnatural or unergonomic movements which are very susceptible to musculoskeletal disorders. So it is necessary to carry out a review using the method of identifying complaints of work-related musculoskeletal disorders (GOTRAK) to measure the level of musculoskeletal disorders. The results of the study showed that 18 dentists experienced a low risk of musculoskeletal disorders



(30.0%), 26 people experienced a moderate risk (43.3%), and 16 people experienced a high risk (26.7%).).

Dentists who work in a sitting or standing posture are equally susceptible to unergonomic positions such as bending, bending their necks and natural hand positions. Based on the GOTRAK questionnaire, it is known that dentists experience musculoskeletal disorders in certain parts of the body. In this study, musculoskeletal disorders occurred in the right neck of 34 dentists (56.6 %) and the left neck of 3 dentists (5%). At the right elbow there were 21 dentists (35%). In the right arm there were 39 dentists (65%) and in the left arm 2 dentists (3.3 %). In the right upper back there were 41 dentists (68.3 %) and in the left upper back there were 6 dentists (10%). In the right lower back there were 21 dentists (35%) and in the left lower back there was 1 dentist (1.6 %). In the right hand there were 42 dentists (70%) and in the left hand there were 2 dentists (3.3 %). On the right hip there were 44 dentists (73.3 %) and on the left hip there were 11 dentists (18.3%). On the right thigh there were 2 dentists (3.3 %). On the right knee there were 7 dentists (11.6 %) and on the left knee there was 1 dentist (1.6%). In the right calf there were 5 dentists (8.3 %). This is in line with research conducted by Kumar, Pai & Vineetha (2020) which stated that during 12 months complaints or pain due to musculoskeletal disorders experienced by dentists occurred in the neck of 58 people (66.7%), shoulders. as many as 38 people (43.7%), backs as many as 46 people (52.9%), hands as many as 16 people (18.4) and feet as many as 9 people (10.3%).

Dentists experience musculoskeletal disorders in the neck due to unergonomic attitudes such as looking down to see the condition of the patient's teeth. Dentists also experience complaints about their elbows, arms, back and hands, all of which are due to the fact that in carrying out their work, dentists use their hands for long periods of time and unnaturally, such as being too raised. This will also affect the dentist's upper back. Work carried out in an inappropriate sitting position can result in a person getting tired easily and a decrease in efficiency due to the bent lordosis position with too much weight on the spine, triggering muscle disorders, especially the abdominal muscles and back muscles which cause musculoskeletal disorders (Rachmat Utomo, Sembada & Andyarni, 2019) .

The influence of work posture on musculoskeletal disorders among dentists at the Deli Serdang Community Health Center

The results of the correlation test between the work posture variable and musculoskeletal disorders show a value of $p = 0.000$ ($p < 0.05$) , so H_0 is rejected so there is a relationship between work posture and musculoskeletal disorders. And the regression coefficient value of work posture (β_1) is 0.210, which is positive with a significance value of $p = 0.000$ ($p < 0.05$) . This means that the work posture variable has a positive and significant effect on the emergence of musculoskeletal



disorders . This means that if the work posture value increases, there will be musculoskeletal disorders will increase significantly, and vice versa.

When carrying out their work, dentists at the Community Health Center in the Deli Serdang area often carry out work with a slope in the upper body, such as the neck, back, hands and elbows. Unnatural postures carried out by dentists occur in almost every action carried out such as during examinations, tooth extractions, *scaling* or fillings. Unnaturally shaped angles in the upper body will result in a high RULA assessment, thus greatly influencing the risk of musculoskeletal disorders.

Age variables in moderating work posture factors . The results of research on dentists show that the lowest age for dentists is 25 years and the highest age is 55 years before retirement. The dominant age group among dentists is the early elderly age group (46-55 years) with 27 people (45%). This group is still of productive age in carrying out various jobs, in this case the activities carried out by dentists at the Community Health Center. If we look at the work posture assessment, dentists are predominantly in the high category, as many as 28 people (46.7 %), and musculoskeletal disorders predominantly occur in dentists in the medium category. Tarwaka (2019) states that at the age of 25 – 65 years, workers will begin to experience disorders or complaints related to muscles and skeleton.

The results of research using the MRA test show that there was an increase in Rsquare after the age variable was used as a moderate variable. The *R square value* increased from 0.484 or 48.4 to 0.530 or 53%. There was an increase of 4.6 % . It can be concluded that the presence of age (a moderate variable) will strengthen the relationship between posture and significant musculoskeletal disorders . According to Gurung et al., (2015) age is a strong potential moderator of musculoskeletal with a p value <0.001 (<0.05). Age is not the main factor causing musculoskeletal disorders in workers, but there are other causal factors as mentioned by Tarwaka (2004) where age is part of the combination of factors causing musculoskeletal disorders. This is in line with Stack et al., (2016) who stated that worker age is one of the individual factors that contributes to musculoskeletal disorders . This explains that musculoskeletal disorders are not only caused by the independent factor of age but there are other causal factors that are more dominant.

BMI variables in moderating work posture factors. Based on the research results, dentists were found with variations in BMI and various categories ranging from thin, normal, overweight and obese. The majority of dentists in the normal category are 30 people (50%). Furthermore, there were 20 people with excess BMI, 8 people with obese BMI and 2 people with underweight BMI.

In this research, there was an increase in the R square value from 0.484 or 48.4 % to 0.520 or 52%. There was an increase of 0.036% in the level of relationship between variables. It can be



concluded that the presence of BMI (moderate variable) will be able to strengthen the relationship between posture and musculoskeletal disorders.

The results of the ANOVA test produced a calculated F of 20.259 with a significance level of 0.00, so work posture and moderation, namely BMI, together have an effect on the musculoskeletal disorder variable. And the interaction between the work posture variable and the BMI variable is significant, so the BMI variable is a moderating variable in this study.

The existence of skeletal muscle complaints related to body size is more due to the condition of the balance of the skeletal structure in receiving loads, whether body weight or other loads. The impact of obesity is decreased flexibility, fluid buildup, and increased pressure on the disc which can cause muscle pain (Stack et al., 2016) .

Conclusion

Based on research that has been conducted on the influence of dentists' working posture on musculoskeletal disorders in the Deli Serdang area health center, it can be concluded that the regression coefficient value of working posture (β_1) is 1.045, which is positive. This means that the work posture variable has a positive effect and the p-value is 0.000 (<0.005), meaning it is significant for the emergence of musculoskeletal disorders. This means that if the work posture value increases, musculoskeletal disorders will increase significantly. There is an increase in the R square value for the age variable from 0.484 or 48.4%, to 0.53 or 53% with an F test at a significance level of 0.00. The age variable parameter coefficient value is -0.038 with a significance level of 0.04 (<0.05), so the age variable is a moderating variable in this study. And for the BMI variable, the R square value also increased from 0.484 or 48.4%, to 0.52 or 52% with the ANOVA test or F significance of 0.00. However, the t test with a significance level of 0.04 (>0.05) means that the BMI variable in this study is also a moderate variable for musculoskeletal disorders.



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