EPIDEMIOLOGY OF MUSCULOSKELETAL DISORDERS AMONG DENTISTS IN HANOI, VIETNAM

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PRIMARY HEALTH CARE MANAGEMENT FACULTY OF GRADUATE STUDIES MAHIDOL UNIVERSITY 2009

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Thesis
entitled

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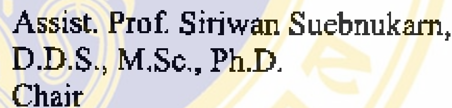

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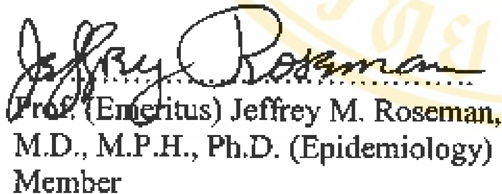

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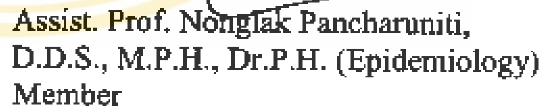

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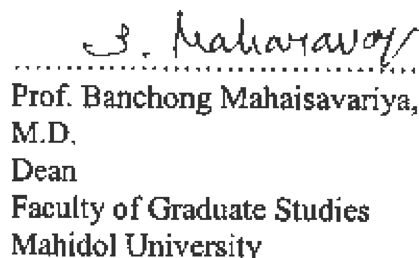

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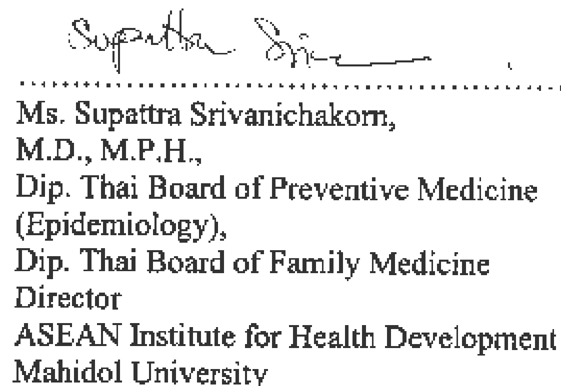

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Ma Quang Dung

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EPIDEMIOLOGY OF MUSCULOSKELETAL DISORDER AMONG DENTISTS IN HANOI, VIETNAM

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ABSTRACT

Musculoskeletal disorders (MSDs) are the most important occupational health issues in dentistry. The objective of the study was to estimate the prevalence of MSDs and explored the related factors among dentists in Hanoi, Viet Nam.

Study design was cross-sectional. Self-administered questionnaires were sent to 400 dentists working in Hanoi, Vietnam. Chi-square and multiple logistic regression analyses were used.

Three-hundred-thirty-six questionnaires (84%) were completed; 61.6% of them were from males, 38.4% from females with mean age = 34.0 year old (SD = 8.4). Most were general dentists (78.3%). Almost 84% reported having experienced one or more musculoskeletal symptoms during the past 12 months and 34.8% of them reported having them in the last 7 days. The most prevalent locations in the previous 12 month were neck (58.0%), shoulder (57.1%) and lower back (46.7%). The right shoulder and arm joints were many times more likely to be involved than the left. The most commonly physician-diagnosed MSDs were neck pain (17.9%), back pain (16.1%), and tendonitis (10.1%). None of the socio-demographic factors including years in dentistry were significantly associated with having an MSD. Among the work-related factors:- working more than 8 hour/ day, more than 5 days a week, more than 60 minutes without a break, and only sitting when doing dental work were all significantly associated with MSDs. Among the social factors, having little or no help if they were sick or support from their colleagues were significant factors. For multivariate logistic regression analysis, those significantly associated with MSDs in bi-variate analyses remained significantly independently associated with having MSDs except having help available when sick.

The study showed that MSDs were major occupational health issues for dentists in Hanoi, Vietnam. Possibilities for preventions of future MSDs are recommended.

KEY WORDS: EPIDEMIOLOGY / MUSCULOSKELETAL DISORDERS / POSTURE / POSITION / STRESS / DENTISTS/ VIETNAM

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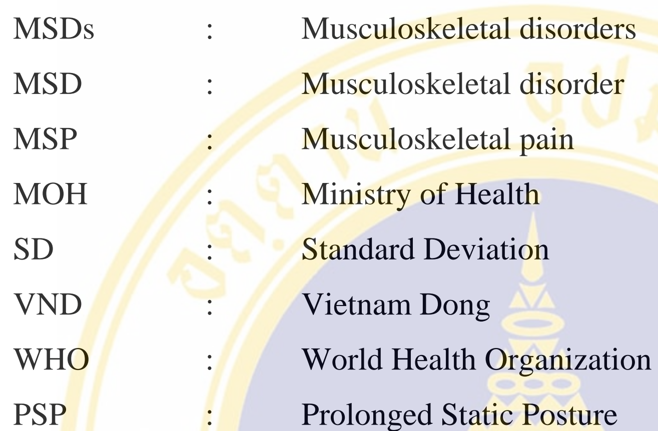

MSDs	:	Musculoskeletal disorders
MSD	:	Musculoskeletal disorder
MSP	:	Musculoskeletal pain
MOH	:	Ministry of Health
SD	:	Standard Deviation
VND	:	Vietnam Dong
WHO	:	World Health Organization
PSP	:	Prolonged Static Posture

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CHAPTER I
INTRODUCTION

1.1 Rationale and justification of the study

In the dental profession, dentists and dental hygienists spend their working days in an awkward, static position performing extremely precise procedures in a small workspace of patient's mouth. Since dental practitioners must work for long period in a prolonged awkward posture, they often develop musculoskeletal disorders (MSDs). [1] MSDs in dentistry may result in lowered productivity due to absence from work or in a career-ending difficulty.

The first report of the prevalence of back pain in dentists was 65% by Biller in 1946. [2] To prevent this changes, such as going from standing to sitting was recommended for dentist in 1960. The term four-hand dentistry was first presented at a conference in 1960. It has attempted to reduce the fatigue and MSDs among dental practice, but the prevalence of MSDs has not been decreased.

There have been many studies regarding MSDs experienced by persons working in the dental field that have used surveys to assess pain perception. In Thessaloniki, Greece, 62% of dentists reported at least one musculoskeletal complaint. [3] A study of musculoskeletal symptoms in New Shouth Wales (Australia) dentists showed that 82% of the respondents reported experiencing one or more musculoskeletal symptoms during the previous month and 64% reported backache during the previous month. [4]

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Several studies have indicated that back, neck and shoulder pain are a major problem among dentists. Five different surveys found that 60% of the participating dentists experienced musculoskeletal pain. [1]

Table 1: Prevalence of MSDs among dentists [5]

Dental professionals reporting pain in the past year			
Authors	Country	Study year	Percentage reporting pain
Shugars and colleagues	United States	1987	60
Rundcrantz and colleagues	Sweden	1990	72
Auguston and Morken	Norway	1996	81
Finsen and colleagues	Denmark	1997	65
Chowanadisai and colleagues	Thailand	2000	78

A recent study in Queensland, Australia (2004) by Leggat PA and Smith showed that have 87.2% of dentists reported having experienced at least one MSD symptom over the past 12 months [6] and other study in Saudi Arabia cited 83% dentists had pain or discomfort from the neck, shoulders, lower back or head. [7] Among the varied and diversified hypothesied factors related to MSDs are physicals factor, time pressure, workload, stress, etc. Why this is increasing when the tools, instruments and environment at work are improved that providing more convenience for working dentists?

In Vietnam, particularly in Hanoi City, the density of the population was very high and the rate of dental practices per 1,000 was low so that dentists usually work particularly to provide the needed services for all the patients. Therefore, the dentists in Hanoi capital, Vietnam always worked more than 8 hours per day.

This was the first epidemiological survey on musculoskeletal disorders among dentists in Hanoi, Vietnam. It also examined the factors associated with presence of any MSD or specific part of MSDs. The results of this research may help

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to find measures to improve working conditions and the musculoskeletal health of dentists.

1.2 Research questions

What was the prevalence of MSDs among dentists in Hanoi, Vietnam?

What were the factors related to MSDs among dentists in Hanoi, Vietnam?

1.3 Research objective

1.3.1 General objective

To study the magnitude and characteristics of MSDs and related factors among the dentists in Hanoi, Vietnam.

1.3.2 Specific objectives

- To examine epidemiologic characteristics of MSDs among dentists in Hanoi, Vietnam.

- To identify the factors related to MSDs among dentists in Hanoi, Vietnam.

1.4 Study variables

1.4.1 Dependent variable:

Musculoskeletal disorders

In this research MSDs refered to MSDs experienced among dental practice in Hanoi, Vietnam.

MSDs are chronic diseases that affect the muscles, ligaments, and tendons, along with the bones system. Musculoskeletal disorder among dentists includes

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problems with frequent neck, shoulder, lower back, hand, wrist, and other parts of body. [4, 8]

1.4.2 Independent variables in this study include:

Socio-demographic factors: age, gender, marital status, educational attainment, dental specialty among dentists in Hanoi, Vietnam.

Organizational factors: work load and time limit, autonomy, responsibility, job security of dentists in Hanoi, Vietnam.

Social support: family support, colleague support, safety awareness of dentists in Hanoi, Vietnam.

Personal factors: Physical factors (posture, position, vibration, repetitive movements, and infrequent breaks), psychological factors (stress), non work – related activities: (using computer, exercise/playing sport).

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1.5 Conceptual framework

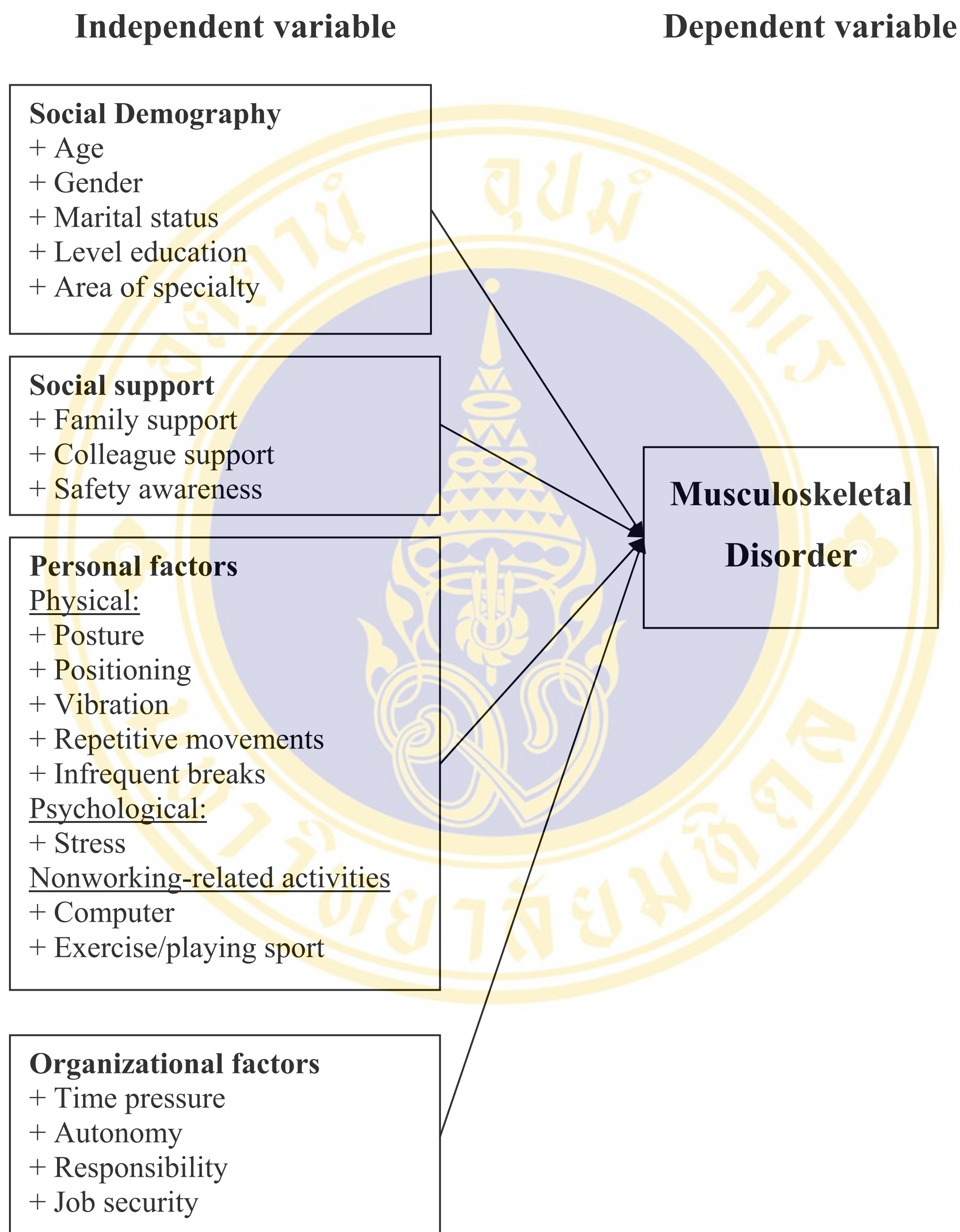

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Figure 1: Conceptual framework

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1.6 Operational definition of studied variables

1.6.1 Musculoskeletal Disorder

Musculoskeletal disorder is defined as a disorder of the muscles, tendons, peripheral nerves, and vascular system. They are not directly results from an acute or instantaneous event (e.g., slips, falls, trip). [5]

The most common use of the term MSD is for disorders of the hands, wrists, elbows, forearms, knees or neck, back and shoulders. Among dentists MSDs occur frequently in specific part of the body, for example: neck and shoulder, lower back, hand and wrist. [6,7,9] The common sign of MSD are decreased range of motion, deformity, decreased grip strength, loss of muscle functions and their normal symptoms are trouble, ache, pain, numbness, tingling, burning, cramping, and stiffness. [9, 10]

MSDs are measured based on the questionnaire modified from the Standardised Nordic Questionnaire for the analysis of musculoskeletal symptoms. [11].The participants answered the question " Have you at any time during the last 12 months had trouble(ache, pain, discomfort)?" with regard to nine regions of the body: neck, shoulders, elbows, wrists/hands, upper back, low back, hips/thighs, knees and ankles/feet. Participants had MSD if they had at least one trouble during the past 12 months.

1.6.2 Socio-demography

Age was calculated in complete years of dentists at the time of interview.

Gender referred to male or female.

Marital status referred to married, separated, divorced, widow, or single.

Educational attainment was the total number of years of education dentists attained. It include: Bachelor (6 year), Master (2year), Doctorate (3year).

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Dentists area of specialties: [12]

General Practioner is dentists who can prevent, evaluate, diagnose, and treat diseases of the oral cavity and associated structures.

Periodontics involve diagnosing, preventing and treating gum disease. Periodontists can also place dental implants as well as perform cosmetic periodontal treatments.

Prosthodontics is the specialty of implant, esthetic and reconstructive dentistry. Prosthodontists specialize in the restoration of oral function by creating prostheses and restorations. Cosmetic dentistry, implants and joint problems also fall within the field of prosthodontics.

Pedodontics is a branch of dentistry dealing with children's' teeth from birth to childhood. This focus on children's teeth (milk teeth, or deciduous teeth)

Endodontics is a specialist sub-field of dentistry that deals with tooth pulp and tissues surrounding the root of a tooth. The term comes from Greek endo (inside) and odons (tooth).

Orthodontics is a specialty of dentistry that is concerned with the study and treatment of malocclusions (improper bites), which may be a result of tooth irregularity, disproportionate jaw relationship, or both. The word comes from the Greek words ortho meaning straight and odons meaning tooth.

Oral and Maxillofacial Surgery is surgery to correct a wide spectrum of diseases, injuries and defects in the head, neck, face, jaws and the hard and soft tissues of the oral and maxillofacial region. It is a recognized international surgical specialty.

Others: Dental anesthesiology, oral and maxillofacial pathology.

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1.6.3 Social support

Family support was support from members in a dentist's family. They could help and take care of dentists, therefore, making dentists feel happy and comfortable.

Colleague support was support from a dentist's colleagues. The colleague could share experiences, consultations, and other supporting works.

Safety awareness was any kind of knowledge making dentists aware while working. It could be derived from university, hospital and the MOH guidelines.

1.6.4 Personal factors

1.6.4.1 Physical factors

Posture and position of dentists

Depending on the anterior – posterior axis (X-axis) of the head and body of dentists, and the left-right posterior axis (X-axis) of their head and body, as classified as the followings:

Head angle in anterior – posterior axis (X-axis):

+ 0° - 30^0: The head straight with vertical of the body

+ 31° – 45°: The head is ducked slightly toward the front

+ $\geq 46^o$: The head duck toward the front

Head angle in left-right posterior axis (X-axis)

+ 0° - 30^0: The head straight or tilting

+ 31° – 45°: The head tilt slightly to one side

+ $\geq 46^o$: The head tilt more to one side

The body in left-right posterior axis (X-axis)

+ 0° - 30^0: The head straight or tilting

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+ $31^o – 45^o$: The head tilt slightly to one side

+ $\geq 46^o$: The head tilt more to one side

The body in anterior – posterior axis (X-axis)

+ 0° - 30^0: The body straight with vertical body

+ $31^o – 45^o$: The body stoops toward the front

+ $\geq 46^o$: The body stoops toward the front

Adjust dental chair referred to whether or not dentists adjust their dental chair during their work.

Adjust dental unit referred to the number of times dentists adjust dental units during their work.

Using mouth mirror referred to using dental mouth mirror when treating upper teeth. Dentists always obtain the indirect view of operation while working with patients' mouth, or as the part of their regular habits, or might perform indirect view more than direct view, or epual, or having indirect view less often then direct views.

Sitting position referred to the position dentists usually adopt way while they treated on a patients. It included sitting position and alternating position (sitting and standing).

Common position in related to the patient was described as lock face with the patient's mouth as the centre of the dial. It refered to 9-12 o'clock position, 12 o'clock, and 12-15 o'clock.

Common handedness referred to right handed, left handed, and ambidextrous.

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Repetitive movements was defined as the average number of movements or exertions performed by a joint or a body link within a unit of time. In this study, measurement of repetitive movements is based on regular activity repetitive movement of dentists. It was classified as: seldom or never, now and then, often, and always.

Vibrating tools referred to regularly using vibrating stools. It has four levels seldom or never, now and then, often, and always.

Playing sport/exercise referred to those who play or do not play.

Type of exercise/sport referred to tennis, badminton, swimming, jogging, and other .

Days exercise/sport per week referred to the number of days per week dentist exercise or playing sport (days).

Time exercise/sport per day referred to the length of time dentists exercise or playing sport per days (minutes).

Using computer referred to those using or not using computer.

Time using computer referred to the length of time dentists use computer per day (hours).

1.6.4.2 Psychological factors:

Stress was a set of physiological, behavioral and emotional responses that occur in reaction to situations which were potentially harmful to an individual's physical or psychological health. [13] Stress among dentists was thought to result from various sources, including job satisfaction, income, working hours, as well as staff and patient interactions and other general social relationship.

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Stress was measured based on the response of fifteen stress' statements of respondents. It was measured by questionnaire.

1.6.4.3 Organizational factors

Time pressure was the length of time during which dentists have to work. It refers to total hours per day, total days per week, and total length of time before dentist taking 10 minutes break.

Autonomy referred to the extent to which dentists controlled their work condition.

Responsibility referred to whether participants had or did not have responsibility for his workplace and legal responsibility for their treatment.

Job security referred to whether safety protocol/professional guidelines or did not have in dental workplace.

1.7 Limitation

The data were collected by self administered-questionnaires. Therefore, it was assumed that the respondents were accurate in answering the questionnaires.

1.8 Expected outcome

From the result of this study, it was hoped that the Hanoi Department of Health, hospitals with employed dentists would be made aware of the occupational hazard afflicting them. The mentioned policy makers and organizational leaders would acknowledge the prevalence of MSDs from this local study and provide timely and effective interventions to dentists and improve their quality of life.

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CHAPTER II
LITERATURE REVIEW

2.1 Definition of Musculoskeletal disorder

The World Health Organization defines a musculoskeletal disorder as "a disorder of the muscles, tendons, peripheral nerves or vascular system. They are not directly result from an acute or instantaneous event (e.g., slips or falls). These disorders were considered to be work-related when the work environment and the performance of work contributes significantly, but was only one of a number of factors contributing to the causation of a multifactor disease." [5]

The neutral terms for musculoskeletal symptoms and musculoskeletal disorders that have been used since the magnitude of causal contribution of work exposures in relation to other causes was largely unknown and sometimes questioned. Musculoskeletal symptoms are common, and are encountered by most people from time to time, for example due to minor traumas or as stiffness following exercise. [10] Therefore, the terms MSDs in this study included any symptoms of participants such as trouble, ache, pain, numbness, tingling, burning, cramping, stiffness, discomfort and signs (decreased range of motion, deformity, decreased grip strength, loss of muscle functions). Musculoskeletal problems related to accidents, injury, endocrine disease or other well-defined conditions were not included.[10]

Among dentists, an important factor related to MSDs was the lack of optimal posture and position while working. Below is a chart showing how prolonged static posture can progress to musculoskeletal disorder.

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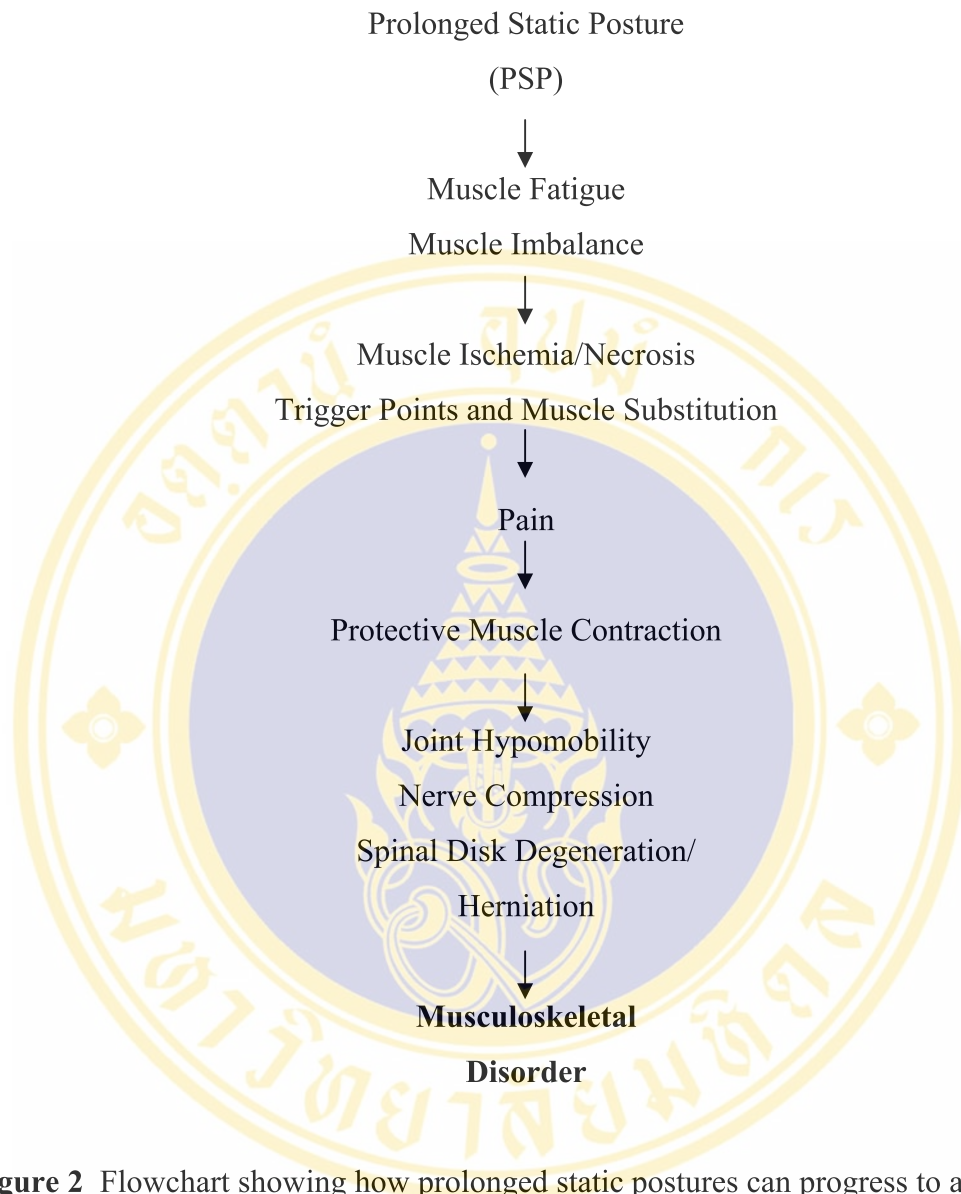

Figure 2 Flowchart showing how prolonged static postures can progress to a pain or a musculoskeletal disorder

A summary of the literature review found the most common MSDs that result from PSP in dentistry included the following: [5]

a/ Chronic low back pain: pain in the low back, often referring into the hip, buttock or one leg. The cause may be muscle strains or trigger points, instability due to weak postural muscles, hypomobile spinal facet joints, or degeneration or herniation of spinal disks.

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b/ Tension neck syndrome: pain, stiffness and muscle spasms in the cervical musculature, often referring pain between shoulder blades or the occiput, and sometimes numbness or tingling into one arm or hand. Forward head posture may precede this syndrome, precipitating muscle imbalances, ischemia, trigger points, or cervical disk degeneration or herniation.

c/ *Trapeziums myalgia:* pain, tenderness and muscle spasms in the upper trapezium muscle. Operating with the arm elevated can predispose the operator to this syndrome, which often is seen in the trapeziums muscle on the side on which the dentist holds the mirror.

d/ Rotator cuff impingement: pain in the shoulder on overhead reaching, sustained arm elevation or sleeping on the affected arm. Incorrect body mechanics and rounded shoulder posture in the operation can lead to the impingement.

The natural spinal curves [14]

In the standing posture, the spine has four natural curves when viewed from the side: cervical lordosis, thoracic kyphosis, lumbar lordosis and sacral kyphosis. The curves are interdependent; a change in one curve will result in a change in the curve above or below it. The sacral curve movement is extremely limited. However, the remaining curves, especially the lumbar and cervical curves, are more mobile and can be influenced more easily.

When sitting unsupported, a frequent posture in dentistry, the lumbar lordosis flattens. The bony infrastructure provides little support to the spine, which now is hanging on the muscles, ligaments and connective tissue at the back of the spine, causing tension in these structures. Ischemia can ensue, leading to low back strain and trigger points.

Maintaining the cervical lordosis in the proper position is equally important. Forward-head postures were common among dentists, due to years of poor

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posture involving holding the neck and head in an unbalanced forward position to gain better visibility during treatment. With forward-head postures, the muscles of the cervical and upper thoracic spine must contract constantly to support the weight of the head in forward-head. It referred to of tension neck syndrome. This syndrome can cause headaches and chronic pain in the neck, shoulder and inter scapular muscles, and it can occasionally radiate pain into the arms.

2.2 Overview of musculoskeletal disorders among the dental practice

MSDs were among the most common of human afflictions. The prevalence of MSDs amongst dentists varies according to different country. In a study from New South Wales in 1997 which interviewed 442 dentists of whom 80% (n=355) responded, the prevalence of musculoskeletal problems amongst dentists was very high with 82% reporting at least one musculoskeletal symptom during the previous month and 64% of the sample reporting back pain.(4) In Thessaloniki, Greece, (2004) a mail questionnaire was sent out to 430 dentists (response 88%). Sixty two percent of dentists reported at least one musculoskeletal complaint, 30% with chronic complaints, 16% had spells of absence and 32% sought medical care.(3) In Queensland, Australia, a study amongst dentists reported the prevalence of back pain was 54%; 58% had neck related pain; and 53% had shoulder pain.(6) In a study by Basset (1983), 465 Canadian dentists were surveyed and 62% of the respondents reported lower back pain.(15)

Several studies found that musculoskeletal pain was very common among dentists: Shugar, et al. (1987) reported 60%; Runderantz, et al. (1990) cited 72%; Auguston and Morken, (1996) reported 81%; Finsen, et al. (1997) reported 65%; and Chowanadisai, et al. (2000) reported 78%. (1) The prevalence of musculoskeletal pain was different in each study, but was very high in each study.

The study “occupational health problems in modern dentistry: reviewed in 2007” (16) showed that occupational health was a major concern for dentists. It included: infections disease, chemicals, “physical and psychological injury”, and MSDs. In Belgium, an investigation of Flemish dentists revealed a similar spectrum of

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problems but different frequency, including low back pain (54%), vision problems (52%), allergies (23%), auditory disorders (20%), and infection disease (6%).

In Vietnam, a study on musculoskeletal problems and occupational stress among dentists and dental assistants in a dental clinic was conducted by Nguyen B.D in 2004. He interviewed all 19 dentists and dental assistants, and their working postures were assessed by the rapid upper limb assessment. This study showed that 89% of dentists and 80% of dental assistants reported neck problems. 50% of the subjects reported pain in both shoulders. Back pain was reported by one third of the dentists. [17] This study revealed a high rate of musculoskeletal problems among dentists but it was based on only 19 dentists and dental assistants in one clinic, so the generalizability of the results were uncertain.

2.3 Risk factors related to musculoskeletal disorders

2.3.1 Social demography

Age

The average age of the dentists resulted from one study of MSDs was 44 ± 12.2 years and the average number of year of dental practice was 21 ± 12 years. [4] Another study showed that the average age of men dentists were 46.9 ± 10.1, female dentists 44 ± 10.2, with age ranging from 24 to 70 yeas, the dentists had worked in average 18.5 years. [3]

The study in Saudi Arabia reported that younger dentists had more symptom of MSDs than older dentists. [7] The study in Queensland dentists found that younger and less experienced dentists were ore likely to report MSD of the neck, upper back and shoulders. [6] Leggat PA explaned that experienced dentists were probably better at adjusting their working position and techniques in order to avoid musculoskeletal problems, when compared to their less experienced counterparts , or that they simply developed coping strategies to help deal with the pain. [16]

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Gender

The New South Wales study showed that female dentists were found to rate the severity of their most severe symptom higher and to report more frequent pain and head. [4] Another study in Saudi Arabia reported the female dentist had a significantly higher frequency of pain, headache and weakness than their male counterparts ($p<0.05$). [7] For hand/ wrist pain, Bethany V reported carpal tunnel syndrome is three times more prevalent in women dentists than men. [1] Similarly in Thessaloniki, Greece, a study reported female dentists was significantly related to chronic back pain (OR = 2.24; 95% CI 1.22-4.82)) and chronic shoulder pain (OR = 4.51; 95% CI 1.72-11.85) than male. [3]

Marrital status

In Thessaloniki, Greece, a study showed that living alone was an important factor for chronic neck pain (OR =4.86; 95% CI was 2.35-10.03). [3]

Education

The Thessaloniki study reported that working long hours was related to higher educational status. It also showed that Dentists with basic education experienced a significantly less job demands and control as compared to dentists with a higher educational level. Perhaps this reflects more demanding cases through referrals and higher expectations from clients. [3]

Specialty of Dentists

In 430 dentists in Thessalonike, Greece showed that the majority were general dentists reported (92,1%), specialists mainly orthodontists (4,4%), oral and maxillofacial surgeons, endodontists, periodontists and, specialists in paediatric dentistry. [3] This study showed that prevalence of shoulder and hand/wrist complaints differed significantly between orthodontists and general dentists. Hand/wrist complaints were more prevalent in orthodontists (42.1%) than general dentists (25.5%) and shoulder complaints reported significantly more often by general dentists (0% vs 21,2%, respectively). In Israeli study, the major practice areas of dentistry were

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general practice (36%), Maxillo Facial Surgery (27%) and Oral rehabilitation (25%) were reported. [18]

2.3.2 Social support

Social support at work can reduce the workers stress, especially when working in difficult position. For dentists, the sources of social support come from their families, colleagues and safety awareness. Dentistry is known to be a demanding profession. Dentists characterize their profession as hard and demanding work, sometimes requiring more patience and physical self-sacrifice than they are able to give. The social interaction of dentists is influenced by the unique work setting and by personal characteristics. [19] The systematic review of occupational risk factors for shoulder pain showed that larger risk estimates were reported for poor job control and for job dissatisfaction. However, median method scores of shoulder pain were also relatively high for social support, psychological work demand and job control. [8]

2.3.3 Physical factors

Physical factors were important factors in musculoskeletal pain among dentists. Jennifer A. Harter defines the contributing factors for work-related MSDs as routine exposures, for example, forceful hand exertions, repetitive movements, fixed or awkward postures, vibrating tools, and unassisted frequent or heavy lifting. [9] In a study by Evangelos CA, Ioanna CS, Fotini C 2003, showed that physical load were the factors lead to MSDs, it included: repetitive shoulder/hand movements factors have 66% respond, awkward posture 52,3% respond, strenuous shoulder/hand movements 15,3% respond, high exposure to vibrating tools 76,5% responds. [3] Physical risk factors were significantly related to the occurrence of low back, neck pain, shoulder, and hand/wrist. But, chronic complaints did not show any correlation with physical factors except hand/wrist complaints. [3]

Posture is the positions of a part of the body relative to an adjacent part measured by the angle of the joint connecting them. Posture is one of the commonl frequently cited occupational risk factor. The faculty of moving body depends on the joint. Each joint the range of motion is defined by movements that do not require high

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muscular force or cause undue discomfort. [20] A previous Swedish study showed that dentists were exposed to a high load on the trapezius muscles bilaterally, as well as prolonged forward bending of the head. [21] Prolonged static postures were thought to be associated with various MSDs. [18] In addition, analysis of loads on the wrists of Swedish dentists showed that their postures were constrained but that dynamic loads were low. However, in New South Wales study suggest that modification of woek practices in dentistry, including taking rest break, dose not seem to influence the prevalence of reported symptoms associated with MSDs. [4]

Posture and position

A poor posture position, held over time, tends to decrease blood supply to the area and overloads the supporting soft tissue structures, thus causing back pain. [18] A Saudi Arabia study reported that during treatment of the left maxillary first molar by 60 recently graduated dentists, the most frequently used (46.7%) postures were posture 1 (whole back bent the seat straight) and posture 3 (40.0%) (Whole back bent, the seat forward tilted). Dentists who used posture 1 have more neck ache and lower back pain than those who used posture 3. [7] A study by Lindfors P showed that strenuous position and general health problem were the factors most strongly related to upper extremity disorders in female dentists. [22] In Thessaloniki, Greece showed that Physical load were associated with the occurrence of back pain (OR: 1.59), shoulder pain (OR:2.57), hand/wrist pain (OR:3.46). [3]

Using mouth mirror

Study in Saudi Arabia showed that most dentist use mirrors when examining the left maxillary first molar. Dentists using mirrors more often had less pain or discomfort in the upper locomotors system than those who did not. [7] The study by Rundcrantz B.L et.al reported that dentists who usually use the dental mirror in positions where a direct view is difficult had significantly less pain and discomfort. [23]

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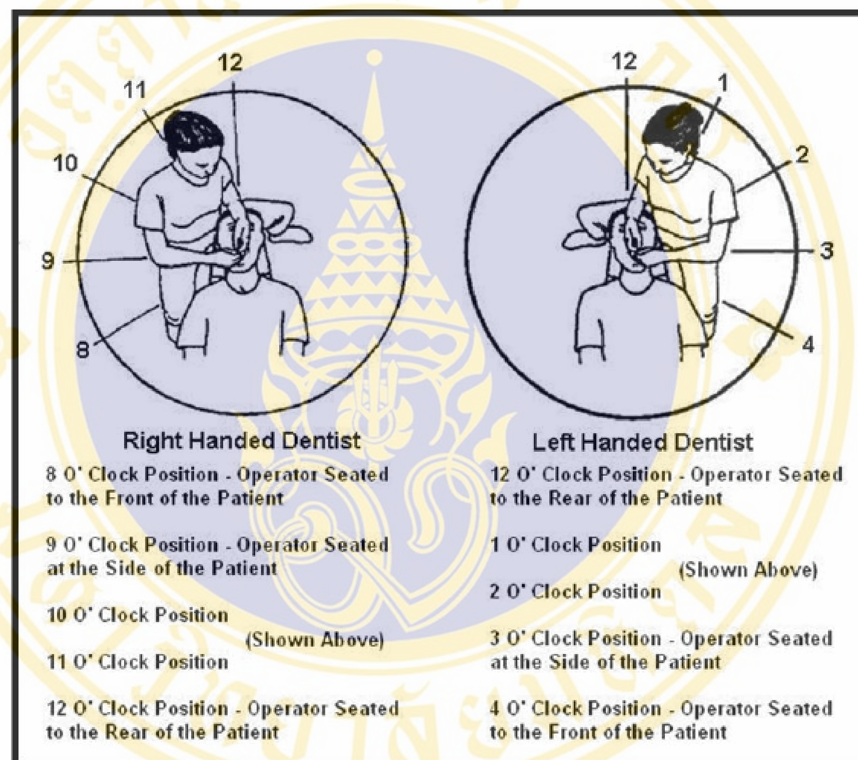
Common position

Sitting positions of the dental operator in relation to the mouth of patient were usually identified in relation to a 12-hour clock. [24] The Saudi Arabia also showed that 67.9% of the dentists reported using a position between 10 and 12 o'clock. Dentists who used 9 o'clock and 10 o'clock position reported more symptoms than those who used 12 o'clock position. [7]



Source: Fundamentals of Dental Assisting, Sweet Haven Publishing 2006

Figure 3 Sitting Positions of the Dental Operator (Clock Position) [24]

Repetitive movements

The occurrence of musculoskeletal complaints among dentists was associated with work-related physical loads. It includes repetitive movements, awkward working postures, prolonged sitting or standing, and strenuous arm positions like working with hands in excessive tightening or arm abduction and elevated arms, and use of vibrating tools. [3] Repetitive movements or repetition rate is defined as the average number of movements or exertions performed by a joint or a body link within

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a unit of time. Repeated identical or similar motions performed over a period of time can cause over-extension and overuse of certain muscle groups, which could lead to muscular fatigue. Interestingly, symptoms often relate not to the tendon and muscle groups involved in repetitive motions, but to the stabilizing or antagonistic tendon and muscle groups used to position and stabilize the extremity in space. For example, using repetitive in dental operations as scaling, roots planning, polishing.

Vibration has been found to be an etiological factor in work environments utilizing tools vibrating in the frequency band of 20 to 80 hz. Although, Dental handpieces and powered automatic instruments operated at higher frequencies in the 5000 to 10,000 hz range, it usually was relatively for short duration of vibratory force during dental procedurest. Thus, it would appear that the exposure to this risk factor in dentistry is relatively small.

Astrom C et.al reported that ultrasonic scalers and high speed hand piece were commonly used in dentistry. The scalers cause high-frequency vibration (6000–40000 Hz) exposure to the hands of the users. The vibration in many hand held tools or work pieces may cause a complex of vascular, neurological, and musculoskeletal disturbances.' Peripheral vascular and sensor neural disorders of the fingers and hands might seriously affect the ability to fulfill the high precision demands of dentistry; especially dentists and dental hygienists need extremely good finger mobility and tactile sensitivity. Such work also requires good hand strength. Disturbances of these functions may make it impossible to continue working in these professions. [25]

Knowledge about the relation between the musculoskeletal injuries and vibration is limited. Exposure to vibration is suggested as a risk factor for developing neck and shoulder disorders in working life. Mechanical vibration applied to a muscle belly or a tendon can elicit a reflex muscle contraction, also called tonic vibration reflex, but the mechanisms behind how vibration could cause musculoskeletal disorders has not yet been described. One suggestion has been that the vibration causes muscular fatigue. Several studies have found associations between exposure to vibration and acute and chronic muscle symptoms and injuries [25] However, the study

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by Astrom C et al indicated that short-time exposure to vibration has no negative acute effects on the fatiguing of upper trapezius muscle. [25]

2.3.3 Psychosocial factor

In the last decade, not only between physical load and musculoskeletal disorder was focused but also between psychosocial demand and work related musculoskeletal disorders. Many mechanisms have been reported to describe how psychosocial stress can result in musculoskeletal tension. Mental stress is one cause that increases in muscle tension similar to that cause by a physical load. [22]

Danielle based on 29 studies found that psychosocial risk factors for shoulder pain may be related to psychological demands at work (mental stress, job pressure, 14 studies); control at work (participation in job decision making, influence on work schedule, 11 studies); social support at work (from coworkers and supervisors, 12 studies); and job satisfaction or stimulus at work (work content, monotonous work, career prospects, 12 studies). [8]

Stress amongst dentists is thought to result from various sources, including job satisfaction, income, working hours, as well as staff and patient interactions. [15] If dentists were not well satisfied with their careers it became the best factors such as income, respect and patient relation. [26-28] Danielle A.W.M Vander et.al reported that shoulder pain was associated with psychosocial work environment and this factor seemed to be important in both development and maintenance of subacute and chronic problem. [8]

Usually, stress (anxiety) is often accompanied by physical symptoms, including: twitching or trembling, muscle tension, headaches, sweating, dry mouth, difficulty swallowing, and abdominal pain. Psychosocial work factors have been defined as the cause of stress and strain. Lazarus suggested that physiological changes arise from a need for action resulting from emotion. [6] However, Alexopoulos E.C. et.al found that psychosocial aspects were less often associated with the occurrence of musculoskeletal complaints in the past 12 months than physical load. [3]

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2.3.4 Organizational factors

Caplan et al. in 1975 reported that work organization reflects the objective nature of the work process and dictates the extent of physical exposures at work in terms of workload, work place, work schedule, work-rest cycle, and design of instrument and work station. Work organization also influences the psychosocial environment which related to job stress. [6]

Work organization can be defined as the way in which work is structured, supervised and processed. Work organization reflects the objective nature of the work process. [29] Working conditions are significantly associated with UEMD(upper extremities musculoskeletal disorders), and changes in the working schedule may decrease the incidence of this problem in workers assigned to tasks related to the interactive use of computer-accessible databases during telephone contacts. The study indicated that time pressure at work and rest/work schedule associated with UEMD were.

In Queensland, Australia, a study showed that the mean hours per week dentists had to work were 37.1 for males, and 31.6 for females.[6] Study in Thessaloniki, Greece, reported that 37% of dentists mostly women worked 30 hours per week while 25% worked more than 40 hours. Working long hours was related to higher educational status and male gender. [3] Leggat PA also reported that the mean number patients per day were 14.4 patients for male dentists and 13.0 for female dentists. [6]

MSDs had been found to be a major health problem for dental practitioners. [2, 4, 30] Several studies have reported a similar prevalence of MSDs among dentists more than 50%. [2, 3, 6, 7, 18] The average ages of dentists were from 38 to 46 year old. [3, 4, 6, 7] According to another report it was fond that younger and less experienced dentists were more likely to have MSDs at neck, shoulder, and upper back. [6, 30] The number of years since graduated has also been shown to be negatively correlated with MSDs.[30] Regard to dental specialist, other study showed that the majority were general dentists MSDs. [3, 18] It was noted that basic operating posture

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was consider as one of important occupational healing issues for dentists and it was noted that Physical posture of the operator, while providing care, should be such that all muscle are in a relaxed, well-balanced, and neutral position, deviation from neutral position was associated with MSDs.[7] and Mental stress was one cause that increased in muscle tension similar to that caused by a physical load. [22]

Table 2 Summary of previous MSDs related studies

Author / Institution	Method	Key variables	Major Findings
New South Wales Brranch, 1997 [4]	Cross-sectional (n=355)	Musculoskeletal symptom	- 82% reported experiencing one or more musculoskeletal symptom - 64% reported suffering pain (back pain), 58% headaches - Female dentists were more likely to rate the severity of their most severe symptom higher
Ratzon NZ, Yaros T, Mizlik, Kanner T 2000-Israel. [31]	Cross-sectional (n=430)	Sitting position, altering position	- 55% reported lower back pain and 38.3% reported neck pain in the past 12 month - 28.3% reported neck pain and 15% reported shoulder pain in the past week - Severity of symptoms was higher among dentists working in the sitting position compared to dentists using altering position
Evargelos CA Ioanna CS Fotini C 2004-Greece[3]	Cross-sectional (n=430)	Prevalence Musculoskeletal disorders	- 62% of dentists reported at least one musculoskeletal complain, 30% chronic complaints, 16% had spells of absence, 32% sought medical care - Factors of physical load were associated with the occurrence of back pain (OR=1.59), shoulder pain (OR = 2.57), and hand/wrist pain (OR = 3.46) - Living alone was related with increased absenteeism due to shoulder pain (OR=5.0) and hand/wrist (OR=4.07)
Leggat PA, Smith DR 2006-Australia [6]	Cross-sectional (n=285)	Musculoskeletal disorders, injury	- Most dentists 87.2% reported having experienced at least one MSD symptom in the last 12 month - Most prevalence MSD were reported at neck (57.5%), shoulder (53.3%), and lower back (53.7%)

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Table 2 Summary of previous related studies (Cont.)

Author / Institution	**Method/ Study Design**	**Key variables**	**Major Findings**
Gandavadi A Ramsay J.R.E Burke F.J.T 2007 [32]	Experimental design	Woking posture working-related upper limb disorder	- Students using conventional seat recorded significantly higher risk of MSDs when compared the student using Bambach saddle seat - Student using a Bambach Saddle seat were able to maintain an acceptable working posrute during dental operation
Bethany V, Keith V. 2003 [5]	Systemic review/ Review Article	MSDs in dentists, Mechnisms leading to MSDs	- The source of MSP and disorders in dentistry were multi factorial - Such postures with increase disk pressures and spinal hypomobility were factors that many lead to degenerative changes within lumbar spine and low back pain - There is relationship between prolong static (motionless) muscle contraction and muscle ischemia or necrosis
Chowanadisai S, Kukiattrakoon B, Yapong B, Leggat PA, 2000- Thailand[30]	A cross-sectional (n=220)	Investigate of occupational related health problems in dentists	- The most common occupational health problems were musculoskeletal pain 78% - Part-time dentists were found having higher proportion of musculoskeletal problems than full-time dentists - Number of year since graduated were negatively correlated with MSP
Tariq 2008- Saudi Arabia [7]	Cross-sectional (n=140)	MSDs working posture and position	- 83% of dentists reported having musculoskeletal pain - Female dentists had highter frequency of pain than male - pain and headache were the most commonly symptoms - Dentists who use posture and have more neckach and lower back pain than those who used posture 3

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CHAPTER III
RESEARCH METHODOLOGY

3.1 Study design

This survey was conducted as a cross-sectional survey.

3.2 Sample description

Dentists (dental practitioners) who worked in Hanoi, Vietnam, both governmental and/or non-governmental setting.

3.2 Sample size

The sample size was calculated by using the following statistical formula:

$$n = \frac{Z^2_{\alpha/2}pq}{d^2}$$

Where n = sample size

Z = 1.96 (referred to standard normal score) confidence interval ($\alpha = 0.05$)

p = 0.32 (From Dutch study year 2000) [33]

q = 1- p = 1- 0.32 = 0.68

d = degree of accuracy desired, setting at 5%

$$n = \frac{(1.96)^2.(0.32).(0.68)}{(0.05)^2} = 334$$

Therefore, the minimum sample size required for the study was 334.

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3.4 Study area and study population

The study population was dental practitioners in Hanoi, Vietnam, working for hospitals or dental clinics during January 2009.

3.5 Sampling technique

Purposively sampling technique was used to recruit the studied samples.

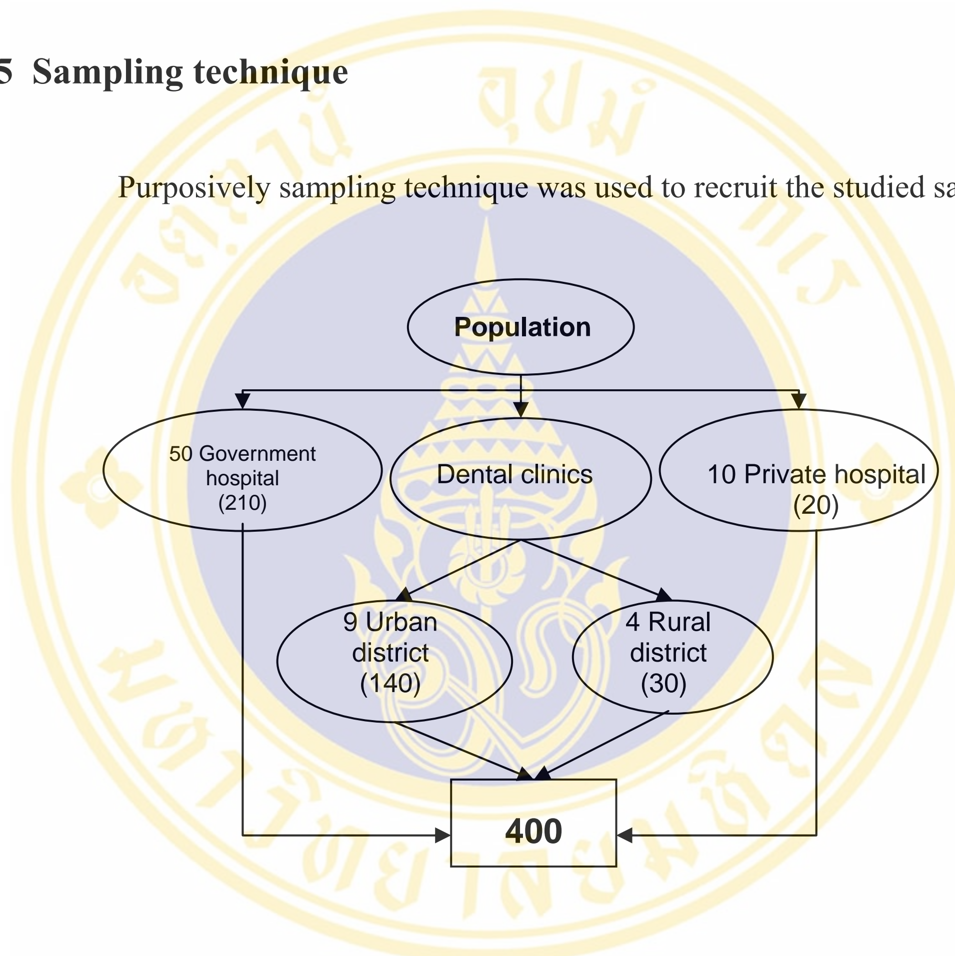

Figure 4 Sampling process

3.6 Research instrument

The survey was conducted among dentists in Hanoi, Vietnam by self administered questionnaire. It included three parts based on the objectives and the conceptual framework of this study:

Part I: Social demographic: age, gander, marital status, educational level, specialist occupation, working duration.

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Part II: Musculoskeletal disorder information included

+ MSDs related nine part of body

+ Special MSD at neck, shoulder, and lower back;

+ Musculoskeletal deformity

+ History of MSDs

Part III: Factor related to MSDs included

+ Social support included: family support, colleague support, and safety awareness.

+ Organizational factor included: time work load, autonomy, responsibility, and job security.

+ Physical factors included: posture and position, repetitive movement, vibrating tools.

+ Psychological factor was stress.

+ Non-Work related physical activities included playing sport/exercise, using computer.

The validity and reliability test of instrument: The informal test for the Vietnamese version of the questionnaire was conducted by 5 dentists working in the Vietnam Cuba Friendship Hospital. Pre-test of the questionnaire was done before collecting data for ten questions related to safety awareness. It was conducted among 30 dentists in the University of Odonto-Stomatology. The pre-test respondents were excluded from the real data collection. The Cronbach's Alpha was 0.84.

3.7 Data collection process

3.7.1 Training data collection.

The questionnaire was translated into Vietnamese. An informal test for the questionnaire was conducted on 5 dentists in Vietnam Cuba Friendship Hospital. After getting permission of Ethics Committee of Ha Noi department of Health, the training was 4 dentists working in Vietnam Cuba Friendship hospital and Hanoi dental students teem. The purpose of this training was to help research assistants understand

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questionnaires clearly so that they could help participant understand the purpose of this research and showed participants how to complete the information sheet and consent form correctly.

3.7.2 Data Collecting

The data collection procedure started on 7th January to 5 February in Hanoi City. It included two parts: Viet Nam Cuba Hospital was responsible to organizing a workshop (science discussion). Dentists in government hospitals were invited to attend science discussion and concomitant with inviting to participation in this study. The dentists who were absent from workshop and those working for private clinic in Hanoi were collected by Hanoi dental student's researcher team.

3.8 Data analysis procedure and statistical method

Part 1 Univariate analyses: To described the frequency and percentage distribution, mean, standard deviation, maximum and minimum of each independent and dependent variables.

Part 2 Bivariate analyses: To assessed the association between MSDs and socio-demographic characteristics (age, sex, marital status, education level, specialist occupation, working duration), social support (family support, colleague support, and safety awareness), organizational factors, physical factors, psychological factors, non-work related physical activities by using Chi-square test.

Part 3 Multivariate analysis: Multiple logistic regression analyses were used to test the relationship between MSDs, MSD at neck, MSD at shoulder, MSD at lower back and other defined predictor factors.

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CHAPTER IV
RESULTS

The Epidemiology of musculoskeletal disorders among dentists in Hanoi was studied in January, 2009. Self-administered questionnaires were answered by 336 dentists. The responses to these questionnaires were completed in January, 2009. The findings of this study are presented in two parts: part one is the description of the sample socio-demographic factors, social support factors, organizational factors, physical factors, and psychological factors. Part two is the inferential statistic analyses to determine the associations between musculoskeletal disorders among dentists and its related factors. The level of statistical significance was set at 0.05.

Part one: Descriptive statistical analysis
Section 1: Socio-demographic of respondents
Section 2: Social support
Section 3: Organizational factors
Section 4: Physical factors
Section 5: Psychological factors
Section 6: Non-work Related Activity
Section 7: Musculoskeletal disorders among dentists

Part two: Inferential statistical analysis
Section 8: Association between dependent and independent variables
Section 9: To predict dependent variable by independent variables. Multiple logistic regressions were used to determine the strength of association between MSDs and related factors.

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Part one: Descriptive Statistical Analysis

4.1 Socio-demographic characteristics of respondents

4.1.1 Age

The age of respondents ranged from 23 to 72 years old with mean age of 34.0 (standard deviation =8.4). The majority of the dentists fell into two groups, 20-29 and 30-39, 35.7% and 45.4% respectively. An additional 13.1% were concentrated in the aged group of 40-49 year old; 4.8% of them were in the age group of 50-59 year old, 1.2%, over 60 years old.

4.1.2 Gender and marital status

The majority of the respondents were male (61.6%). Almost of them (75.0%) were married; 22.9% were single. Divorced, separated and widowed (1.2%, 0.6% and 0.3%, respectively) were.

4.1.3 Education

Regarding to the level of graduation showed that the majority 71.1% of the respondents had completed bachelor level. Master level occupied 24.7%. Only 4.2% were doctorate level.

4.1.4 Dental specialty

About 78% of the respondents were in general practice; prosthodontic at 4.4%, prosthodontics; both of Orthodontic and Pedodontics, 2.4%; 5.0% of the respondents were in oral and maxillofacial surgery; both periodontics and Endodontics, at 2.4%. All other specialist occupation of respondents made up 4.1 %.

4.1.5 Working duration

Almost 47% of total dentists have had less than 5 years of experience. About 26% of the dentists had been working for 6 to 10years, 13.4% of them had been working for 11 to 15 years, 7.1% of them had been working from 16 to 20 years, 2.9% of them had 21 to 25 year of working experience. The senior dentists (4.2%) had

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more than 26 years of experience. The mean working duration was 8.7 years, the shortest duration was 1 year and the longest working duration was 43 years.

Table 3 Frequency and percentage of respondents by socio-demographic characteristics

Socio-demographic factors		Number (N= 336)	Percentage (%)
Age			
20 – 29		120	35.7
30 - 39		152	45.2
40 – 49		44	13.1
50 – 59		16	4.8
≥ 60		4	1.2
Mean = 34.0	SD = 8.4	Min = 23	Max= 72
Gender			
Male		207	61.6
Female		129	38.4
Marital status			
Married		252	75.0
Separated		2	0.6
Divorced		4	1.2
Widow		1	0.3
Single		77	22.9
Education level			
Bachelor		239	71.1
Master		83	24.7
Doctorate		14	4.2
Dental specialty			
General Practice		263	78.3
Periodontics		4	1.2
Prosthodontics		15	4.4
Pedodontics		8	2.4
Endodontics		4	1.2
Orthodontics		8	2.4
Oral and Maxillofacial Surgery		20	5.0
Others.		14	4.1
Working duration			
≤ 5 year		157	46.7
6 - 10 year		87	25.9
11 - 15 year		45	13.4
16 – 20 year		24	7.1
21 -25 year		9	2.7
≥ 26		14	4.2
Means = 8.7	SD = 7.2	Min = 1	Max= 43

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4.2 Social support

Social support included family support, colleague support and safety awareness. Table 4 describes the percentage of respondents who answered either “no” or “little” compared those who answered “most of the time” to 4 questions about family support, 2 questions about colleagues’ support and 10 questions about safety awareness. Almost all (over 90.0%) respondents answered that most of time they had family support to help with daily routine meals or errands when they got sick; someone they could count on to listen to them if needed; and someone to help with the housework (93.2%, 92.9% and 92.0% , respectively). Having a family member who understood dental work pattern most of the time was only available to 86.9% of respondents. Almost 85% of respondents said that most of the time they could ask their colleagues for professional support.

Table 4 Distribution of Family and Colleagues’ Support

Statements	Most of time		No or a little	
	(%)	N	(%)	N
Family Support				
Understanding dental work pattern	(86.9)	292	(13.1)	44
Assist in housework	(92.0)	3.9	(8.0)	27
Counts on to listen to when needed	(92.9)	312	(7.1)	24
Help daily routine meals or errands while sick	(93.1)	313	(6.8)	23
Colleague Support				
Help with professional support/ assistance whenever needed	(84.5)	284	(15.5)	52
Usually follow the best interest of teamwork/ organization	(94.3)	317	(5.7)	19

Table 5 showed the distribution of safety awareness in dental practice. Most respondents responded that they were always aware of safety issues in their work. The highest percentage (95.2%) of respondents said that they were always or

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often aware of the hazards from sharp instruments. Ninety-two percent of respondents were aware of exposure to infection from communicable diseases. The fewest number of respondents were aware that related awkward postures/positions can also lead to development of MSDs and when working with anxious patients (75.7% and 73.2% respectively).

Table 5 Distribution of safety awareness in dental practice

Safety awareness in dental practice	Almost		No-infrequently	
	(%)	N	(%)	N
Working long hours at high level of concentration being at risk of developing stress.	(86.9)	292	(13.1)	44
Working with anxious patients	(73.2)	246	(26.8)	90
Exposure to microbial aerosols generated by high-speed rotary hand pieces	(84.8)	285	(15.2)	51
Hazards from sharp instruments	(95.2)	320	(4.8)	16
Various chemicals used in clinical dental practice	(89.3)	300	(10.7)	36
Exposure to eyes from bits, splatters practice	(86.3)	290	(13.7)	46
Exposure to communicable infections	(92.0)	309	(8.0)	27
Dental practitioner timer roles guided by MOH	(86.7)	271	(19.3)	65
Working in an awkward posture/ position could lead to development of MSDs	(85.4)	287	(14.6)	49
The non-work related awkward postures/ positions could also lead to development of MSDs	(75.7)	254	(24.3)	82

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4.3 Organizational factor

The results in Table 6 show that 39.3% (132 dentists) worked less than an 8 hours per day, while 60.7% (204 dentists) worked more than 8 hours. About 84% worked more than five day a week.

The results in Table 6 show the total length of time each dentist worked without taking a 10 minute break. 42.6% worked from 31 to 60 minutes; 30.4% dentists worked from 0 to 31 minutes. Only 7.4% worked 61 to 90 minutes without taking 10 minutes; 13.1% worked from 91-120 minutes. Only 6.5% worked more than 120 minutes without taking a 10 minute break.

The total number of patients that the dentists treated during their working day is shown in table 6. The mean was 7.6. About 56% of dentists treated less than 7 patients per day. About 93% of dentists felt they had autonomy in their organization, and 88.1% responded that they had job security in their work.

Table 6 Frequency and percentage of respondents by organization factors.

Organizational Factors	Frequency (N) = 336	Percentage (%)
Working hours per day		
1-8 hours	132	39.3
> 8 hour	204	60.7
Working days per week		
1-5 days	53	15.8
>5 days	283	84.2
Time (minutes) working without taking 10 minute break		
0-30	102	30.4
31-60	143	42.6
61-90	25	7.4
91-120	44	13.1
>120	22	6.5

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Table 6 Frequency and percentages of respondents by organization factors (Cont.).

Organization				Frequency (N)	Percentage (%)
Patients per day					
0-7 patients				189	56.4
> 7 patients				146	43.6
Mean = 7.6	Median = 6	Min = 1	Max =	30	
Autonomy in organization					
Yes				313	93.2
No				23	6.8
Job security					
Yes				296	88.1
No				40	11.9

4.4 Physical factors

The results in Table 7 show that when dentists operate on the upper teeth of the patient, over half of them (50.9%) use a mirror to obtain the viewing, indirect > direct, 11.0% indirect using mirror every time. Only 8 (2.4%) dentists always obtain their view by direct viewing.

Almost all dentists have to adjust their dental chairs during their operations (99.1%). The most common position of dentists when they operated compared with their patient was to sit at 9-12 o'clock (83.6%); 14.9% of dentists always sat at 12 o'clock only. Most dentists were right handed (92.9%).

Over half of the dentists (53.6%) answered that they always used vibrating tools during their work. Almost 79% of dentists responded that they often or always practice with repeat activities. The exclusive sitting position was the most preferred (72.3%).

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Table 7 Frequency and percentages of respondent by physical-related factors

Physical-related Factors	Frequency (N)=336	Percentage (%)
Adjusting dental chair during operation		
Yes	333	99.1
No	3	0.9
Operation for upper teeth		
Indirect every time	37	11.0
Indirect > Direct	172	51.2
Indirect = Direct	76	22.6
Direct > Indirect	43	12.8
Direct every time	8	2.4
Position sitting		
Sitting position	243	72.3
Alternating positions (sitting and standing)	93	27.7
Common position		
at 9-12 o'clock	281	83.6
at 12 o'clock	50	14.9
at 12-15 o'clock	5	1.5
Common handedness		
Right handed	312	92.9
Left handed	4	1.2
Ambidextrous	20	5.9
Vibrating tools		
Seldom or never	12	3.6
Now and then	49	14.6
Often	95	28.3
Always	180	53.5
Repetitive movement		
Seldom or never	8	2.4
Now and then	64	19.0
Often	130	38.7
Always	134	39.9

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Regarding to posture and position of head and body of dentists with anterior-posterior and left right axis of the patient, the high number (≥70%) of respondents were found to bend forward or tilt right or left with an angle of 0^0 - 30^0. The results were showed in figure 5.

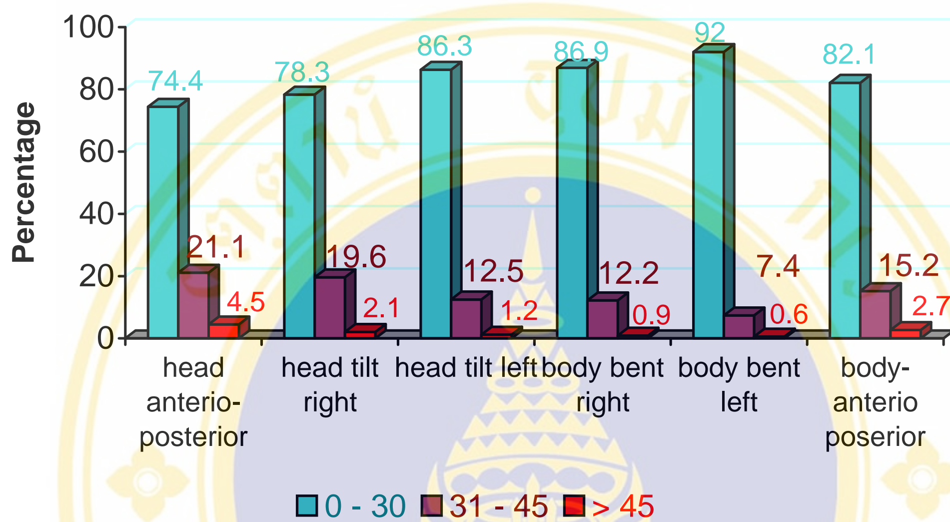

Figure 5 Distribution of head and body compared with anterior-posterior and left-right axis of the Patient

4.5 Psychological Factors

Total stress ranged from 0 to 36 with mean 11.7, standard deviation was 7.6. The cut-off point for classification of level of stress was T = 11. Only 14 respondents had no stress.

Table 8 Distribution of Stress Condition

Stress condition	Number (n=336)	Percentage (%)
Non / Mild	189	56.3
Serious	147	43.7
Mean = 11.7 Median = 11 Min = 0 Max 36		

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4.6 Non-work Related Physical Activity Factors

Table 9 shows the percentage of some non-work related activities. About 61% of participants either played sport or were involved in exercise while 39.3% of participants did not. Of the 204 participants who played sport or were involved in exercise, 46.1% did jogging; 26.0%, played badminton; 10.8%, played tennis; 9.8%, did swimming, and 7.3% involved in other types of sport. Most of them (61.3%) played or were involved in exercise from 1 to 3 days per week, and 38.7% from 4 – 7 days.

Another non-work related activity was the use of computer. About 85% of participants reported using a computer. Of the 285 users, 36.1% were using the computer for 1 hour; 34.1%, for 2 hours; and 29.8%, for 3 hours or more.

Table 9 Distribution of Non-work Related Physical Activity

Non-work related activity	Number (N)	Percentage (%)
Dentists playing sport/exercise		
Yes	204	60.7
No	132	39.3
Type of sport		
Tennis	22	10.8
Badminton	53	26.0
Swimming	20	9.8
Jogging	94	46.1
Other	15	7.3
Total days/week of play sport/exercise		
From 1 to 3 days	125	61.3
From 4 to 7 days	79	38.7
Using computer		
Yes	285	84.8
No	51	15.2
Hour using computer		
1	103	36.1
2	97	34.1
≥3	85	29.8

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4.7 Outcome

4.7.1 Distribution of MSDs

Figure 6 shows the frequency of troubles of participants during the last 12 months. There were 58.0% of participants who had neck discomfort; 57.1% with shoulder pain; 46.7% with lower backache; 24.7% with upper backache; 11.4% with pain in the elbow joint; and 20.2% with pain in wrists or hands.

Regarding trouble during the last 7 days, 34.8 % had any trouble during the last 7 days; 18.8% experienced neck discomfort; shoulder joint and low backache were noted in 18.2% and 17.0% participants respectively.

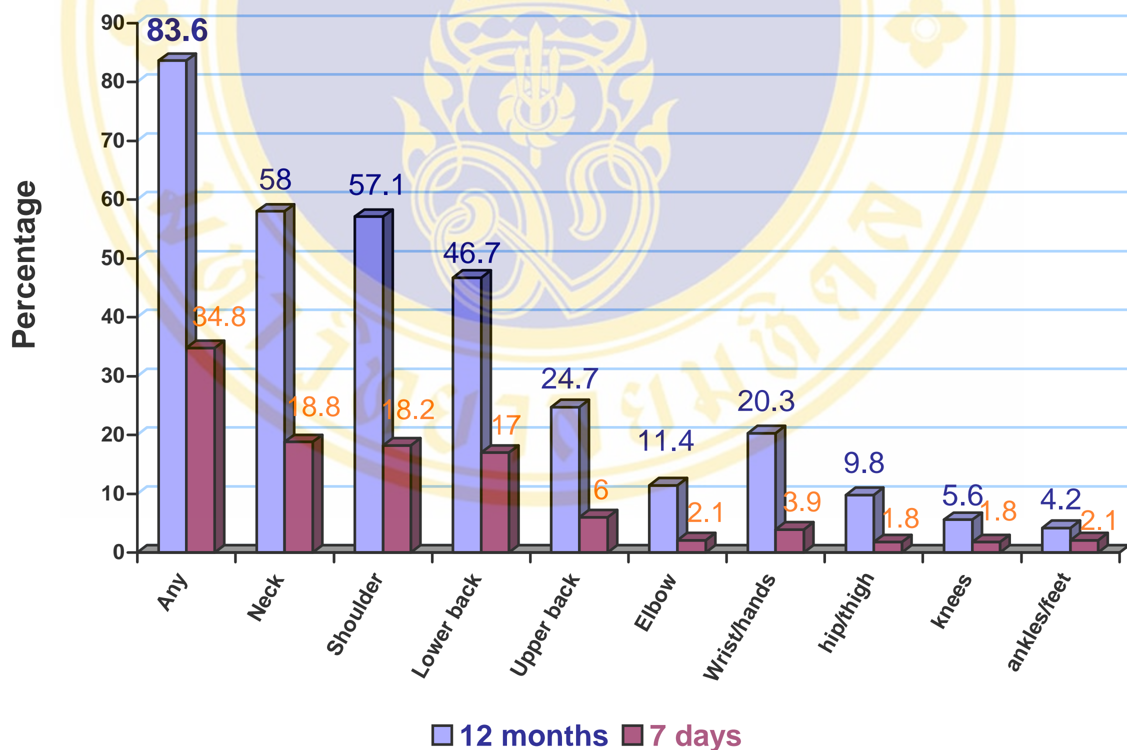

Figure 6 Location of trouble during last 12 month and during last 7 days

4.7.2 Characteristics of MSDs

In this part will describe about characteristic of MSDs.

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4.7.2.1 Distribution of participants who had been prevented from doing normal work during the last 12 months

Overall, 25.6 percent had been prevented from doing normal work during the last 12 months due to these problems. About 14% were prevented from doing normal work due to neck discomfort; 12.5%, due to pain in shoulder joint; 9.8%, due to low backache; 3.9%, due to pain in elbow joint; 5.9%, due to upper backache; and 3.3%, due to pain in wrist joints or hands. The results were shown in table 10.

Table 10 Distribution of participants prevented from doing normal work during last 12 months.

Region / Part of Body	Number (N)=336	Percentage (%)
Any part of body	86	25.6
Neck	45	13.4
Shoulder	42	12.5
Lower back	33	9.8
Upper back	20	5.9
Elbow	13	3.9
Wrists/hands	11	3.3
One or both hips/thighs	4	1.2
One or both knees	2	0.6
One or both ankles/feet	3	0.9

4.7.2.2 Characteristic of MSDs by region of body.

Table 11 shows that with respect to neck problems, three of them said had resulted from an accident; six (1.8%) of them reported had to change jobs or duty. Among the participants (195) who had had neck problems, 43.2% of them (145) had had trouble for 1-7 days; 36 participants, trouble from 8-30 days. Only 2 respondents reported that they had a neck problem every day. About 39 participants

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had been prevented from doing their normal work from 1 – 7 days because of neck trouble.

Regarding shoulder problems, 2.1% participants reported that they had resulted from an accident; 2.7% participants said that they had to change their jobs. About 35.7% participants reported that the duration of their shoulder problems during the last 12 months was from 1-7 days; 14.9% of participants, from 8-30 days; 5.1% participants, more than 30 days but not every day; only 1.5% of them responded every day. About total length of time, shoulder trouble had been prevented dentists from doing their normal work, 9.8% of participants reported total time from 1-7 days; 0.9 % dentists said that they had trouble every day.

The only participants who had been hospitalized for an MSD were two dentists who reported that they had been to hospital because of lower back trouble. Ten (3.2%) of participants reported having to change their jobs or duties due to lower back trouble. About 29.5% of participants said that the total length of time having pain was from 1-7 days; 11.0 % of participants from 8-30 days, 5.6% participants reported having lower back problem longer than 30 days but not every day, and only 0.6% reported they had trouble every day. Regarding the total length of time having lower back trouble had prevented dentists from doing their normal work over last 12 months, 7.2% participants reported of having problem 1-7 days; 1.5% dentists had 8-30 days of problem of MSDs, and there were 4 dentists who reported more than 30 days of having MSDs.

Table 11 also shows information about dentists who had any problems of any part (neck, shoulder, and neck) of the body. About 0.6% of dentists reported having been to hospital because of trouble, 2.1% of them reported they had resulted from an accident, 5.4% of participants reported having to change their jobs or duties due to trouble, 46.1% participants reported that the duration of their body problems during the last 12 months was from 1-7 days; 23.2% of participants, from 8-30 days; 8.6% participants, more than 30 days but not every day; and 1.8% of them responded every day. Regarding the total length of time trouble had prevented dentists

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from doing their normal work during last 12 months, 16.4% participants reported 1-7 days; 3.3% dentists, 8-30 days, and there were 4 dentists who reported more than 30 days.

Table 11 Characteristic of MSDs of special region of body

Statements	Neck N(%)	Shoulder N(%)	Low back N(%)	Any
Hospitalization due to MSD				
Yes	-	-	2(0.6)	2(0.6)
No			334(99.4)	334(99.4)
Hurt in accident				
Yes	3(1.0)	7(2.1)	-	7(2.1)
No	333(99.0)	329(97.9)		329(97.7)
Change of jobs or duty due to MSD				
Yes	6(1.8)	9(2.7)	10(3.0)	18(5.4)
No	330(98.2)	327(97.3)	326(97.0)	318(94.6)
Duration of trouble				
0 day	141(42.0)	144(42.7)	179(53.3)	68(20.2)
1-7 days	145(43.2)	120(35.7)	99(29.5)	155(46.1)
8-30 days	36(10.7)	50(14.9)	37(11.0)	78(23.2)
More than 30 days, not every day	12(3.6)	17(5.1)	19(5.6)	29(8.6)
Every day	2(0.6)	5(1.5)	2(0.6)	6(1.8)
Prevented from doing normal work during last 12 months				
0 day	291(86.1)	294(87.5)	303(90.2)	226(67.3)
1-7 days	39(11.6)	33(9.8)	24(7.2)	55(16.4)
8-30 days	6(1.8)	6(1.8)	5(1.5)	11(3.3)
More than 30 days	0	3(0.9)	4(1.2)	4(1.2)

4.7.2.3 Health-professional diagnosed deformities among dentists

Regarding deformities among dentists in Hanoi, Vietnam, Table 12, almost all 300 (89.3%) of them reported that they did not have any deformity on their body. Some of them reported having a mild level deformity on

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some part of body such as 3.9% on the eyes; 3.0% on the Shoulder. At the moderate level, 1.2% respondents reported having deformity on the lower back.

Table 12 Frequency of deformity on region of the body diagnosed by health professional

Region of the body	No		Mild		Moderate	
	N	%	N	%	N	%
Any	300	89.3	29	8.6	7	2.1
Head	332	98.8	4	1.2	0	0
Eyes	323	96.1	13	3.9	0	0
Neck	327	97.3	8	2.4	1	0.3
Shoulder	326	97.0	10	3.0	0	0
Upper back	331	98.5	4	1.2	1	0.3
Lower back	327	97.3	5	1.5	4	1.2
Elbows	333	99.1	3	0.9	0	0
Wrists/Hands	332	98.8	4	1.2	0	0
Knees	332	98.8	3	0.9	1	0.3
Ankles	333	99.1	3	0.9	0	0
Feet	332	98.8	4	1.2	0	0
Total N = 336 = 100%						

With regard to history of respondents on MSDs, this study would present percentage of some syndrome or region which dentists were diagnosed in the past 6 months such as what kind of therapies they used to control MSDs problem, and what was the common medicine dentists always used when they got MSDs.

Table 13 showed that 17.9% participants had been diagnosed by a health professional as having neck pain in the past 6 months, 16.1% as having back pain; 10.1% with tendonitis syndrome, 5.1% with repetitive motion disorders; and 2.7% with trigger finger syndrome. No participants had a diagnosis of Carpal Tunnel Syndrome.

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With regard to therapies for MSDs problems, almost all participants used massage and meditation for treatment of MSDs (55.4%, 55.7% respectively); 52.1% of participants used vigorous exercice to reduce MSDs problems; 30.7% used mindfulness practice, and 2.1% used chiropractic therapy. 71.7% of participants reported never use medicine for MSDs, 24% reported using an analgesic; and 5.4% used an anti-inflammatory.

Table 13 Frequency of health professional diagnosis and therapeutic approaches of MSDs

Type of Diagnosis	Number (N=336)	Percentage (%)
Diagnosed by Health professional		
Back pain	54	16.1
Carpal Tunnel Syndrome	0	0
Epicondylitis (Tennis Elbow)	5	1.5
Fibromyalgia	6	1.8
Neck pain	60	17.9
Repetitive Motion Disorders	17	5.1
Tendonitis	34	10.1
Trigger Finger	9	2.7
Arthritis	3	0.9
Scoliosis	4	1.2
Therapies for MSD problem		
Chiropractic	7	2.1
Massage	186	55.4
Meditation	187	55.7
Mindfulness Practice	103	30.7
Vigorous exercise (sport, swimming, aerobics, etc)	175	52.1
Medicine taken for MSDs		
No	241	71.7
Analgesic	82	24.0
Narcotic	6	1.8
Steroids	5	1.5
Anti-inflammatory	18	5.4

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Part II: Association between independent variables and any MSD

4.8 Association between dependent variable and independent variables

4.8.1 Association between MSDs and socio-demographic characteristics

Table 14 showed that at least 80% of respondents in each age group had musculoskeletal disorder. A statistically significant association was not found between age group and presence of musculoskeletal disorder

The percentage of females who had a musculoskeletal disorder was not significantly higher than males. There was also no statistically significant association found between musculoskeletal disorder and marital status.

The percentage of respondents having a musculoskeletal disorder was very high in all educational groups, highest were doctorate (92.9%), and the lowest were master (80.7%). The differences were not significant. Similarly, there were no significant differences by specialty, nor by working duration.

Table 14 Association between MSDs and Socio-demographic characteristics

Socio-demographic	Musculoskeletal disorder				χ^2	p-value
	Yes		No			
	N	%	N	%		
Age (year)						
20 – 29	101	84.2	19	15.8	1.24	0.744
30 – 39	125	82.2	27	17.8	(3)	
40 – 49	39	88.6	5	11.4		
≥50	16	80.0	4	20.0		

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Table 14 Association between MSDs and Socio-demographic characteristics (Cont.)

Socio-demographic	Musculoskeletal disorder					
	Yes		No		χ^2	p-value
	N	%	N	%		
Sex						
Male	171	82.6	36	17.4	0.41	0.512
Female	110	85.3	19	14.7	(1)	
Marital status						
Married	212	84.1	40	15.9	0.18	0.670
Non-married	69	82.1	15	17.9	(1)	
Education level						
Bachelor	201	84.1	38	15.9	1.42	0.491
Master	67	80.7	16	19.3	(2)	
Doctorate	13	92.9	1	7.1		
Specialist Occupation						
General Practice	222	84.4	41	15.6		0.730
Periodontics/ Prosthodontic/ Pedodontics/ Endodontics	32	82.1	7	17.9	0.63 (2)	
Oral and Maxillofacial/ Other	27	79.4	7	20.6		
Working duration						
≤ 5 year	132	84.1	25	15.9		
6 - 10 year	70	80.5	17	19.5	1.12	0.892
11 - 15 year	39	86.7	6	13.3	(4)	
16-20 year	20	83.3	4	16.7		
≥21	20	83.3	3	13.0		

4.8.2 Association between MSDs and social support

4.8.2.1 Family support

Only one statement that family member was available to help the dentists with daily routine meal or errands when he/she got sick had a statistically significant association with musculoskeletal disorder (Chi-square Fisher's exact test = 4.8, P-value=0.036) (Table 15).

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4.8.2.2 Colleague support

The results illustrate that there were statistically significant associations with two of the statements between MSDs and asking for professional support/assistance (χ^2 = 7.048, P-value=0.008). In contrast, there was no significant association between musculoskeletal disorder and colleagues' interest of teamwork (Table 15).

Table 15 Association between MSDs and social support

Social support	Musculoskeletal Disorder					p-value
	Yes		No		χ^2	
	n	%	n	%	(df)	
Family support						
Understands dental work pattern						
No or a little	37	84.1	7	15.9	0.01	0.930
Most of time	244	83.6	48	16.4	(1)	
Assist in housework						
No or a little	23	85.2	4	14.8	0.05	0.820
Most of time	258	83.5	51	16.5	(1)	
Listening whenever needed						
No or a little	23	95.8	1	4.2	2.81	0.094
Most of time	258	82.7	54	17.3	(1)	
Help daily routine meals if got sick						
No or a little	23	100	0	0	4.83	**0.035****
Most of time	258	82.4	55	17.6	(1)	
Colleagues support						
Ask for professional support						
No or a little	50	96.2	2	3.8	7.05	**0.008***
Most of time	231	81.3	53	18.7	(1)	
Follow interest of teamwork						
No or a little	17	89.5	2	10.5	0.50	0.55**
Most of time	264	83.3	53	16.7	(1)	

* p-value < 0.05; ** %Fisher' Exact Test.

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4.8.3 Association between MSDs and safety awareness in dental practice

There were 10-safety awareness for dentists in their dental practice. The level of awareness was divided into two categories: “no” or “infrequently” (rarely received awareness) and “almost” (often or always).

Table 16 indicated that there were four safety awareness statements which had statistical significant associations with MSDs. They are as follow:

+ Awareness of working with anxious patients (χ^2 = 5.024, P-value=0.025).

+ Awareness of the role for dental practice from MOH (χ^2 = 10.40, P-value=0.001).

+ Awareness that working in an awkward posture/ position can lead to development of MSDs (χ^2 = 11.23, P-value=0.001) .

+ Awareness that the non-work related awkward postures can lead to development of MSDs (χ^2 = 10.46, P-value=0.001).

Tables 16 also showed that following awareness were not found to be significantly associated with MSDs by both Chi-square and Fisher’s exact test:

+ Awareness of working long hours at high level of concentration will be at risk of developing stress.

+ Awareness of exposure to microbial aerosols generated by high speed rotary hand pieces.

+ Awareness of the hazards from sharp instruments.

+ Awareness of various chemicals used in dental practice.

+ Awareness of exposure to yes from bits, splatters .

+ Awareness of exposure to communicable diseases.

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Table 16 Association between MSDs and safety awareness on dental practice

Safety awareness	Musculoskeletal Disorder					
	Yes		No		χ^2	p-value
	n	%	n	%	(df)	
Working long hours						
No-infrequently	39	88.6	5	11.4	0.93	0.336
Almost	242	82.9	50	17.1	(1)	
Working with anxious patients						
No-infrequently	82	91.1	8	8.9	5.03	**0.025***
Almost	199	80.9	47	19.1	(1)	
Exposure to microbial aerosols						
No-infrequently	46	90.2	5	9.8	1.89	0.169
Almost	235	82.5	50	17.5	(1)	
Hazards from sharp instruments						
No-infrequently	15	93.8	1	6.2	1.26	0.331**
Almost	266	83.1	54	16.9	(1)	
Chemicals used in dental practice						
No-infrequently	32	88.9	4	11.1	0.81	0.367
Almost	249	83.0	51	17.0	(1)	
Exposure from bits, splatters						
No-infrequently	43	93.5	3	6.5	3.77	0.052
Almost	238	82.1	52	17.9	(1)	
Exposure CD						
No-infrequently	25	92.6	2	7.4	1.72	0.278**
Almost	256	82.9	53	71.1	(1)	
Guideline from MOH						
No-infrequently	63	96.9	2	3.1	10.40	**0.001***
Almost	218	80.4	53	19.6	(1)	
Awkward posture/ position						
No-infrequently	49	100.0	0	0	11.23	**0.001***
Almost	232	80.8	55	19.2	(1)	
Non-work related awkward postures						
No-infrequently	78	95.1	4	4.9	10.46	**0.001***
Almost	203	79.9	51	10.1	(1)	

* p-value < 0.05; **Fisher's Exact Test

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4.8.4 Association between MSDs and Organizational factors

The percentage having MSDs among dentists working more than 8 hours per day (87.7%) was higher than those who worked from 1 to 8 hour per day (77.3%) (χ^2 = 6.42, p-value=0.001) (Table 17).

The percentage of MSDs among dentists working more than 5 days per week (85.9%) was higher than those who worked 5 less day per week (71.7%)(χ^2 = 6.5 and p-value=0.001)(Table 17).

In addition, time working without taking 10 minute break was to be found associated with MSDs, and was greatest in those who took breaks most frequently (χ^2 = 12.4, p-value=0.006).

Another organizational factors as number of patients per day greater or smaller than 7, having autonomy in the organization and providing written protocol/professional guidelines for dentist had no significant association with musculoskeletal disorder in this study (Table 17).

Table 17 Association between MSDs and Organization

Organization	Musculoskeletal Disorder					
	Yes		No		χ^2 (df)	p-value
	n	%	n	%		
Working hour per day						
1-8 hours	102	77.3	30	22.7	6.42	**0.011***
> 8 hour	179	87.7	25	12.3	(1)	
Working days per week						
1-5 days	38	71.7	15	28.3	6.55	**0.011***
>5 days	243	85.9	40	14.1	(1)	

* p – value <0.05

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Table 17 Association between MSDs and Organization (Cont.)

Organization	Musculoskeletal Disorder					
	Yes		No		χ^2 (df)	p-value
	n	%	n	%		
Time (in minutes) working without taking 10 minute break						
0-30	75	73.5	27	26.5		
31-60	124	86.7	19	13.3	12.32	**0.006***
61-90	21	84.0	4	16.0	(3)	
> 90	61	92.4	5	7.6		
Patient						
0-7 patients	152	80.4	37	19.6	3.25	0.072
> 7 patients	129	87.8	18	12.2	(1)	
Autonomy						
No	21	91.3	2	8.7	1.06	0.303
Yes	260	83.1	53	16.9	(1)	
Job security						
No	36	90.0	4	10.0	1.35	0.246
Yes	245	82.8	51	17.2	(1)	

* p – value <0.05

4.8.5 Association between MSDs and physical factors

This research studied 13 physical factors to determine the relationship between them and musculoskeletal disorder. The results are shown in Table 18.

There were four physical factors that had a statistically significant association with musculoskeletal disorder as follow:

+ Sitting position when operating patient (χ^2 = 8.4, p-value=0.004)

+ Using vibrating tools during a regular workday (χ^2 = 12.4, p-value=0.006)

+ Practices with repetitive movement during and operation (χ^2 = 10.2, p-value=0.017)

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+ Position of head angle in anterior –posterior axis (χ^2 = 6.6, p-value=0.037)

Following physical factors were not found to be significant associated with musculoskeletal disorder:

+ Times adjusted dental chair during time operation/patient.

+ Using mirror.

+ Common position (at 9 -12 o'clock, 12 o'clock, 12-15 o' clock).

+ Handedness when operating.

+ Most common of position of head angle in left – right axis

+ Most common position of your body angle in Left-right axis.

+ Most common position of your body angle in antero-posterio.r axis

Table 18 Association between MSDs and Physical Factors

Physical factor	Musculoskeletal Disorder					
	Yes		No		χ^2 (df)	p-value
	n	%	n	%		
Adjust dental chair during time operation						
No	2	66.6	1	33.4	0.64	0.416**
Yes	279	83.8	54	16.2	(1)	
Using mirror						
Indirect every time	31	83.8	6	16.2		
Indirect > Direct	141	82.0	31	18.0	0.75	0.686
Indirect = Direct	109	85.8	18	14.2	(2)	
Direct > Indirect						
Direct every time						
Sitting position						
Sitting position	212	87.2	31	12.8	8.36	**0.004***
Alternating positions	69	74.2	24	25.8	(1)	
Position						
at 9-12 o'clock	238	84.7	43	15.3	1.43	0.319**
at 12 o'clock	43	78.2	12	22.8	(1)	
at 12-15 o'clock						
Handedness						
Right handed	261	82.4	52	16.6	0.20	0.655
Left handed/Ambidextrous	20	87.0	3	23.0	(1)	

* p – value < 0.05; ** %Fisher' Exact Test

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Table 18 Association between MSDs and physical factors (cont.)

Physical Factor	Musculoskeletal Disorder					
	Yes		No		χ^2 (df)	p-value
	n	%	n	%		
Using vibrating tools						
Seldom or never	10	83.3	2	16.7		
Now and then	33	67.4	16	32.6	12.42	**0.006***
Often	79	83.2	16	16.8	(3)	
Always	159	88.3	21	11.9		
Repetitive movement						
Seldom or never	5	62.5	3	37.5		
Now and then	47	73.4	17	26.6	10.18	**0.017***
Often	110	84.6	20	15.4	(3)	
Always	119	88.8	15	11.2		
Position of head angle in anterior –posterior axis						
Head bending for ward 0-30^0	202	80.8	48	19.2	6.60	**0.037***
Head bending for ward 31^0-45^0	64	90.1	7	9.9	(2)	
Head bending for ward > 45^0	15	100.0	0	0		
Position of head angle in left – right axis						
Right side						
Head tilting (rightward) 0-30^0	215	81.7	48	18.3	3.65	0.161
Head tilting (rightward) 31-45^0	59	89.4	7	10.6	(2)	
Head tiling > 45^0	7	100.0	0	0		
Left side						
Head tilting (leftward) 0-30^0	241	83.1	49	16.9	0.43	0.512
Head tilting (leftward) 31-45^0	40	87.0	6	23.0	(1)	
Head tilting > 45^0						
Position of body angle in Left-right axis						
Right side						
Body tilting (rightward) 0-30^0	241	82.5	51	17.5	1.96	0.162
Body tilting (rightward) 31 - 45^0	40	90.9	4	9.1	(1)	
Body tilting (rightward) > 45^0						
Left side						
Body bending (leftward) 0-30^0	258	83.5	51	16.5	0.05	1
Body bending (leftward) 31 - 45^0	23	85.2	4	14.8	(1)	
Body bending (leftward) > 45						
Position body angle in antero-posterior axis						
Body bending 0-30^0	288	82.6	48	17.4	0.29	0.589
Body bending 31-45^0	44	86.3	7	13.7	(1)	
Body bending > 45^0	9	100.0	0	0		

*** p-value < 0.05**

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4.8.6 Association between MSDs and Stress Condition

Stress condition in this study was divided into two groups: No or Mild – Stress and Serious – Stress. It was categorized based on the mean (mean = 11) total score of stress. Participants were put in group No or mild stress if they had a total score less than 11. Other were put in the serious stress group. The percentage of people with musculoskeletal disorder in Serious – Stress (92.5%) was significantly higher than those with musculoskeletal disorder in No Mild – Stress(76.7%).(χ^2 = 15.1, p-value=0.000) (Table 19).

Table 19 Association between MSDs and Stress Condition

Stress Condition	Musculoskeletal Disorder					p-value
	Yes		No		χ^2 (df)	
	n	%	n	%		
Non / Mild - Stress	145	76.7	44	23.3	15.08	**0.000**
Serious – Stress	136	92.5	11	7.5	(1)	

* p – value < 0.05

4.8.7 Association between Non-working Related Physical Activity and MSDs

Table 20 shows that those not playing sport or doing exercise were statistical significantly more likely to have a musculoskeletal disorder (χ^2 = 10.26, P-value=0.001). However, playing sport on 1 to 3 days per week or playing sport on 4 to 7 days per week was equally to cause a musculoskeletal disorder.

Using computers or different times of using computers were not found associated with MSDs in this study (Table20).

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Table 20: Association between Non-working Related Physical Activity and MSDs

Non-working Related Physical Activity	Musculoskeletal Disorder					
	Yes		No		χ^2	p-value
	n	%	n	%	(df)	
Exercise/sport						
No	121	91.7	11	8.3	10.3	**0.001***
Yes	160	78.4	44	21.6	(1)	
Total days of play sport/exercise						
1-3 days/week	98	78.4	27	21.6	0.00	0.989
4-7 days/week	62	78.5	17	21.5	(1)	
Computer usage						
No	43	84.3	8	15.7	0.02	0.886
Yes	238	83.5	47	14.5	(1)	
Housing computer						
1	90	87.4	13	12.6	2.32	0.313
2	77	79.7	20	20.6	(2)	
≥ 3	71	83.5	14	16.5		

* p – value < 0.05

4.9 Factors predicting musculoskeletal disorders

Chi-square test was conducted to investigate the relationship between each of independent variables and the outcome (MSDs). For further analysis to indicated the strength of association between independent variables and MSDs, multiple logistic regression was applied. Forward (Wald) selection was used to obtain the final model.

All variables that were found to have statistically significant associations were included in the initial full models. This statistical analysis also applied in order to identify predictors MSDs affecting the neck, shoulder and lower back, respectively.

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4.9.1 Predictors of MSDs

The results of the full model were reported in Table 27. The following factors were found to be significant independent predictors of MSDs: asking colleague for professional support (OR=7.9; 95% CI=1.5-40.8; P-value=0.014), daily average number of patients (OR=2.2; 95% CI=1.0-4.8; P-value=0.046), stress condition (OR=4.04; 95% CI=1.7-9.6; P-value=0.002), and playing sport (OR=2.8; 95% CI=1.2-6.5; P-value=0.012). Other factors: hour working per day, time worked without 10 minutes break and practicing repetitive movement were nearly found to be significant predictors of MSDs in this study.

After adjustment for other factors in the final model, the following factors were significantly risk factors related to MSDs (Table 21):

1. Asking colleague for professional support (OR=7.1; 95% CI=1.6-32.3; p-value=0.011). Dentists can asking college for professional support no or little had 7 times of greater risk of having MSDs than those who can ask college for professional support most of time.

2. Awareness of non-work related awkward postures/position (OR=3.5; 95% CI=1.1-11.2; p-value=0.032). Dentists with no or having this awareness infrequently had 3.5 times of higher risk of getting MSDs than those who was received almost of time.

3. Hours working per day (OR=2.6; 95% CI=1.3-5.1; p-value=0.007). Dentists working more than 8 hours per day had 2.5 times of risk of having MSDs than those who worked less than 8 hour per day.

4. Daily average number of patients (OR=2.4; 95% CI=1.2-5.0; p-value=0.015). Dentists provided dental care for more than 7 patients per day had 2.4 times of risk of getting MSDs than those providing less than or equal 7 patients per day.

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5. Practicing repetitive movement (OR=2.7; 95% CI=1.3-5.6; p-value=0.007). Dentists who often or always practiced repetitive movement had 2.7 times of risk of having MSDs than those who never or sometime did.

6. Stress condition (OR=4.5; 95% CI=2.1-9.9; p-value=0.000). Dentists with serious stress had 4.5 times of risk of having MSDs than those with no-mild stress.

7. Playing sport (OR=3.4; 95% CI=1.6-7.5; P-value=0.002). Playing sport among dentists had 3.1 times of risk of having MSDs than those who did not play.

Table 21 Final model of Multiple Logistic Regression of MSDs

	Odds ratio	**95% CI for MSDs**		**p-value**
		Lower	**Upper**	
Ask for professional support				
Most of time	1			
No or a little	7.08	1.56	32.19	**0.011**
Non-work related awkward postures				
Almost	1			
No-infrequently	3.54	1.12	11.23	**0.032**
Working hour per day				
1-8 hours	1			
> 8 hour	2.58	1.30	5.11	**0.007**
Patient				
0-7 patients	1			
> 7 patients	2.44	1.19	5.01	**0.015**
Using repetitive tools				
Never or sometime	1			
Often or always	2.72	1.31	5.65	**0.007**
Stress				
No or Mild - Stress	1			
Serious – Stress	4.52	2.07	9.86	**0.000**
Exercise/sport				
No	1			
Yes	3.42	1.56	7.50	**0.002**

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4.9.2 Predictors of MSDs at neck position

The results of the full model were showed in Table 28. The following factors were found to be significant predictors of MSDs at neck position: more than 60 minutes working without 10 minutes break (OR=2.3; 95% CI=1.2-4.14; P-value=0.007), head angle in anterior-posterior axis (OR=2.8; 95% CI=1.5-5.01; p-value=0.001), stress condition (OR=1.9; 95% CI=1.1-3.2; p-value=0.014). Other factors: using mirror, sitting position and practicing repetitive movement were nearly found to be significant predictors of MSDs at neck position in this study.

After adjustment for other factors in the final model, the following factors were significant risk factors related to MSDs at neck position (Table 22):

1. Time working without 10 minutes break (OR=1.9; 95% CI=1.1-3. 4; P-value=0.017). Dentists who worked more than 60 minutes without 10 minutes break had 1.9 times of risk of having MSDs than those who took a 10 minutes break after working less than 60 minutes.

2. Using mirror (OR=0.5; 95% CI=0.5-0.8; P-value=0.004).OR=0.5 equal to 1/ 2.1 indicated that while operated upper teeth, dentists looked indirect more than direct had 2.1 times of having MSDs at neck position than those who did not.

3. Sitting position (OR=1.7; 95% CI=1.0-2.9; P-value=0.038). Dentist with sitting position had 1.7 times of risk of getting MSDs at neck position than those who with alternating position.

4. Practicing repetitive movements (OR=1.9; 95% CI=1.1-3.4; P-value=0.038). Dentists who often or always practiced repetitive movement had 1.9 times of risk of having MSDs at neck than those who never or sometime did.

5. Head angle in anterior-posterior axis (OR=2.6; 95% CI=1.5-4.7; P-value=0.01). Dentists with position of head bending forward from 31^0 and above had

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2.6 times of risk of having MSDs at neck position than those who with position of head bending forward from ≤ 30^0.

6. Stress condition (OR=2.?; 95% CI=1.2-3.2; P-value=0.005). Dentists with serious stress had nearly 2 times of risk of having MSDs at neck position than those with no-mild stress.

Table 22 Final model of Multiple Logistic Regression of MSDs at neck position

	Odds ratio	**95% CI for MSDs**		**p-value**
		Lower	**Upper**	
Time working without taking 10 minute break				
≤ 60 minutes	1			
> 60 minutes	1.95	1.13	3.37	0.017
Using mirror				
Indirect > Direct	1			
Indirect ≤ Direct	0.48	0.29	0.79	0.789
Sitting position				
Alternating positions	1			
Sitting position	1.72	1.03	2.88	0.038
Repetitive movement				
Never or sometime	1			
Often or always	1.91	1.09	3.36	0.024
Head angle in anterior –posterior axis				
$0\text{-}30^0$	1			
$> 30^0$	2.62	1.46	4.68	0.001
Stress				
No or Mild - Stress	1			
Serious	1.99	1.24	3.19	0.005

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4.9.3 Predictors of MSDs at shoulder position

The results of full model were showed in Table 29. The following factors were found to be significant predictors of MSDs at neck position: number of working day per week (OR=2.3; 95% CI=1.1-4.5; p-value=0.035), time working without 10 minutes break (OR=2.5; 95% CI=1.4-4.7; p-value=0.003), practicing repetitive movement (OR=2.2; 95% CI=1.1-4.3; p-value=0.027), using mirror (OR=0.4; 95% CI=0.3-0.6; p-value=0.000), and stress condition (OR=2.4; 95% CI=1.4-4.03; p-value=0.002).

After adjustment for other factors in the final model, the following factors were significantly risk factors related to MSDs at shoulder position (Table23):

1. Awareness of working in an awkward postures/position (OR=2.8; 95% CI=1.3-5.9; p-value=0.007). Dentists with no or having this awareness infrequently had 2.7 times of higher risk of getting MSDs at shoulder position than those who was received almost of time.

2. Number of working days per week (OR=2; 95% CI=1.03-3.9; p-value=0.040). Dentists who worked 5 days per week had nearly 2 times of risk of having MSDs at shoulder position than those who worked 5 less days per day.

3. Time working without 10 minutes break (OR=2.3; 95% CI=1.3-4.104; p-value=0.003). Dentists with duration of working more than 60 minutes without 10 minutes break had 2.3 times of risk of having MSDs ta shoulder than those who took 10 minutes break after duration of working less than 60 minutes.

4. Using mirror (OR=0.4; 95% CI=0.2-0.7; p-value=0.000).OR=0.4 equal to 1/ 2.5 indicated that while operated upper teeth, dentists looked indirect more than direct had 2.5 times of having MSDs at shoulder position than those who did not.

5. Practicing repetitive movement (OR=2.4; 95% CI=1.3-4.3; p-value=0.003). Dentists who often or always practiced repetitive movement had about

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2.4 times of risk of having MSDs at shoulder position than those who never or sometime did.

6. Stress condition (OR=2.4; 95% CI=1.5-3.9; p-value=0.000). Dentists with serious stress had 2.4 times of risk of having MSDs at shoulder position than those with no-mild stress.

7. Playing sport (OR=1.7; 95% CI=1.04-2.8; p-value=0.033). Playing sport among dentists had 1.7 times of risk of having MSDs at shoulder than those who did not play.

Table 23 Final model of Multiple Logistic Regression of MSDs at shoulder position

	Odds ratio	**95% CI for MSDs**		**p-value**
		Lower	**Upper**	
Awkward postures/position				
Almost	1			
No-infrequently	2.79	1.32	5.89	**0.007**
Working days per week				
1-5 days	1			
>5 days	1.99	1.03	3.86	**0.040**
Time working without taking 10 minute break				
≤ 60 minutes	1			
> 60	2.33	1.33	4.10	**0.003**
Using mirror				
Indirect > Direct	1			
Indirect ≤ Direct	0.40	0.24	0.65	**0.000**
Using repetitive movements				
Never or sometime	1			
Often or always	2.39	1.34	4.28	**0.003**
Stress				
No or Mild - Stress	1			
Serious – Stress	2.40	1.47	3.93	**0.000**

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4.9.4 Predictors of MSDs at lower back position

The results of full model were showed in Table 30. The following factors were found to be significant predictors of MSDs at back position: age of respondent (OR=0.5; 95% CI=0.3-0.8; p-value=0.006), asking college for professional support (OR=2.7; 95% CI=1.3-5.5; p-value=0.006), awareness of non-work related awkward postures/position (OR=2.7; 95% CI=1.3-5.5; p-value=0.009), number of working day per week (OR=2.2; 95% CI=1.4-4.7; p-value=0.044), time working without 10 minutes break (OR=2.5; 95% CI=1.42-4.5; p-value=0.002), sitting position (OR=0.5; 95% CI=0.3-0.9; p-value=0.018), and stress condition (OR=2.1; 95% CI=1.2-3.5; P-value=0.007).

After adjustment for other factors in the final model, the following factors were significantly risk factors related to MSDs at back position (Table 24):

1. Age of respondent (OR=0.5; 95% CI=0.3-0.8; P-value=0.006). OR=0.5 = 1/ 2 implied that dentists with age ≥ 35 had 2 times of risk of having MSDs at back than those with age < 35 years old.

2. Asking colleague for professional support (OR=2.4; 95% CI=1.3-4.6; p-value=0.008). Dentists can asking colleague for professional support no or little had 2.4 times of greater risk of having MSDs at back than those who can asking colleague for professional support most of time.

3. Awareness of non-work related awkward postures/position (OR=2.3; 95% CI=1.321-4.0; p-value=0.003). Dentists with no or having this awareness infrequently had about 2.3 times of higher risk of getting MSDs at back than those who was received almost of time.

4. Number of working days per day (OR=2.8; 95% CI=1.4-5.7; p-value=0.003). Dentists working more than 5 days per week had nearly 2.8 times of risk of having MSDs at back position than those who 5 days per day or less.

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5. Time working without 10 minutes break (OR=2.4; 95% CI=1.4-4.1; p-value=0.001). Dentists who worked more than 60 minutes without 10 minutes break had 2.4 times of risk of having MSDs at back position than those who took 10 minutes break after duration of working less than 60 minutes.

Table 24 Final model of Multiple Logistic Regression of MSDs at lower back position

	Odds ratio	95% CI for MSDs		p-value
		Lower	Upper	
Age				
≥ 35 year	1			
< 35 year	0.50	0.30	0.82	0.006
Ask for professional support				
Most of time	1			
No or a little	2.41	1.26	4.62	**0.008**
Non-work related awkward postures				
Almost	1			
No-infrequently	2.30	1.32	4.00	**0.003**
Time working without taking 10 minute break				
≤ 60 minutes	1			
> 60	2.40	1.41	4.08	**0.001**
Working days per week				
1-5 days	1			
>5 days	2.84	1.41	5.71	**0.003**
Sitting position				
Alternating positions	1			
Sitting position	0.55	0.32	0.96	0.034
Stress				
No or Mild - Stress	1			
Serious – Stress	1.87	1.17	2.98	**0.008**

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6. Sitting position (OR=0.56; 95% CI=0.3-0.9; p-value=0.034). Dentist with alternating position had more than 2 times of risk of getting MSDs at back position than those who with sitting position.

7. Stress condition (OR=1.9; 95% CI=1.2-3.0; P-value=0.008). Dentists with serious stress had about 1.9 times of risk of having MSDs at back position than those with no-mild stress.

In summary, those factors considered to be predictors in this study (table 25):

1. Socio-demographic: age of respondent.
2. Social support: asking college for professional support, awareness of non-work related awkward postures/position and awareness of working in an awkward postures/position.
3. Workload and organization: hours working per day, daily average number of patients.
4. Physical factors: practicing repetitive movements, time working without 10 minutes break, using mirror, sitting position, and head angle in anterior-posterior axis.
5. Stress condition.
6. Playing sport /exercise.

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Table 25 Final model of Mutiple Logistic Regression of MSDs

Predictors	MSD		MSDs at Neck		MSDs at Shoulder		MSDs at Lower back	
	β	OR (Lower - Upper)	β	OR (Lower - Upper)	β	OR (Lower - Upper)	β	OR (Lower - Upper)
Predisposing factor								
Age	-	-	-	-	-	-	- 0.70	0.50 (0.30-0.82)
Ask for professional support	1.96	7.08 (1.56 – 32.19)	-	-	-	-	0.88	2.41 (1.26 – 4.62)
Awkward posture/position	-	-	-	-	1.03	2.79 (1.32 – 5.89)	-	-
Non-work related awkward posture	1.26	3.54 (1.12 – 11.23)	-	-	-	-	0.83	2.30 (1.32 – 4.00)
Working hours per day	0.95	2.58 (1.3 – 5.11)	-	-	-	-	-	-
Working days per week	-	-	-	-	0.69	1.99 (1.03 – 3.86)	1.04	2.84 (1.41 – 5.71)
Number of patients	0.89	2.44 (1.19 – 5.01)	-	-	-	-	-	-
Using mirror	-	-	0.73	0.48 (0.29 – 0.79)	0.93	0.40 (0.24 – 0.65)	-	-
Time working without 10 min break	-	-	0.67	1.95 (1.13 – 3.37)	0.85	2..33 (1.33 – 4.10)	0.88	2.4 (1.41 – 4.08)
Sitting position	-	-	0.54	1.72 (1.03 – 2.88)	-	-	-0.6	0.55 (0.32 – 0.96)
Practice repetitive movement	1.00	2.72 (1.31 – 5.65)	0.65	1.91 (1.09 – 3.36)	0.87	2.39 (1.34 – 4.28)	-	-
Head angle in anterior-posterior axis	-	-	0.96	2.62 (1.46 – 4.68)	-	-	-	-
Stress	1.51	4.52 (2.07 – 9.86)	0.69	1.99 (1.24 – 3.19)	0.88	2.40 (1.47 – 3.93)	0.63	1.87 (1.17 – 2.98)
Exercise/sport	1.23	3.42 (1.56 – 7.5)	-	-	0.54	1.71 (1.04 – 2.81)	-	-

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CHAPTER V
DISCUSSION

This study was based on primary data collected from 336 dental practitioners in Hanoi, Vietnam. The main objective of the study was to study the characteristics of musculoskeletal disorder and related factors among dentists in Hanoi, Vietnam. In order to fulfil this, a descriptive study was carried out. The findings are discussed below.

5.1 Musculoskeletal disorder

5.1.1 Prevalence of MSDs

The prevalence of MSDs in this study was calculated based on the total number of respondents who had one or more complaints of their body regions during the last 12 months.

The prevalence of MSDs among dentists in Hanoi, Vietnam was 83.6%. It is lower than the study in Queensland, Australia, in 2006 which reported that most dentists (87.2 per cent) reported having experienced at least one MSD symptom during the past 12 months.[6] But it was higher than prevalence of MSDs in dentists in Thessaloniki, Greece, 2004. This research reported that 62% of dentists had had at least one musculoskeletal complaint in the past 12 months. [3] The prevalence of this study is approximately similar to research in Saudi Arabia where the prevalence was reported 83%.[6] Marshall E.D, in New South Wales (1997), reported that the prevalence musculoskeletal problems during the last a month among dentists was 82%.[4]. Chowanadisai S' study of 220 dentists working in 14 provinces in southern Thailand in 1997 showed that the most common occupational health problem was

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musculoskeletal pain (78 per cent). [30] It indicates a higher prevalence of MSDs among dentists in Hanoi, Vietnam compared with other studies.

During the last 12 months, the prevalence of neck trouble among dentists was 58.0%. This prevalence was similar with some study such as Leggat PA in Queensland, Australia, 2004, which reported MSDs of neck 57.5%. [6] Finsen L , in Denmark 1998 reported that MSDs of neck was 65%, [25] but it was lower than MSDs at neck (67.9%) reported by Jabbar T in Saudi Arabia.[7]

During the last 12 months, the prevalence of shoulder trouble among dentists in Hanoi was 57.1%. Leggat PA in Queensland, Australia 2004 reported that MSDs of shoulder (53.3%),[6] Jabbar T in Saudi Arabia reported MSDs at Shoulder was 46.4%.[7]. Evangelos CA in Thessalonili, Greece 2004 reported that MSDs at shoulder was only 20%.[3] So this study has shown that prevalence of MSDs at shoulder is higher than other studies.

Regarding prevalence of lower back trouble in the past 12 months, this study found that prevalence of lower backache was 46.7% which was lower than Queensland, Australian (53.7%) and Saudi Arabia (52.1%), but higher than Thessaloniki, Greece (20%)[6,7,3] Overview of prevalence of MSDs from some researches were presented in table 25.

Overall, the prevalence MSDs among dentists in Hanoi, Vietnam was high compared with other study. The reason may be the percentages of young dentists with less experience were very high. 35.7% of dentists were aged between 20-29 year and 45.0% between 30-39 years. Workload was common situation of dentists, 84.2% dentists had to work on more than 5 days per week, and 60.7% work for more than 8 hour per day. Almost all of them were working under stress. It was also one of the important factors leading to a high prevalence of MSDs among dentists in Hanoi, Vietnam.

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Table 26 Prevalence of some research related MSDs

Country	Year	MSDs	Neck	Shoulder	Lower back
Queensland, Australian (N=285) [6]	2004	87.2	57.7	53.3	53.7
Saudi Arabia (N=140) [7]	2006	59	67.9	46.4	52.1
Thessaloniki, Greece (N=430) [3]	2004	62	26	20	46
Israel (N=60 male) [17]	2000		38.3	25	55
Hanoi, Vietnam (N=336)	2009	83.6	58.0	57.2	47.7

5.1.2 Characteristic of MSDs

In our study, we found out not only the prevalence of MSDs, but also effects of MSDs such as MSDs interfered with normal work because of trouble, therapies for MSDs problem, and kind of medicine used.

During the past 12 months, MSDs which interfered with normal work were reported as neck trouble (13.4%), shoulder trouble (12.5%), and lower backache (9.8%). These prevalence were lower than reported from Queensland, Australian.[6] Dentists in Hanoi, Vietnam did not pay more attention to health care for themselves, and most of them had trouble for 1-7 days at neck(43.2%), shoulder (35.7%), and lower back (29.5%). However, those troubles were mild and did not interfere with normal work. The prevalence MSDs which interfered with normal work was higher than the report from Israel, [18] but participants were male dentists only. So with mild musculoskeletal problem they could continue their work.

With regard to the level of MSDs, we tried to find the frequency of participants having deformity or some syndrome, and were diagnosed by Health

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professional. But it had very low frequency. Most of them reported that they did not have any deformity on their bodies. Only some of them reported have mild level deformity on some part of body comprising 3.8% on eyes, 3.0% on shoulder. This result emphasizes that dentists who had deformity might have changed their job either to protect themselves or due to inability to continue do dental work.

Regarding therapies for MSDs problem, massage, meditation and vigorous exercise were given preferences by 55.4%; 55.7%; and 52.1% dentists respectively. Massage is one of the traditional medicine therapies in Vietnam. People with muscular pain always go for massage treatment. Mindfulness, a new practice was preferred by 30.7%. In the future, it may correspond with Buddhism country.

5.2 Frequency and association between independent and dependent variables

5.2.1 Socio-demographic factors

In this study, the age of participants ranged from 23 to 72 with the mean age 34 years, and the majority of them were young dentists. The highest percentages (45.4%) were aged between 30 and 39 years, while 35.7% were in between 20 and 29 years. Research by Leggat PA, Smith DR in Queensland, Australia has shown the dentists aged 40-49 years at higher frequency with the mean age of 45.2 years. [6] Other study in Israeli reported the mean age of dentists 46.0 years. Most of dentists in Hanoi were young. The reasons for the substantial were in recent year, the social demand to provide more dental care to general population. So the University of Odonto-stomatology opened 1 year training course for general doctor. After attending one year training course, they can be evaluated as dentists. Many doctors after being graduated in Medical University joined this course to become dentists. After one year they tend to stay in capital and work in dental clinic. On other hand, some dentists after getting older, they change their job to become manager or give up their dental practices. The results from multiple regression analysis showed that dentists with age ≥ 35 had 2 times of risk of having MSDs at back than those with age < 35 years old.

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This reasons might be older dentists always had providing more dental care than younger dentists.

The working duration of the dentists were low (mean 8.7 year), and the level of education almost was Bachelor degree (71.1%).

The number of male dentists was higher then female dentists. This frequency was similar with Saudi Arabia with frequency of male and female dentist were 53.7% male and 46.3 %. [7] There was no significant association between sex and MSDs. Research from Queensland, Australia reported that female dentists had a significant higher frequency of pain than their male counterparts. [6]

Concerning with the specialist occupation, most of participants were general dentists (78.3%). We did not find out a significant association between specialist occupation and MSDs in this study.

5.2.2 Social support

Social support had a positive influence that could reduce unfortunate consequences resulting from a stressful environment. In this study shown that the high frequency (more than 90%) of six kind of social supports reported by participants in term of most of time during their need. 84.5% reported asking their colleagues for professional support most of the time, and 15.5% reported no or a little. Dentistry is noble occupation in Vietnam so that dentists always get full supporting from their family. In four kinds of family supports, there was only helping with daily routine meals or errands if dentists got sick had a significant association with MSDs.

Conflicts in working place usually happen in every office. It also can not exclude environmental working in hospital. The conflict was not only between doctor and nurse but also between doctors. In this study, we did not try to find the effectiveness of conflict in working place rather we found how much support dentists received from their colleagues. Dentist could ask colleagues for professional support whenever they needed had a significant association with MSDs. Dentists who could

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ask his/her colleagues for professional support whenever they needed might had lower at risk to getting MSDs than those could not. The results from multiple regression analysis also showed that dentists who could ask their colleagues for professional support no or little had 7 times of greater risk of having MSDs and had 2.4 times of greater risk of having MSDs at back than those who can asking college for professional support most of time. So this independent variable was might be a important predict factor lead to MSDs.

Regarding to safety awareness, in this study gave 10 statements. Most of participants responded that almost of time were awarded with 10 safety awareness. There were four safety awareness had statistical significant association with MSDs. Four safety awareness, awareness that working with anxious patients can lead to development of MSDs, awareness that from MOH can lead to development MSDs, awareness that working in an awkward posture/position can lead to development of MSDs, awareness that the non-work related awkward postures can lead to development of MSDs were need to pay more attention. Dentist could be awareness with many statements but awareness with four items it will might indirect help him reduces their MSD. Awareness working in an awkward posture/position was statistically significant predictors of MSDs at shoulder. Dentists with no or having this awareness infrequently had 2.8 times of higher risk of getting MSDs at shoulder position than those who was received almost of time. Non-work related awkward postures also statistically significant predictor of MSDs at lower back and common MSDs. So awkward posture/position and non-work related awkward postures were most important predictor independent variables could lead to MSDs.

5.2.3 Organizational factors

Numbers of dentists working for more than 8 hour per day (60.7%) were higher than those worked for 8 hours or less per day (39.3%). Most dentists worked more than 5 days per week (84.2%) were higher than dentists working for 5 days or less per week. There was a statistically significant association between MSDs, and more hours working per day and more number of working days per week. The dentists who have to work more are at greater risk of developing MSDs.

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The results from multiple regression analysis also showed that dentists working for more than 8 hour per day had 2.5 times of risk of having MSDs than those who worked less than 8 hour per day. And Dentists working more than 5 days per week had nearly 2 times of risk of having MSDs at shoulder position and had nearly 2.8 times of risk of having MSDs at back position those who worked less than equal or less than 5 days per day. Working less than 8 hour per day and 5 days per week were standard working hour not only for dental practices but also for general worker. It was applied on chapter VII-Low of the labor union Vietnam. [36] It is limited time for working per day, after that worker need time to recover their health. Dentists worked more than 8 hour per day might get more burden and depressed. It made them became risk of having MSDs.. The reasons of increasing time working might be that dentists were the high number of patients and considered as the main source of income to their families.

The dentists had to provide dental health care for an average of 7 patients per day. The study in Queensland, Australia reported the mean of patients per days by gender (male 15.4 patients, female 13 patients) . [6] The average number of patients treated by dentists per day in Hanoi was less than by dentists in Queensland, Australia. There were statistically significant predictors of MSDs and number of patient. Similar with hours working per day factor, dentists had to provided more dental care will get more expose so that they will be more at risk of having MSDs. This showed that patients load was also significant predictors could lead to MSDs.

Participants were asked regarding their usual work duration without 10 minutes break.. Respondents were categorized according to the length of time they worked before taking a 10 minute break into periods of 30 minutes duration. The most commonly selected time period was 30-60 minutes duration (42.6%). There was a significant association between the length of time before taking a 10 minute break and MSDs. Dentists who working long hours without taking 10 minute break will be more at risk develop MSDs. The study in Saudi Arabia reported that the most commonly selected time period was of 1-2 hours duration. [7] The results from multiple regression analysis showed that There were no statistically significant predictors of MSDs

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working long hours without taking 10 minutes break. But had statistically significant predictors between this variable and MSDs at neck, MSDs at shoulder, MSDs at lower back. So this might be a predict factor lead to special region of body on neck, shoulder, and lower back.

Participants in our study reported having autonomy in their job (93.2%) and board writing protocol/professional guidelines (88.1%). There were no statistically significant association between them and MSDs.

5.2.4 Physical factors

During the time of patients' operation, 99.1% dentists reported that they had to adjust dental chair at least once. This is normal and natural action which dentists have to do during operation. There was no statistically significant association between adjusting dental chair during operation and MSDs.There was no previous related study.

When dentists operated upper teeth of patients, they always tried to obtain the good view. Depending upon the level of difficulty or ease of patient, habit of dentists, some dentists used mirror to obtain indirect view while others did not use mirror to have direct view. In our study, the majority groups were found to view indirectly > directly (51.2%), indirect every time (11%). Only 2.4% participant reported view direct every time. There were no significant association between using mirror and MSDs. But there were a statistically significant association between using mirror, and neck disorder (OR= 0.48; 95%CI 0.48-0.79) and shoulder disorders (OR = 0.4; 95% CI 0.24-0.65). Dentists who looked indirect more than direct had more than 2 times of having MSDs at neck and shoulder than those who did not. This result were opposite with previous study such as the study in Saudi Arabia has shown that the symptoms of musculoskeletal had been decreased with dentists who used the dental mirror all the time. [6] The reasons might be dentists who had MSDs already so they had to change to using mirror when they operated with upper teeth.

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The frequency of dentists working only in sitting position was higher than those followed alternating position (sitting and standing) while working. There was a significant relationship between sitting position and MSDs. Dentists working in the sitting position had 1.7 times more risk of getting MSDs at the neck than those working in the alternating position. But dentists who worked in the sitting position had less severe lower backache than those who followed an alternating position during their work. This finding is not similar with an earlier study which has shown that dentists experienced severe lower back pain whilst working in sitting position than those who alternated their positions during work. [8] This findings in my study could be explained by the participants having experienced lower back pain already so that they had to change from sitting to alternating positions due to the dentists experiencing physical discomfort (lower back ache).

When the operating position of the dentists in relation to the patient was described as clock face with the patient's mouth as the centre of the dial, 83.6% of the dentists reported using between 9 and 12 o'clock, and 14% reported 12 o'clock position. This result were similar with study in Saudi Arabia, it reported that the high frequency (67.9%) of the dentists used a position between 10 and 12 0'clock. There were no significant association between operating position of the dentists in relation to the patient was described as clock and MSDs.

Common handedness of dentists was right hand (92.9%). Some of them used ambidextrous (5.9%). The percentage of common handedness was high because dental instruments were made for dentists with right handedness. There were no statistically significant association between common handedness of dentists and MSDs. We also did not find out the previous related study which pays attention about this situation.

A vibrating appliance used by dentists to massage gum, remove calculus or tartar from teeth and excess cement from crowns or orthodontic bands wherein an air driven turbine through a mechanical linkage effects vibration of a dental tool, particularly a scalar.

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Frequent use of vibrating tools was reported by more than half of dentists. They were found always using vibrating tools similarly repetitive movement was noted in high percentage of dentists 38.7 per cent reported often practicing repetitive movement during an operation, and 39.9 per cent reported practicing always. There were significant association between using vibrating tools and repetitive movement, and MSDs. It was similar with reported in Thessalniki, Greece.[3] Dentists who reported always or often used vibrating tools and repetitive movements might be more at risk getting MSDs than those reported seldom or never. There were statistically significant predictors between practice repetitive movement and common MSDs, MSD at neck, and MSDs at shoulder. Handbook of Disabilities informed that disorder can be caused by repetitive movement, repeated use of force (pushing or pulling, hammering, etc), working in an unnatural body position, or long-term vibration. The problems are the result of a cumulative "micro-traumas" that exceed the body's normal healing ability. They are not cause by a single injury or event, but months or years of repeated physical stress. The damage arises from injury to muscles, tendon, and nerves that are not given a chance to rest and recover. [38] So might be dentists often or always practice repetitive movement be at risk than those never or sometime done.

Results regarding the position of head and body compared with anterior-posterior axis and left-right axis. The number of dentists working with their heads bending forward with an angle of 0-30° in anterior-posterior axis was higher than those with angle of head, 31-45° and more than 45°. The number of dentists working with their heads tilting towards right and left with an angle of 0-30° in left-right axis higher than those with angle of head, 31-45° and more than 45°. Similarly, tilting of body towards right and left with an angle of 0-30° was reported by the majority of dentists. The body bending forward with an angle of 0-30° was reported by a high number of dentists. Of them, there was only position of head angle in anterior-posterior had statistically significant association with MSDs. And there were statistically significant predict of MSD at neck by head angle in anterior-posterior. Dentists with position of head bending forward from 31^0 and above had 2.6 times of risk of having MSDs at neck position than those who with position of head bending forward from $\leq 30^0$.

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5.2.5 Psychological factors

Stress was found to be strongly associated with musculoskeletal disorders in dentists. There were statistically significant predictor of MSD and three part of body (neck, shoulder, and neck) by stress. It showed that stress was one of important predictor factor lead to MSDs. The previous thesis has shown that dentistry can be stressful occupation and stress can elicit muscular contraction and pain, especially in the trapezium muscles. [12]

5.2.6 Non-work Related Physical Activities

There were many non-work Related Activities may be related to MSDs such as certain sport, exercising, working with computers, needlework, playing musical instruments as mentioned by Jennife A. [9] In this study, number of dentists playing sport or doing exercise were high than those did not play or do exercise. Normally, they played sport or exercise from 1 to 3 days per week (61.3%). We also found that playing sport or having exercise had statistically significant association with MSDs. Dentists who playing sport and exercise with long times might be more at risk develop MSDs than those playing with short times. Multiple logistic analysis also showed that playing sport/exercise were found to be statistically significant predictors of MSDs, and MSDs at shoulder.

The number of dentists using computer were higher than those did not use computer. But there was no statistically significant association between using computer and MSDs.

5.3 Strength and Limitation of this study

5.3.1 Strength of this study

In order to explore the prevalence of MSDs among dentists in Hanoi, Vietnam, Hanoi Department of Health, Vietnam Cuba Friendship hospital, and Odonto-stomatology University cooperated and coordinated to do the research. Our

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study, therefore had support from them in terms of providing students team and Vietnam Cuba Friendship hospitals team for data collection.

This is the first epidemiology of MSDs among dentists in Hanoi, Vietnam. So that the information from participants were not reflected by other studies.

This study base on comprehensiveness conceptual framework, detail of measurement of MSDs. Statistic analysis, we used multiple regression analysis to found predictor factor related MSDs. Cross-sectional was used to find the prevalence

5.3.2 Limitation of the study

Nevertheless, there are certain limitations of this study that need to be acknowledged.

The major limitation of this study is regarding the validity of responses on questionnaire**.** The data were be collected by self administered-questionnaires. Therefore, it was assumed that the respondents are accurate in answering the questionnaires. Addition, the result might be not reflected the actual situation if respondents answered together, the content of answer may be converted from other colleague.

Limited short time duration of the study is an another important limitation

A further limitation is the study design. A cross-sectional study design was used to conduct this study which was able to explore the prevalence rather than assess the causal relationship between independent and dependent variables. Case-control or prospective cohort study is further needed to find out the temporal relationship between them.

In summary, this study is the first survey epidemiology of musculoskeletal disorder among dentists in Hanoi, Vietnam. The self-administered questionnaire was conducted to data collection. The results showed that the prevalence of MSDs among

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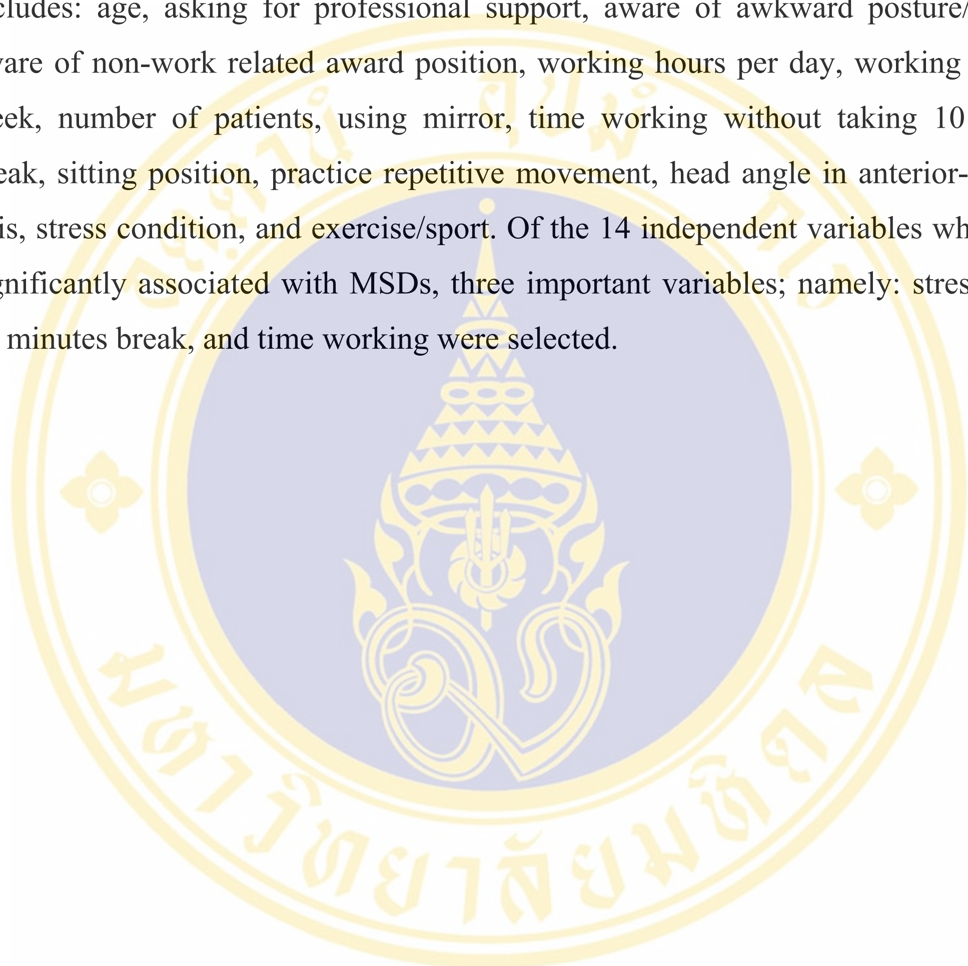
dentists in Hanoi, Vietnam during the last 12 months was high (83.6 per cent). The most of prevalence of MSDs period time 12 months were reported at neck (58.0 per cent), shoulder (57.1 per cent), and lower back (46.7 per cent). There were 14 independent variables were found as predictor independent variables of MSDs, it includes: age, asking for professional support, aware of awkward posture/position, aware of non-work related award position, working hours per day, working days per week, number of patients, using mirror, time working without taking 10 minutes break, sitting position, practice repetitive movement, head angle in anterior-posterior axis, stress condition, and exercise/sport. Of the 14 independent variables which were significantly associated with MSDs, three important variables; namely: stress, taking 10 minutes break, and time working were selected.



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CHAPTER VI
CONCLUSION AND RECOMMENDATION

6.1 Conclusion

This was cross sectional descriptive study conducted in 336 dentists working in Hanoi, Vietnam. The study was aimed to examine epidemiologic characteristic of musculoskeletal disorders among dentists in Hanoi, Vietnam and identify the relationship between MSDs and related factors.

Information about the participants was collected by self administered questionnaires. The questionnaire was divided into three parts: Part one was question about socio-demographic: age, gender, marital status, education level, specialist occupation, working duration). Part two was questions about musculoskeletal disorders. Part three was question regard to factors related to musculoskeletal disorder: social support: family support, colleague support, safety awareness, organization: time pressure, autonomy, responsibility, job security, physical factor: posture, position, vibration tools, repetitive movements, psychological factor: stress, and non-work related physical activity such as playing sort/exercise, using computer.

Pretest was conducted on January 7, 2009 with 30 dentists. After that data collection process was carried out during January, 2009. Data analysis was conducted by Epi Data 3.0 and MINITAB 13 software.

Chi-square test was used to assess the association between MSDs and each independent variable. Multiple logistic regression analysis was used to predict dichotomous independent variable of dependent variable.

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Within the limitations of the present study, the following conclusions can be drawn down:

1. Prevalence of MSDs: The results revealed that the prevalence of MSDs among dentists in Hanoi, Vietnam was high (83.6%). The most prevalence was reported at the neck, shoulder, and lower back. This prevalence appears almost similar to reports from other countries. The majority of dentists had duration of MSDs from 1-7 days. In some of care, MSDs were shown to interfere with normal work. Massage and meditation were the therapies most prefer for MSD problem, 28.3% of dentists had take medicine for MSDs.

2. Socio-demographic: There was a statistically significant association between MSD at lower back and age groups (β= - 0.70; OR = 0.50, 95% CI = 0.30 – 0.82).

3. Social support: There were a statistically significant association between common MSDs, MSD at lower back and asking colleague for professional support (β= - 1.96; OR = 7.08, 95% CI = 1.56-32.19) and (β= 0.88; OR = 2.41, 95% CI = 1.26 – 4.62). There were a statistical significant association between MSD at shoulder and awareness of working in an awkward posture/position (β= 1.03; OR = 2.79, 95% CI = 1.32 – 5.89). There was also a statistical significant association between common MSDs, MSD at lower back and awareness of non-work related awkward posture/position (β= 1.26; OR = 3.54, 95% CI = 1.12 – 11.23) and (β= 0.83; OR = 2.30, 95% CI = 1.32 – 4.00).

4. Organization: There was a statistically significant association between common MSDs and hours working per day (β= 0.95; OR = 2.58, 95% CI = 1.30 – 5.11). There were statistical significant associations between MSD at shoulder, MSD at lower back and total number days working per week (β= 0.69; OR = 1.99, 95% CI = 1.03 – 3.86) and (β= 1.04; OR = 32.84, 95% CI = 1.41 – 5.71). There was a statistical significant association between common MSDs and number of patients (β= 0.89; OR = 2.44 , 95% CI = 1.19 – 5.01). And there were statistical significant associations

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between MSD at neck, shoulder, lower back and the length of time working before taking 10 minute break (β= 0.67; OR = 1.95, 95% CI = 1.13 – 3.37), (β= 0.85; OR = 2.33 , 95% CI = 1.33 – 4.10), and (β= 0.88; OR = 2.4 , 95% CI = 1.41 – 4.08).

5. Physical: There was statistically significant association between MSD at neck, shoulder and using mirror situation (β= -0.73; OR = 0.48, 95%CI = 0.29 – 0.79) and (β= -0.93; OR = 0.40, 95% CI = 0.24 – 0.65). There were statistical significant association between MSD at neck, lower back and sitting position (β= 0.54; OR = 1.72, 95%CI = 1.03 – 2.88) and (β= - 0.6; OR = 0.55 , 95%CI = 0.32 – 0.96). There were statistical significant associations between common MSDs, MSD at neck, MSD at shoulder and repetitive movement (β= 1.00; OR = 2.72, 95%CI = 1.31 – 5.65) , (β= 0.65; OR = 1.91, 95%CI = 1.09 – 3.36), and (β= 0.87; OR = 2.39 , 95%CI = 1.34 – 4.28). And we found that MSD at neck had a statistically significant association with common position of head angle in anterior-posterior (β= 0.96; OR = 1.99, 95%CI = 1.24 – 3.19).

6. Psychological: stress was one of risk factors related with MSDs. It had a significant relationship with common MSDs and three main part of body (neck, shoulder, and lower back) (β= 1.51; OR = 4.52, 95%CI = 2.07 – 9.86), (β= 0.69; OR = 1.99, 95%CI = 1.24 – 3.13), (β= 0.88; OR = 2.40, 95%CI = 1.47 – 3.93), and (β= 0.63; OR = 1.87, 95%CI = 1.17 – 2.98).

7. Non-Work Related Physical Activity: There were a statistical significant associations between common MSDs, MSD at shoulder and playing sport or exercise (β= 1.23; OR = 3.42, 95%CI = 1.56 – 7.5), and (β= 0.54; OR = 1.71, 95%CI = 1.04 – 2.81).

Overall, This study shown that there were 14 independents variable had significant association wish at least one MSDs. It located in all independents variable include: socio demographic, social support, organization factor, physical factor, psychological factor, and non-work related physical activity.

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6.2 Recommendation

6.1.2 Recommendations

Based on the findings in this study, the following recommendations can be to reduce musculoskeletal problems among dentists in Hanoi, Vietnam. It will prevent consequences and complication can happens in future and will be helping dentists avoid or reduce harm, injury, damage, and MSDs from their work place.

Regarding age, we need to aware them working with long time and patients load per days will be exposing with MSD at lower back. Working long hour in awkward posture/position also relate to develop MSDs.

Colleague support needs be to implemented more. We need to make work place are good environmental for dentists working. The heads of each hospital should know how to control and solve the conflict problem in their hospital.

Regarding duration time working, the majority of dentists in Hanoi, Vietnam were working more than 8 hours per day and more than 5 days per week. This exceeds the standard set the labor union Vietnam. But the related organization can not suggest them reduce their time working because it is personal cognitive-attitude. It should inform them the standard of time working and the guideline of correspondent schedule working for dentists. Similarly, we can not recommend dentists reduce the number of patients who were provided dental care per days. But we can let them know how to divided total number per days in one week.

Regarding physical, dentists should sit with straight lower and upper back, the neck bent ($0 – 30^0$), the seat straight. When dentists operate a patient, they always pay more attention about their work they do not care about their posture and position, especially young dentists. So dental universities should establish ergonomics programs aimed at increasing knowledge of right posture and position for dental students and making them aware of the disadvantages and consequences of awkward posture and position which relate to MSDs.

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The study revealed that mental stress was a strength risk factor related to develop MSDs so that stress reduction programs should be invented and considered an important way to prevent psychological strain for dentists.

Hospital and dental clinics should provide latest technological instruments to reduce effects from vibrating tools and repetitive movements and also implement policies from the MOH to protocols that emphasizes the need to renew equipment every 8 years.

6.2.2 Recommendation for further study

From the result of this study, the following recommendations for further study are suggested:

1. More study should be conducted to find out the prevalence of MSDs in other provinces in Vietnam.

2. Implementation some pilot model dental clinic with advance ergonomic that can support for dentists in their work.

3. Cohort or case control studies should be used to establish causal relationships.

4. Experimental study might be done to explore some of therapies for treating musculoskeletal disorder such as traditional medicine, take medicine, practice mindfulness.

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APPENDIX

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APPENDIX A

QUESTIONNAIRES

EPIDEMIOLOGY OF MUSCULOSKELETAL DISORDERS AMONG DENTISTS IN HANOI, VIET NAM

Date questionnaire: … ………. …/ ….. /2009
Time Start ………….(answering questionnaire)

Part I: Socio-demography

1. What is your date of birth? ……../……/……..(DD/MM/Year)

2. Sex: 1.☐ Male
 2. ☐ Female

3. 1. Weight.......................Kg
 2. Height......................Cm

4. What is your marital status?

 1. ☐ Married
 2. ☐ Separated
 3. ☐ Divorced
 4. ☐ Widow
 5. ☐ Never married

5 What is your highest educational degree?

 1. ☐ Bachelor
 2. ☐ Master
 3. ☐ Doctoral

6. What is your dental specialization?

 1. ☐ General
 2. ☐ Periodontics
 3. ☐ Prostodontics
 4. ☐ Pedodontics
 5. ☐ Endodontics

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6. ☐ Orthodontics
7. ☐ Oral and Maxillofacial Surgery
8. ☐ Other

7 How many years have you worked in dental practice?......years

8. Have you ever been diagnosed with diabetes?

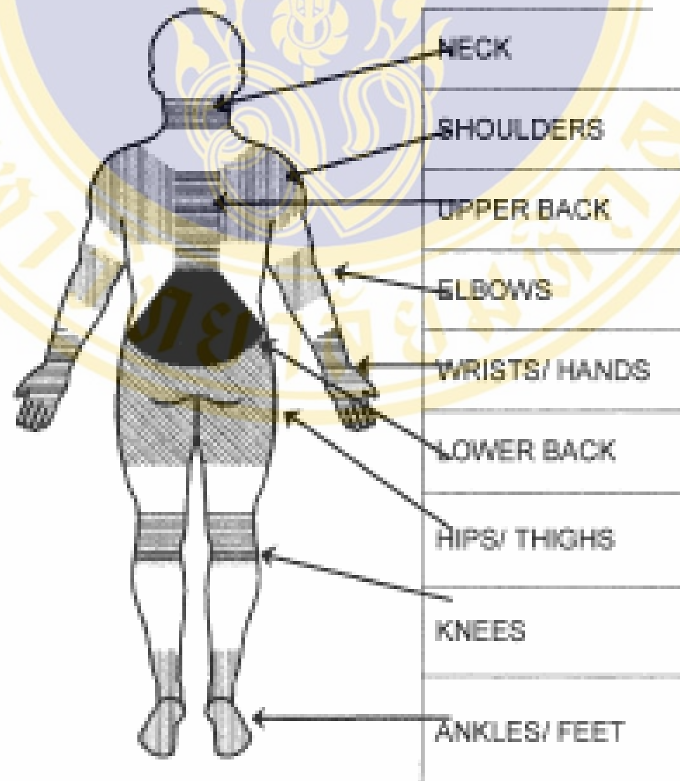
1. ☐ No
2. ☐ Yes..

9 Do you have to take medicine for diabetes?

1. ☐ No
2. ☐ Yes

10. Do you smoke?

1. ☐ Never smoker
2. ☐ Ex-smoker
3. ☐ Current smoker



Region of the body

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Part II: Musculoskeletal disorders

2.1 General questionnaire of musculoskeletal disorders (1)

Please answer by putting a cross in the appropriate box – one cross for each question. Please answer every question, even if you have never had trouble in any part of your body.

Trouble with the locomotive organs			
		To be answered only by those who have had trouble	
	11. Have you at any time during the last 12 months, had trouble(ache, pain, discomfort) in:	12. Have you at any time during the last 12 months been prevented from doing your normal work (at home or away from home) because of the trouble?	13. Have you had trouble at any time during the last 7 days?
Neck	1. No 2. Yes	1. No 2. Yes	1. No 2. Yes
Shoulder	1. No 2. Yes, in the right 3. Yes, in the left 4. Yes, in both shoulders	1. No 2. Yes	1. No 2. Yes
Elbow	1. No 2. Yes, in the right 3. Yes, in the left 4. Yes, in both elbow	1. No 2. Yes	1. No 2. Yes
Wrists/hands	1. No 2. Yes, in the right 3. Yes, in the left 4. Yes, in both	1. No 2. Yes	1. No 2. Yes
Upper back	1. No 2. Yes	1. No 2. Yes	1. No 2. Yes
Lower back	1. No 2. Yes	1. No 2. Yes	1. No 2. Yes
One or both hips/things	1. No 2. Yes	1. No 2. Yes	1. No 2. Yes
One or both knees	1. No 2. Yes	1. No 2. Yes	1. No 2. Yes
One or both ankles/feet	1. No 2. Yes	1. No 2. Yes	1. No 2. Yes

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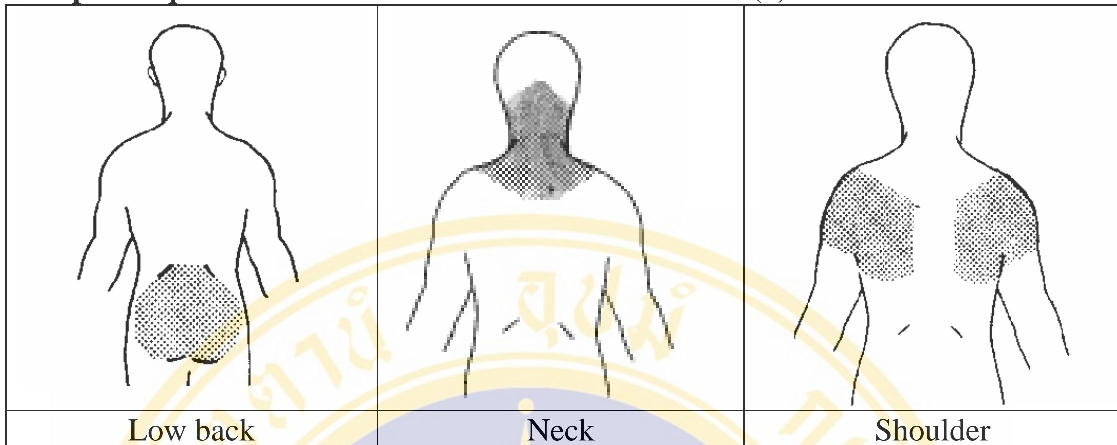
2.2 Special questionnaire of musculoskeletal disorders (1)



Low back	Neck	Shoulder

Please select only one appropriate answer (by mark (√)) for each question related to three regions of the body.

	Low back	Neck	Shoulder
14. Have you ever been hospitalized because of low back trouble?			
No			
Yes			
15. Have you ever hurt your Neck and Shoulder in an accident?		Neck	Shoulder
No			
Yes			
16. Have you ever had to change jobs or duties because of each region troubled (Lower back, Neck, Shoulder)?	Low back	Neck	Shoulder
No			
Yes			
17. What is the total length of time that you **have had trouble for each region of body (Lower back, Neck, Shoulder)** during the last 12 months?	Low back	Neck	Shoulder
0 days			
1 -7 days			
8 – 30 days			
More than 30 days, but not every day			
Every day			
18. What is the total length of time that each troubled region (low back, Neck, shoulder) **has prevented you from doing your normal work (at home or away from home) during the last 12 months?**	Low back	Neck	Shoulder
0 days			
1 -7 days			
8 – 30 days			
More than 30 days			

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2.3 Musculoskeletal deformity

19. Have you ever been **diagnosed of any kind of deformity on regions of the body below?** (Please answer all the questions by mark (x) in the appropriate scaling boxes)

0: No; 1: Mild; 2: Moderate; 3: Severe; 4: Very severe

		No	Mild	Moderate	Severe	Very severe
19	**Region of the body**	0	1	2	3	4
19.1	Head					
19.2	eyes					
19.3	Neck					
19.4	Shoulder					
19.5	Upper back					
19.6	Lower back					
19.7	Elbows					
19.8	Wrists/Hands/Fingers					
19.9	Knees					
19.10	Ankles					
19.11	Feet					

2.4. Questions related to historical MSDs

20	**Has a health professional ever told you, you had any of the following(in the past 6 month)?**	No	Yes
	Back pain		
	Carpal Tunnel Syndrome		
	Epicondylitis (Tennis Elbow)		
	Fibromyalgia		
	Neck pain		
	Repetitive Motion Disorders		
	Tendonitis		
	Trigger Finger		
	Arthritis		
	Scoliosis		

21	**Have you ever got any of the following therapies for your MSD problem?**	No	Yes
	Chiropractic		
	Massage		
	Meditation		
	Mindfulness Practice *		
	Vigorous exercise (sport, swimming, aerobics, etc)		

***Mindfulness Practice is Concentration, awareness or heedfulness of one's thoughts, actions or motivations**.

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22. Have you ever taken any kind of medicine below for your MSDs
    1.☐ None
    2.☐ Analgesic
    3.☐ Narcotic
    4.☐ Steroids
    5.☐ Anti-inflammatory

Part III: Factors related to musculoskeletal disorders

A. Social support: Please answer the questions related to "Help and Support" from Family and Colleagues. Please select one choice by mark (√)) for the following questions

How often for each of the following Types of Support available to you when needed?

0. None of the time
1. A little of the time
2. Some of the time
3. Most of the time
4. All of the time

Family support

		None	Little time	Some time	Most time	All time
	Statement	0	1	2	3	4
23	Family member who understands your dental work pattern					
24	Family member helps you to do housework like cooking, cleaning, or washing					
25	Family member you can count on to listen to you whenever you need to					
26	Family member to help with daily routine meals or errands if you are sick					

Colleague support

		None	Little time	Some time	Most time	All time
	Statement	0	1	2	3	4
27	You can ask your colleague for professional support / assistance whenever you need to					
28	Colleagues usually follow the best interest of teamwork /organization					

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Safety Awareness in Dental Practice

Please select the best answer and mark (√) for the following questions

		No	Infre-quently	Often/ Most	Always
	Statement	0	1	2	3
29	Are you aware of working long hours at high level of concentration being at risk of developing stress?				
30	Are you aware when working with anxious patients?				
31	Are you aware of exposure to microbial aerosols generated by high-speed rotary hand pieces?				
32	Are you aware of the hazards from sharp instruments?				
33	Are you aware of various chemicals used in clinical dental practice?				
34	Are you aware of exposure to your eyes from bits, splatters when you practice ?				
35	Are you aware of your exposure to communicable infections?				
36	Are you aware of the role for dental practice from ministry of health's guideline?				
37	Are you aware that working in an awkward posture/ position can lead to development of MSDs?				
38	Are you aware that the non-work related awkward postures/positions can also lead to development of MSDs (exercise, sit, sleep etc)				

II. Dental Practice –Work Load and Organizational Factors

39. How many **hours per day** do you work in dental service?.............hours/day

40. How many **days per week** do you work in dental service? ..…hours/week

41. What is the **daily average number of patients** that you provide dental care to? ……. patients / day .

42. Do you have autonomy in your organization?

1. ☐ No
2. ☐ Yes

43. Does your workplace have written protocol/professional guidelines provided for your practice?

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1. ☐ No
2. ☐ Yes

III Physical factors

44. Do you have to adjust your dental chair during your operation? …….times / patient?

1. ☐ No
2. ☐ Yes

45 How often do you adjust the dental unit during your operation (Not including adjusting before and after operation or when the patients rinse their mouth)?

….. times/ Patient

46. When you operate for upper teeth, your working position (to the upper teeth) is:

1. ☐ Indirect every time
2. ☐ Indirect > Direct
3. ☐ Indirect = Direct
4. ☐ Direct > Indirect
5. ☐ Direct every time

47. How long do you usually work (with your patients) without taking a break?…… mins

48. Which position do you usually prefer when operating on a patient?

1. ☐ Sitting position
2. ☐ Alternating positions (sitting and standing)

49. What is the common position when you operate a patient?

1. ☐ at 9-12 o'clock
2. ☐ at 12 o'clock
3. ☐ at 12-15 o'clock

50. What is your common handedness when you operate?

1. ☐ Right handed
2. ☐ Left handed
3. ☐ Ambidextrous

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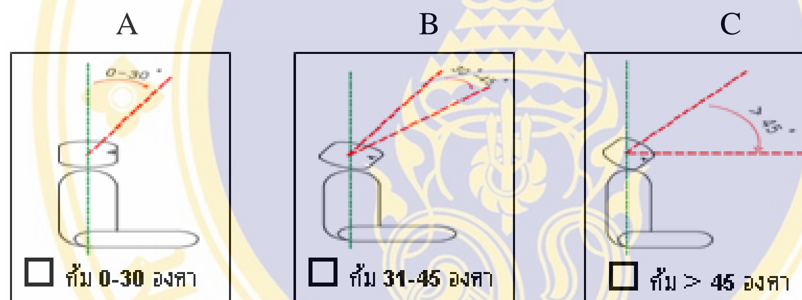
51 How often do you use vibrating tools during a regular workday?

1. ☐ Seldom or never
2. ☐ Only when needed or necessary
3. ☐ Often and more than necessary
4. ☐ Always

52. How often do you practice with repetitive movement during an operation?

1. ☐ Seldom or never
2. ☐ Only when needed or necessary
3. ☐ Often and more than necessary
4. ☐ Always

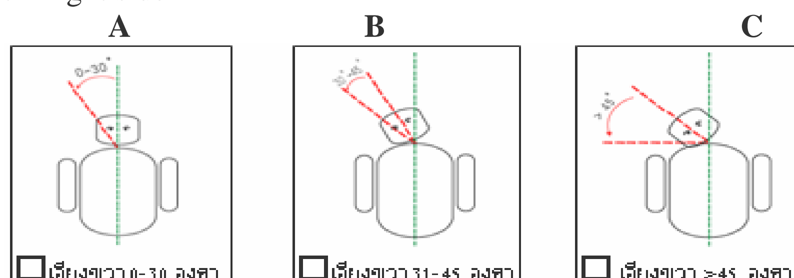
53. What is the most position of your head angle in anterior -posterior axis when you work? (Please select one and mark (x) in the ☐)



☐ a) Head tilting forward 0^0-30^0
☐ b) Head tilting forward 31^0-45^0
☐ c) Head tilting forward $> 45^0$

54. What is the most common position of your head angle in left - right axis when you work? (Please select one and mark (x) in the ☐)

54.1 Right side



☐ a) Head tilting rightward 0^0-30^0
☐ b) Head tilting rightward 31^0-45^0
☐ c) Head tilting rightward $> 45^0$

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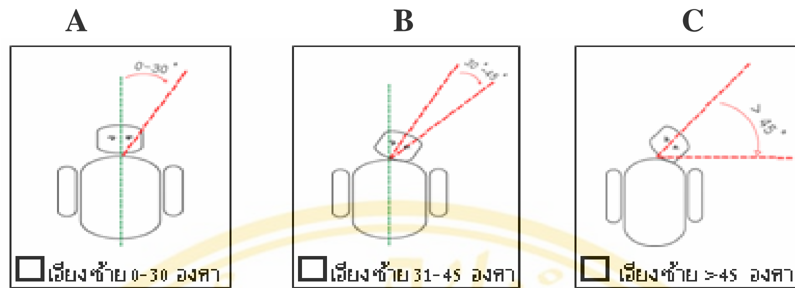
54.2 Left side



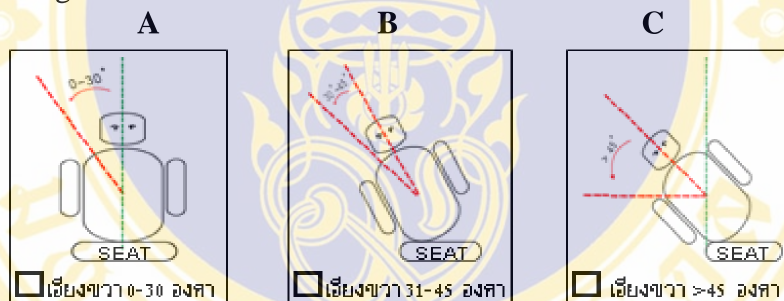
☐ a) Head tilting leftward 0^0-30^0

☐ b) Head tilting leftward 31^0-45^0

☐ c) Head tilting leftward $> 45^0$

55. What is the most common position of your body angle in Left-right axis when you work

55.1 Right side

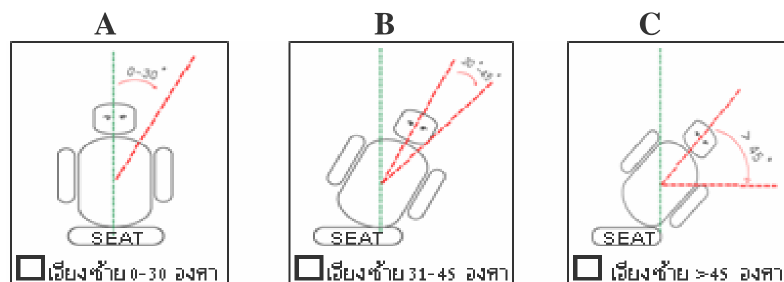


☐ a) Body tilting rightward 0^0-30^0

☐ b) Body tilting rightward 31^0 - 45^0

☐ c) Body tilting rightward $> 45^0$

55.2 Left side



☐ a) Body tilting leftward 0^0-30^0

☐ b) Body tilting leftward 31^0 - 45^0

☐ c) Body tilting leftward $> 45^0$

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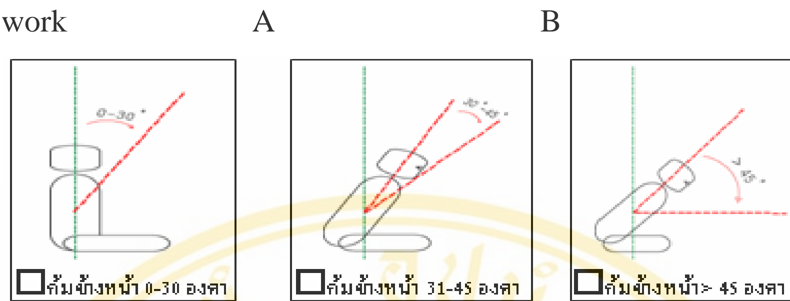
56. What is the most common position of your body angle in antero-posterior axis when you work A B C



☐ a)Body tilting forward 0^0-30^0
☐ b)Body tilting forward 31^0-45^0
☐ c)Body tilting forward $> 45^0$

IV: Stress condition

Please read the situations below and, ONLY for those which occurred to you during the past 3 months, mark your feelings about the stress associated each situation with (x). Fill in the box which represents your stress estimate with respect to that situation

1. No Stress
2. Mild Stress
3. Moderate Stress
4. Severe Stress

		No Stress	Mild Stress	Moderate Stress	Severe Stress
57	Making mistake at work				
58	Missing a goal or objective				
59	Controversy within family, household work, or income				
60	Competition at work				
61	Overspending budget / money				
62	Stretched muscle or pain				
63	Headache (one or two-sided)				
64	Feeling nervous				
65	Feeling of uncontrolled anger				
66	Feeling depressed				
67	Feeling bored or tired of your dental profession				
68	Feeling confused				
69	Problems with short term memory				
70	Difficulty concentrating				
71	Lack of sleep				

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V. Non- work related physical activity

72. Is there any kind of sports or exercise (eg:- tennis, badminton, Jogging or other sport) do you usually play?

1. ☐ No
2. ☐Yes

73. What kind of exercise/sport do you play?

1. ☐ Tennis
2. ☐ Badminton
3. ☐ Swimming
4. ☐ Jogging
5. ☐ Other …………(please specify)

74. How many days / week do you play sport/exercise? ....days / week

75. How long each day do you play sport/exercise?..........(minutes)

76. Do you use computer?

1. ☐ No
2. ☐ Yes

77. How many hours do you use computer per day?......hours

Thank You!

Time ending:-……………
Total time spent answering this questionnaire =……………minutes

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APPENDIX B

Table 27 The full model of multiple logistic regression of MSDs

	Odds ratio	95% CI for MSDs Lower	Upper	p-value
Age				
≥ 35 year	1			
< 35 year	0.58	0.26	1.32	0.196
Sex				
Male	1			
Female	1.36	0.64	2.85	0.423
Understands dental work pattern				
Most of time	1			
No or a little	0.62	0.19	2.03	0.432
Help daily routine meals when gt sick				
Most of time	1			
No or a little	+	+	+	+
Ask for professional support				
No or a little	1			
Most of time	7.89	1.53	10.77	**0.014**
Working with anxious patients				
Almost	1			
No-infrequently	1.15	0.41	3.19	0.790
Guideline from MOH				
Almost	1			
No-infrequently	3.25	0.64	16.48	0.154
Awkward posture/ position				
Almost	1			
No-infrequently	0.99	+	0.00	+
Non-work related awkward postures				
Almost	1			
No-infrequently	1.95	0.49	7.47	0.338
Working hour per day				
1-8 hours	1			
> 8 hour	2.15	0.99	4.69	**0.053**

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Table 27 The full model of multiple logistic regression of MSDs (Cont.)

	Odds ratio	95% CI for MSDs Lower	Upper	p-value
Time working without taking 10 minute break				
≤ 60 minutes	1			
> 60	2.53	0.97	6.59	**0.057**
Using mirror				
Indirect > Direct	1			
Indirect ≤ Direct	1.12	0.51	2.43	0.783
Sitting position				
Alternating positions	1			
Sitting position	1.57	0.72	3.39	0.255
Using vibrating tools				
Never or sometime	1			
Often or always	1.01	0.37	2.77	0.988
Repetitive movement				
Never or sometime	1			
Often or always	2.42	0.94	6.22	0.067
Head angle in anterior –posterior axis				
$0\text{-}30^0$	1			
$> 30^0$	1.58	0.59	4.23	0.365
Stress				
No or Mild - Stress	1			
Serious – Stress	4.04	1.70	9.57	**0.002**
Exercise/sport				
No	1			
Yes	2.85	1.25	6.78	**0.012**

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Table 28 The full model of multiple logistic regression of MSDs at neck position

	Odds ratio	95% CI for MSDs Lower	Upper	p-value
Age				
≥ 35 year	1			
< 35 year	1.04	0.61	1.85	0.900
Sex				
Male	1			
Female	0.82	0.49	1.37	0.438
Understands dental work pattern				
Most of time	1			
No or a little	0.55	0.24	1.27	0.162
Help meals when got sick				
Most of time	1			
No or a little	2.13	0.67	6.78	0.202
Ask for professional support				
No or a little	1			
Most of time	1.99	0.96	4.10	**0.084**
Working with anxious patients				
Almost	1			
No-infrequently	0.97	0.53	1.75	0.910
Guideline from MOH				
Almost	1			
No-infrequently	1.93	0.92	4.06	0.084
Awkward posture/ position				
Almost	1			
No-infrequently	0.53	0.23	1.26	0.152
Non-work related awkward postures				
Almost	1			
No-infrequently	1.02	0.50	2.10	0.950
Working hour per day				
1-8 hours	1			
> 8 hour	1.36	0.79	2.35	**0.262**
Working days per week				
1-5 days	1			
>5 days	0.83	0.40	1.72	0.613
Time working without taking 10 minute break				
≤ 60 minutes	1			
> 60	2.27	1.25	4.14	**0.007**
Number of patients				
0-7 patients	1			
> 7 patients	1.22	0.74	2.02	**0.443**

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Table 28 The full model of multiple logistic regression of MSDs at neck position (Cont.)

	Odds ratio	**95% CI for MSDs**		**p-value**
		Lower	**Upper**	
Using mirror				
Indirect > Direct	1			
Indirect ≤ Direct	0.48	0.29	0.80	**0.005**
Sitting position				
Alternating positions	1			
Sitting position	1.64	0.94	2.87	0.082
Using vibrating tools				
Never or sometime	1			
Often or always	1.25	0.60	2.58	0.549
Repetitive movement				
Never or sometime	1			
Often or always	1.80	0.92	3.52	0.085
Head angle in anterior –posterior axis				
$0-30^0$	1			
$> 30^0$	2.78	1.51	5.11	**0.001**
Stress				
No or Mild - Stress	1			
Serious – Stress	1.92	1.14	3.24	
Exercise/sport				
No	1			
Yes	1.21	0.72	2.04	0.465

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Table 29 The full model of multiple logistic regressions of MSDs at shoulder position

	Odds ratio	95% CI for MSDs Lower	Upper	p-value
Age				
≥ 35 year	1			
< 35 year	0.92	0.54	1.57	0.752
Sex				
Male	1			
Female	1.38	0.81	2.35	0.233
Understands dental work pattern				
Most of time	1			
No or a little	0.62	0.27	1.46	0.274
Help meals when got sick				
Most of time	1			
No or a little	2.00	0.62	6.45	0.244
Ask for professional support				
No or a little	1			
Most of time	1.28	0.63	2.59	**0.500**
Working with anxious patients				
Almost	1			
No-infrequently	1.18	0.64	2.16	0.593
Guideline from MOH				
Almost	1			
No-infrequently	1.21	0.59	2.48	0.611
Awkward posture/ position				
Almost	1			
No-infrequently	2.28	0.92	5.65	0.076
Non-work related awkward postures				
Almost	1			
No-infrequently	1.11	0.54	2.30	0.773
Working hour per day				
1-8 hours	1			
> 8 hour	0.89	0.51	1.56	0.687
Working days per week				
1-5 days	1			
>5 days	2.22	1.06	4.67	0.035
Time working without taking 10 minute break				
≤ 60 minutes	1			
> 60	2.54	1.38	4.67	0.003
Number of patients				
0-7 patients	1			
> 7 patients	1.33	0.80	2.22	**0.277**

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Table 29 The full model of multiple logistic regressions of MSDs at shoulder position (Cont.)

	Odds ratio	95% CI for MSDs Lower	Upper	p-value
Using mirror				
Indirect > Direct	1			
Indirect ≤ Direct	0.36	0.21	0.60	0.000
Sitting position				
Alternating positions	1			
Sitting position	1.01	0.58	1.77	0.963
Using vibrating tools				
Never or sometime	1			
Often or always	0.94	0.44	2.01	0.876
Repetitive movement				
Never or sometime	1			
Often or always	2.15	1.09	4.25	0.027
Head angle in anterior –posterior axis				
$0\text{-}30^0$	1			
$> 30^0$	1.63	0.89	2.99	0.114
Stress				
No or Mild - Stress	1			
Serious – Stress	2.86	1.38	4.03	0.002
Exercise/sport				
No	1			
Yes	1.62	0.96	2.74	0.069

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Table 30 The full model of multiple logistic regressions of MSDs at lower back position

	Odds ratio	95% CI for MSDs		p-value
		Lower	Upper	
Age				
≥ 35 year	1			
< 35 year	0.48	0.28	0.81	0.006
Sex				
Male	1			
Female	1.34	0.79	2.27	0.277
Understands dental work pattern				
Most of time	1			
No or a little	1.24	0.55	2.78	0.600
Help daily routine meals when got sick				
Most of time	1			
No or a little	1.09	0.38	3.314	0.875
Ask for professional support				
No or a little	1			
Most of time	2.70	1.33	5.46	**0.006**
Working with anxious patients				
Almost	1			
No-infrequently	1.05	0.58	1.88	0.881
Guideline from MOH				
Almost	1			
No-infrequently	1.58	0.80	3.13	0.186
Awkward posture/ position				
Almost	1			
No-infrequently	0.49	0.21	1.14	0.096
Non-work related awkward postures				
Almost	1			
No-infrequently	2.65	1.28	5.49	0.009
Working hour per day				
1-8 hours	1			
> 8 hour	1.59	0.92	2.77	0.099
Working days per week				
1-5 days	1			
>5 days	2.19	1.02	4.68	**0.044**
Time working without taking 10 minute break				
≤ 60 minutes	1			
> 60	2.53	1.42	4.48	**0.002**
Number of patients				
0-7 patients	1			
> 7 patients	1.03	0.62	1.71	**0.912**

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Table 30 The full model of multiple logistic regressions of MSDs at lower back position (Cont.)

	Odds ratio	**95% CI for MSDs**		**p-value**
		Lower	**Upper**	
Using mirror				
Indirect > Direct	1			
Indirect ≤ Direct	0.85	0.51	1.42	0.533
Sitting position				
Alternating positions	1			
Sitting position	0.50	0.28	0.89	0.018
Using vibrating tools				
Never or sometime	1			
Often or always	1.17	0.55	2.50	0.688
Repetitive movement				
Never or sometime	1			
Often or always	1.19	0.60	2.36	0.619
Head angle in anterior –posterior axis				
0-30^{0}	1			
> 30^{0}	1.66	0.94	2.95	**0.083**
Stress				
No or Mild - Stress	1			
Serious – Stress	2.05	1.22	3.46	0.007
Exercise/sport				
No	1			
Yes	1.54	0.87	2.42	0.155

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APPENDIX C

Table 31 Distribution of head and body compared with anterior-posterior and left-right axis of the Patient

Position	Frequency (N)=336	Percentage (%)
Position of head angle in anterior –posterior axis		
Head bending forward 0-30^0	250	74.4
Head bending forward 31-45	71	21.1
Head Bending forward > 45	15	4.5
Position of head angle in left – right axis		
Right side		
Head tilting (rightward) 0-30^0	263	78.3
Head tilting (rightward) 31-45^0	66	19.6
Head tiling > 45^0	7	2.1
Left side		
Head tilting (leftward) 0-30^0	290	86.3
Head tilting (leftward) 31-45^0	42	12.5
Head tilting > 45^0	4	1.2
Position of your body angle in Left-right axis		
Right side		
Body tilting (rightward) 0-30^0	292	86.9
Body tilting (rightward) 31 – 45^0	41	12.2
Body tilting (rightward) > 45^0	3	0.9
Left side		
Body bending (leftward) 0-30^0	309	92.
Body bending (leftward) 31 – 45^0	25	7.4
Body bending (leftward) > 45	2	0.6
Position of your body angle in antero-posterior axis		
Body bending 0-30^0	276	82.1
Body bending 31-45^0	51	15.2
Body bending > 45^0	9	2.7

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Table 32 Location of trouble during last 12 month and during last 7 days

Region of the body		Trouble during the last 12 months		Trouble during last 7 days	
		Number (N)=336	Percentage (%)	Number (N)=336	Percentage (%)
Any		281	83.6	11 7	34.8
Neck		195	58.0	63	18.8
Shoulder		192	57.1	61	18.2
	right	84	25.0		
	left	14	4.1		
	both	94	27.9		
Lower back		157	46.7	57	17.0
Upper back		83	24.7	19	6.0
Elbow	right	22	6.6	7	2.1
	left	2	0.6		
	both	14	4.2		
Wrists/hands	right	43	12.8	13	3.9
	left	4	1.2		
	both	21	6.3		
One or both hips/things?		33	9.8	6	1.8
One or both knees		19	5.6	6	1.8
One or both ankles/feet		14	4.2	7	2.1

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APPENDIX D

Participant Information Sheet

In this document, there may be some statements that you do not understand. Please ask the principal investigator or his/her representative to give you explanations until they are well understood. To help your decision making in participating the research, you may bring this document home to read and consult your relatives, intimates, personal doctor or other doctor.

Title of Research Project- Epidemiology of Musculoskeletal disorder among dentists in Ha Noi – Viet Nam.

Name of Researcher Dr. Ma Quang Dung.

Research Site

Master of Primary Health Care Management (MPHM) Office At ASEAN Institute for Health Development, Mahidol University, Salaya, Phutthamonthon, Nakhonpathom, Thailand

Tel. (66)24419040-3 Fax : (66)2441-9044.

Tel: 083-435-3629.

Address at Vietnam: Vietnam Cuba Hosptal. No 37, Hai Ba Trung stress , Hoan Kiem district, Hanoi City, Vietnam

Telephone number: (84) 912303473 (Vietnam); (66) 0814338994 (Thailand)

This research project aims: To study characteristics of musculoskeletal disorders and related factors among dentists in Ha Noi – Viet Nam

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The expected benefit: From the result of this study, it is hoped that the Ha Noi Department of Health, hospitals with employed dentists will be made aware of the occupational hazard afflicting them. The mentioned policy makers and organizational leaders will acknowledge the prevalence of MSDs from this local study and provide timely and effective interventions to dentists and improve their quality of life.

The dental practices are invited to participate in this research project because

The investigator would like to based on total the dentists in Hanoi city we will calculate the prevalence and find out the risk factors relationship with musculoskeletal disorders among dentists

The sample size of this study: There will be 351 participants,

Duration of study: August 2008 - February 2009 and the research project will last for 2 months/years.

If you decide to participate in the research project, you will go through the following procedures.

- A self administered questionnaire will be given to the dentist and complete the questionnaire in the presence of the investigator and representative. The questionnaire consists of 109 items about musculoskeletal disorder, socio-demography, socio support, organization factor, physical factor, psychological factor. It will take 25 minute to complete the questionnaire

Remuneration and Expense

The dentists working in government and private hospital will invited to attend the training course. They can get free updated dental topic from Viet nam Cuba hospital.

There is no remuneration for dentists can not attend the training course.

Privacy and confidentiality protection

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The dentist's private information will be kept confidential, it will not be subject to an individual disclosure, but will be included in the research report as part of the overall results. Only the investigators access to the questionnaire. The questionnaire will be destroyed after study finished.

The right to withdraw from the study

The dental practice has the right to withdraw from the project at anytime without prior notice. And the refusal to participate or the withdrawal from the research project will not at all affect the proper service that he/she will receive.

If you have any questions regarding with the study, please do not hesitate to contact with Dr Ma Quang Dung Tel. 084-0912303473.

On the condition that you are not treated as indicated in this information sheet, you can contact the Chair of Mahidol University Institutional Review Board (MU-IRB) at the office of MU-IRB, Research Administration Division, Office of the President, Mahidol University, Tel 66-2-8496223-5, Fax 66-2-8496223.

I thoroughly read the details in this document.

Signature……………………….Participant

(………………………………..)

Date……………………………..

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Form of Informed and Voluntary Consent to Participate in Research

Date..... /…..../…..........

My name is....................., aged....….years old, now living at the address no…......road/street..................district/amphur.........................province……………
Postal code……...Tel. No.:.....................

I hereby express my consent to participate as a subject in the research project [(1)] ***Epidemiology of Musculoskeletal Disorder among dentists in Ha Noi Viet Nam.***

In so doing, I am informed of the research project's origin and purposes; its procedural details to carry out or to be carried out; its expected benefits and risks that may occur to the subjects, including methods to prevent and handle harmful consequences; and remuneration, and expense. I thoroughly read the detailed statements in the information sheet given to the research subjects. I was also given explanations and my questions were answered by the head of the research project.

I therefore consent to participate as a subject in this research project [(2)].

On the condition that I have any questions about the research procedures, or on the condition that I suffer from an undesirable side effect from this research, I can contact Dr. Ma Quang Dung Tel. 084-0912303473.

On the condition that I[(*)] am not treated as indicated in the information sheet distributed to the subjects, I can contact the Chair of Mahidol University Institutional Review Board (MU-IRB) at the office of MU-IRB, Research Administration Division, Office of the President, Mahidol University, Tel 66-2-8496223-5, Fax 66-2-8496223.

I am aware of my right to further information concerning benefits and risks from the participation in the research project and my right to withdraw or refrain from the participation anytime without any consequence on the service or health care I am to receive in the future. I consent to the researchers' use of my private information obtained in this research, but do not consent to an individual disclosure of private information. The information must be presented as part of the research results as a whole.

I thoroughly understand the statements in the information sheet for the research subjects and in this consent form. I thereby give my signature.

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Signature... Participants/ Proxy/ Date...........

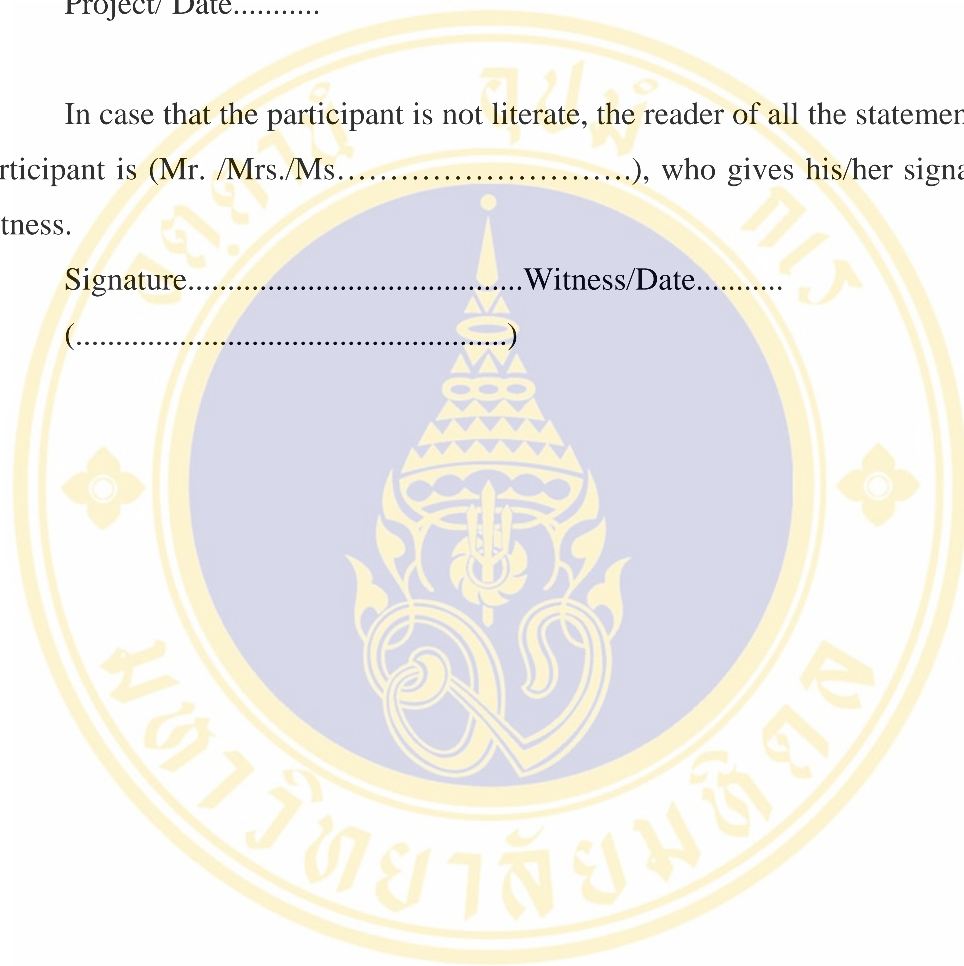
(...)

Signature... Person in Charge of Informing and Requesting a Consent/ Head of (..) Research Project/ Date...........

In case that the participant is not literate, the reader of all the statements for the participant is (Mr. /Mrs./Ms……………………….), who gives his/her signature as a witness.

Signature...Witness/Date...........

(..)



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BIOGRAPHY

NAME	Ma Quang Dung
DATE OF BIRTH	July 23, 1979
PLACE OF BIRTH	Thai Nguyen province, Vietnam
INSTITUTION ATTENDED	Hanoi Medical University, 1997-2003
	Odonto-stomatology University 2005.
	Mahidol University, 2008-2009
	Master of Primary Health Care Management,
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