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MUSCULOSKELETAL DISORDERS (MSDs) RISK ANALYSIS IN WEST SUMATERA DENTISTS AND DENTAL STUDENTS
(Research report)

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ABSTRACT

Introduction: *The prevalence of musculoskeletal complaints in dentists is high. The dental practice is assumed to have static movements, awkward, repetitive at work and requires more than 50% of the body muscles to contraction.* ***Aim:*** *The purpose of this study was to analyze risk factors of musculoskeletal disorders (MSDs) in West Sumatera dentists and dental students.* ***Method:*** *The study design was cross sectional study. There were 261 samples by total sampling technique. The instrument was Nordic Body Map (NBM) questionnaire and observation sheet BRIEF survey. Bivariate analysis used chi-square test with 95% confidence interval, α = 0.05.* ***Results:*** *There were correlation between work risk in right hand toward right wrist and palm right and on foot to right foot and left foot (p <0,05). There were no correlation between age, regular exercise, sleep duration and length of work toward musculoskeletal disorders complaints.* ***Conclusion:*** *Ergonomic interventions may have a good impact in prevention of hand/wrist complaints.*

Keywords :   BRIEF Survey, musculosceletal disorders, nordic body map

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INTRODUCTION

Musculoskeletal disorders (MSD) have become increasingly common worldwide during the past decades and become a significant issue for dentists. Moreover, dentist professions have to spend large amounts of time in awkward and nonergonomic positions, performing repetitive and forceful tasks, which are well established as major risk factors for MSD's[1].

Numerous studies reported prevalences of MSD's among dentists and dental students[2,3,4,5,6,7,8,9]. Hayes et al (2011) explored the predictors of work-related musculoskeletal disorders among dental hygienists. There were correlation between some dental treatments and MSD's in shoulder, forearm, neck, upper back and lower back[2]. The study in Shiraz, Southern Iran reported 33% dentists had lower back pain (LBP); 28% had neck pain; and 12%. had both[3]. The study in Maharashtra, India (2015) showed neck trouble to be the most predominant MSDs (69%), followed by shoulder (51%), upper back (51%), and lower back problem (39%)[4]. The results of literatures investigations show that the prevalence was between 0.5% and 70%. The prevalence of pain in different regions includes; neck pain, back pain, wrist pain, shoulder pain, knee pain and elbow pain[5].

An international review of MSD's in the dental hygiene profession was conducted. It is marked from the literature review is a disease with multifactorial problem. Dental work is supposed to be physically demanding and it perform static postures and awkward positions. Some conditions such as wrist position, snatched joints requiring increased force of the muscles to maintain the position for dental treatments, and repeated twisting and bending. Job postures in dental work is considered to be the main factor of MSD's[10]. It is

caused by mistakes in ergonomic and improper positions that usually done by the dentists, dental students, and dental hygienist.

Despite these facts, little is known about the prevalence and risk factors of musculoskeletal disorders (MSD) among Indonesian Dentists, particularly those in West Sumatera. Therefore, our study was undertaken to analyze risk factors of MSD's in West Sumatera dentists and dental students.

METHODS

The study design was observational and analytic survey and also used cross sectional study. The samples were dentists and dental students in West Sumatera which amount to 261 subjects. The subjects must have minimum 6 months work experience in dental practice and did not have any muscolosceletal disorders history. Informed consent was provided to the respondent before questionnaire was delivered. Ethical clearance was obtained from The Committee of the Research Ethics of the Faculty of Medicine, Andalas University (628/KEP/FK/2018).

Instruments used in this study were a BRIEF Survey to measure the risk level of MSDS per body part and Nordic Body Map to obtain data on MSDs complaints respondents. BRIEF survey comprised of job risk, body posture, load force, frequence and duration. *Cornell Musculoskeletal Discomfort Questionnaires* (CMDQ) was used to assess subjective complaints felt by respondents arising from their work. MSDs complaints were characterized by pain, heat, cramps, death taste, swelling, stiffness and stiffness.

The Baseline Risk Identification of Ergonomic Factors (BRIEF) was an early screening tool performed by using a rating system to identify or measure work hazards that workers receive with respect to ergonomic factors on the basic tasks performed. BRIEF was used for determine the nine parts of the body that can be at risk of musculoskeletal disorders. Body parts analyzed include: hands and wrists (right and left), elbows (right and left), neck, back and legs. There were 28 questions in BRIEF survey. In this study, it was validated using SPSS and chronbach alpha was 0.857 which indicated high internal reliability of questionnaire. Corrected item total correlations were vary from 0.262 – 0.507, despite there was no change if one item of 28 questions was deleted.

Cornell Musculoskeletal Discomfort Questionnaires (CMDQ) was a questionnaire developed by Dr. Alan Hedge along with ergonomics students at Cornell University. The questionnaires were based on previous studies of musculoskeletal discomfort in workers. This survey came from a survey that has been done previously about the discomfort of posture. This survey was a screening tool and not a diagnostic instrument. CMDQ described a 7-day frequency work, severity in work, and the effects of disruption on the ability to work against musculoskeletal discomfort on 20 body parts

Chi-Square used for bivariate analysis of muscolosceletal disorders risk factors. BRIEF survey and CMDQ was analyzed to determine the association of body parts complaints and workplace risk movements. The analysis also measured the correlation between age, regular exercise, slee.p duration and length of work toward muscolosceletal disorders complains.

RESULTS

The study was conducted between 2018 February-April. The data obtained individual characteristics descriptive view. The mean ages was 28 years old (22-61 years old). The mean height was 158 cm (140-172 cm). And mean weight was 58 kg (38-96 kg). The work length was vary and mostly was more than three years (150 respondents). The respondents has different sleep duration a day (< 6 hours : 93, 6-8 hours: 105, and > 8 hours: 64. Regular exercise also had varied results.

There were no correlation between work length and MSD complaints (p = 0.193) and negative correlation between age and MSD complaints (p = 0.000). It was also reported that there was no correlation between sleep duration and MSD complaints.

Table 1. Big five of muscolosceletal disorders among dentists and dental students in West Sumatera.

No	Body parts MSD's	N	%
1	Waist	144	55
2	Right shoulder	128	49
3	Upper neck	126	48
4	Right wrist	118	45
5	Lower neck	112	42

Table 1 showed big five of muscolesceletal disorders among dentists and dental students. The prevalences are between 42-55%. Waist is reported as the most complained body part of MSD's (55%) followed by right shoulder (49%), upper neck (48%), right wrist (45%) and lower neck (42%). The prevalence is measured through dividing the complained number of MSD's by the sample amount.

Table 2. Chi-square test of associatioan between MSD's risk factors of body parts and MSD's complaints

	MSD's Risks	MSD's Complaints (MC)	Sig
1	Neck	• MC in upper neck • MC in lower neck	0,318 0,271
2	Left shoulder	• MC in left shoulder	0,868
3	Right shoulder	• MC in right shoulder	0,945
4.	Right hand	• MC in upper right arm • MC in lower right arm • MC in right wrist • MC in right palm	0,278 0,028* 0,000* 0,325
5.	Left hand	• MC in upper left arm • MC in lower left arm • MC in left wrist • MC in left palm	0,727 0,160 0,924 0,325
6	Right elbow	• MC in right elbow	0,113
7	Left elbow	• MC in left elbow	0,305
8.	Foot	• MC left thigh • MC right thigh • MC left knee • MC right knee • MC left calf • MC right calf • MC left ankle • MC right ankle • MC left feet sole • MC right feet sole	0,414 0,007* 0,350 0,607 0,657 0,184 0,748 0,967 0,000* 0,000*
9	Back	• MC Back	0,09

* significant correlation (p-value < 0,05)

Table 2 showed some anatomical body part association between MSD risk factors and MSD complaints. They were five from twentyfive association that measured between MSD risk factors and MSD complaints (20 %). There were few correlations of each body parts (p < 0,05). The association was found only between right hand and lower right arm (p= 0,028), right hand and right wirst (p= 0,000), foot and right thigh (p= 0,007), foot and left feet sole (p= 0,000), and foot and right feet sole (p= 0,000).

DISCUSSIONS

Previous study showed most common musculoskeletal complaints among the dentists who participated were related to neck, shoulders, upper back, lower back, and wrists respectively[11]. The results corresponded the previous study of MSD's big five among west sumatera dentists and dental students. The job posture like dentists mostly is done by sit back and stands can cause the problems in the waist, back, neck and shoulder. It also will predisposes the blood clot in the foot if it loses proper of control. The study showed waist as the most common complained of MSD's body part. Ehsan et al. (2013) explained the different jobs of dental treatments may cause dynamic and static activities which predispose dentists for musculoskeletal disorders. Waist is used as anchor of dental treatment posture at sitback position. Waist may get the big load of the static activities and cause the muscle fatigue and lead MSD's.

There were significant relationships between hand to right palm and right wrist and a leg relationship to right thigh and the sole of left foot and right foot. Dentists are assumed to have static, awkward, repetitive movements at work and require more than 50% of their muscles to contract. The right palm and right wrist are the parts of the body commonly used in the dental practice. The dentists and dental students will provide the big force of right palm and right wrist during some dental treatments such as teeth extraction and oral minor surgery. Some dentists and dental students also have the static postures that need the foot as anchor of both standing and sitting postures. The static postures are recognized as the main factor of MSD's.

The existence of the relationships between occupational risk factors and MSDs complaints on the respondents due to natural posture and repetitive movements made by respondents at work. Musculosceletal disorder complaints occur because of unnatural work attitude that causes the body to move away from its natural position such

as further position of the body part of the center of gravity and the higher occurrence of skeletal muscle complaints. Work attitude is not natural in general due to work mismatch with workers' ability.

The result of observation research found there were still respondents who work with awkward posture. Respondents in this study undertook unnatural positions such as bending body position (≥200) in the future when treating patients long enough (≥10 seconds) and made rapid movements in carrying tools in treating patients with frequency ≥2 times per minute, to the left and right and put position of the foot in a position that is not supportive. The absence of a relationship to the neck in this study can because there is no burden on the neck of the respondent and the frequency is less than 20 times.

Bhornsawan et al (2014) proposed Bayesian network (BN) that describes the mutual relationships among multiple variables contributing to work-related muscolosceletal disorders (WMSDs). BN model structure categorised into 1) enabling conditions, 2) faults and 3) consequence. Enabling conditions comprised of individual, work, stress, others and postures. Vibrating and repetition will coordinate between individual and work that mediated by specialty. Posture consisted of back, neck, and shoulders[12]. The diverse result is found in the study. Posture (neck, back, and shoulder) which is very high risk for work with sit back and stand position did not give positif result for association with MSD's complaints. The absence of correlation also appeared when it is associated with individual factors such as age, worklength, sleep duration and exercise/sports. Some studies have shown that musculoskeletal pain was negatively correlated with years of experience[13,14]. Work environment and its characteristics were represented by four domains: sitting position, instrument handling, use or otherwise of dental loupes and frequency of working hours. Three items addressed the sitting position, the use of a comfortable stool, adjusting the work stool based on height and back position and using the back support during practice. Four items addressed the handling of instruments, (including); reaching for instruments without strenuous movements, use of forceful movement to perform clinical work, performing clinical work with arms above shoulder height in addition to bending and twisting of the neck[14].

Numerous studies analyzed work length, operator position and physiological effects of various static postures. The other studies analyzed the relationships between prolonged muscle contraction and muscle imbalances, as related to the development of pain and MSDs. Prolonged static postures cause muscle fatigue and imbalance which release muscle ischemia or necrosis (trigger points and muscle substitution. The pain is produced after the process. Protective muscle protection is happened during the pain and cause joint hypomobility, nerve compression and spinal disk degeneration/herniation. MSD's is the result of the lack of joint mobility and nerve compression[15].

Some unlike results of the study may caused by some conditions. The respondents unaware about the disorders or did not feel proper condition related to MSD's. Cross sectional study also can be bias in order to one shot/one time measurement of MSD's. Despite the result, big five of MSD's among dentists and dental students in west Sumatera confirmed the body parts that are mostly impacted in the case of the static position of the work. Ergonomic position, sleep posture and duration and exercise are some prevention efforts of MSD's. According to the results of the study, ergonomic intervention may have a good impact in MSD's prevention.

Most of west Sumatera dentists and dental students complain MSD's of some body parts, but the big number was found in left wrist, right shoulder, upper neck, right wirst, and lower neck. There were correlation between work risk in right hand toward right wrist and palm right and on foot to right foot and left foot. There were no correlation between age, regular exercise, sleep duration and length of work toward musclolosceletal disorders complaints. Ergonomic interventions may have a good impact in prevention of hand/wrist complaints. Future studies may focus on some dentists work movement related to some MSD's with the proper assessment.
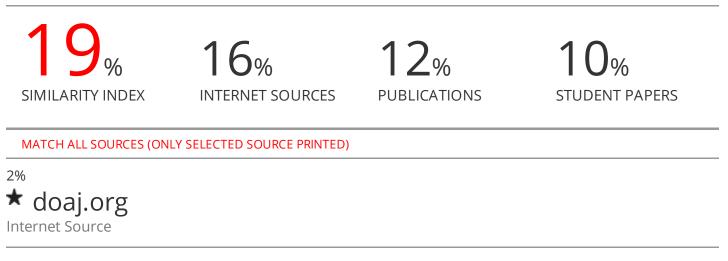
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