PREVALENCE OF BACK PAIN AND ITS ASSOCIATED FACTORS AMONG GOVERNMENT DENTAL PERSONNEL IN KELANTAN

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LIST OF ABBREVIATIONS

BMI	body mass index
BPAI	Branson Posture Assesment Instrument
CI	confidence interval
CT	Computed Tomography
df	degree of freedom
ICC	intraclass correlation coefficient
ICD	International Classification of Disease
IQR	inter quartile range
MRI	magnetic resonance imaging
MSD	musculoskeletal disorder
NIOSH	National Institute of Occupational Safety and Health
NMRR	National Medical Research Registration
OR	odds ratio
ROC	receiver operating characteristics
SD	standard deviation
SE	standard error
SPSS	Statistical Package for Social Science
USM	Universiti Sains Malaysia
WHO	World Health Organization

ABSTRAK

PENGENALAN

Bekerja di dalam bidang pergigian mendedahkan para pekerjanya ke arah masalah sakit belakang berikutan ciri-ciri pekerjaannya yang memerlukan tahap pemfokusan yang tinggi. Ini menyebabkan posisi badan para kakitangan pergigian berada dalam keadaan tetap dan tidak selesa. Kajian ini dilaksanakan untuk menentukan prevalen dan faktor-faktor yang menyebabkan sakit belakang dalam kalangan kakitangan pergigian di klinik-klinik kerajaan di seluruh negeri Kelantan.

METODOLOGI

Satu kajian hirisan lintang yang melibatkan 350 kakitangan pergigian iaitu pegawai pergigian, jururawat pergigian, juruteknologi pergigian dan pembantu pembedahan pergigian. Semua anggota pergigian yang memenuhi kriteria yang dikehendaki telah diambil sebagai peserta dalam kajian. Pemerhatian secara langsung peserta dengan berpandukan Branson Posture Assessment Instrument (BPAI) yang telah disahkan (validated) dan proforma yang mengandungi maklumat tentang sosiodemografi dan ciri-ciri pekerjaan telah digunakan. Statistik deskriptif termasuk purata dan SD untuk data dalam bentuk nombor. Peratusan dikira untuk data dalam bentuk kategori. Analisis regresi logistik pelbagai telah digunakan untuk menentukan faktor- faktor berkaitan sakit belakang.

KEPUTUSAN

Daripada 350 peserta yang terlibat, majoriti adalah perempuan (79.1%) dan berketurunan Melayu (98.0%). Umur peserta adalah dalam julat lingkungan 22 ke 56 tahun. Prevalen sakit belakang adalah 44.9% (95% CI: 39.65, 50.07). Juruteknologi pergigian menunjukkan prevalen sakit belakang yang tertinggi iaitu 52.4% (95% CI : 40.05, 64.71). Analisis regresi logistik pelbagai menunjukkan faktor-faktor risiko bagi sakit belakang adalah posisi abnormal yang diakui sendiri oleh peserta melalui soalan yang dijawab (OR: 7.33, 95% CI: 3.19, 16.82) dan kategori pekerjaan (OR: 0.38, 95% CI: 0.20, 0.75).

KESIMPULAN

Prevalen sakit belakang adalah tinggi. Faktor-faktor risiko seperti posisi badan yang abnormal dan kategori pekerjaan merupakan faktor-faktor yang telah dikenalpasti dalam kajian ini. Justeru itu, pengubahsuaian peralatan pergigian yang ergonomik adalah salah satu cara yang boleh dilakukan untuk meningkatkan cara kerja dan kesihatan kakitangan pergigian.

KATA KUNCI

Kakitangan pergigian, prevalen, sakit belakang, "Branson Posture Assessment Instrument"

ABSTRACT

INTRODUCTION

Dentistry is a high risk profession for the development of back pain as it requires high visual demands which result in the adoption of affixed and uncomfortable postures. This study was conducted to determine the prevalence and associated factors of back pain among government dental personnel in Kelantan.

METHODS

A cross sectional study was conducted among 350 dental personnel including dentist, dental nurse, technician and dental surgery assistant in all government dental clinics in Kelantan. Non probability sampling method was applied as all subjects were included in this study. A validated Branson Posture Assessment Instrument (BPAI) and direct observation of the subjects while performing their routine task were used. Proforma on sociodemographic and occupational characteristic was used. Descriptive statistics including mean and standard deviation for numerical and percentage for categorical data were calculated. Multiple logistic regression analysis was performed to determine factors associated with back pain.

RESULTS

From 350 respondents, majority were female (79.1%) and Malay (98.0%). Age of respondents ranged from 22 to 56 year old. The prevalence of back pain was 44.9% (95% CI: 39.65, 50.07). Dental technician gave the highest prevalence of back pain 52.4% (95% CI: 40.05, 64.71). Logistic regression analysis showed that after controlling for potential confounders, the significant risk factors associated with back pain were self reported abnormal posture (OR: 7.33, 95% CI: 3.19, 16.82) and job category (OR: 0.38, 95% CI: 0.20, 0.75).

CONCLUSION

The prevalence of back pain among Kelantan dental personnel was considered high. The significant risk factors associated with back pain were abnormal posture and job category. Innovations of ergonomically friendly dental equipment is one of the method to improve the work practice and health of the dental personnel.

KEYWORDS

Dental personnel, prevalence, back pain, Branson Posture Assessment Instrument

CHAPTER ONE

1 INTRODUCTION

1.1 Background of the study

The dental sector has seen significant technical advancements in recent years. However, occupational health problems remain (Ayers *et al*., 2009). Hazards faced by dental personnel include infectious bioaerosols (from dental procedures, patients and staff, air conditioning and environment), toxicity from dental materials, contact dermatitis, noise-induced hearing loss, musculoskeletal disorder, carpal tunnel syndrome and psychological stress (Leggat e*t al*., 2007). Unfortunately, many of them paid minimal attention to these hazards until the signs and symptoms of the effects became serious and hampered daily practices. Among reasons for not seeking treatment earlier is the lack of knowledge on the effect of hazards on their work and daily activities (Fasunloro and Owotade, 2004). Majority of the personnel are not trained to specifically recognize and minimize risk from the hazards (Sanders and Turcotte, 2002).

Recently, musculoskeletal disorders (MSD) have become epidemic (Morse *et al*., 2007, Udoye and Aguwa, 2007). Musculoskeletal disorders are characterized by the presence of discomfort, disability or persistent pain in the joints, muscles, tendons and other soft parts, caused or aggravated by repeated movements and prolonged awkward or forced

body postures (Harutunian *et al.,* 2007). The prevalence of general musculoskeletal pain ranges between 64 percent and 93 percent (Hayes *et al*., 2009) and 79.8 percent of the dentists had experienced some kind of musculoskeletal pain (Harutunian *et al*., 2007). Musculoskeletal disorders (MSD) denotes health problems of the locomotor apparatus such as muscles, tendons, skeleton, cartilages, ligaments and nerves (Luttmann *et al*., 2003). These disorders can result in pain and dysfunction of neck, back and fingers. MSDs include sprains, strains, tears, back pain, soreness, pain, carpal tunnel syndrome, musculoskeletal system, or connective tissue diseases and disorders, when the event or exposure leading to the injury or illness is bodily reaction/bending, climbing, crawling, reaching, twisting, overexertion, or repetition (Barbe and Barr, 2006). Several risk factors are associated with the development or exacerbation of MSDs in the workplace, including physical, biomechanical, individual predisposition, and psychosocial (Briggs *et al.,* 2009). Results from several clinical and experimental studies indicate that tissue micro traumas occur as a consequence of performing repetitive and/or forceful tasks, and that this mechanical tissue injury leads to local and perhaps even systemic inflammation, followed by fibrotic and structural tissue change. The end result is often pain and loss of motor function (Harutunian *et al*., 2007).

The dental personnel are at a greater risk of back pain than the general population (Valachi, 2008). The prevalence of back pain among dentists has been reported as ranging from 38 (Moen and Bjorvatn, 1996) to 80 percent (Shrestha *et al*., 2008). Back pain is cited as the most common and troublesome occupational health problem reported by the dental personnel in the United States (Al Wazzan *et al*., 2001). It comprises

approximately 40 percent of all compensation claims in the United States (Lis *et al*., 2007). A survey in Dublin, Ireland by Cunningham *et al*. (2006) indicated that back pain was associated with disability and absenteeism and was one of the most common causes of sick leave in the western world. Similarly, Hayes *et al*. (2009) reported that it was also a major contributor to sick leave, reduced productivity and early retirement in dentistry. Therefore, reducing exposure to back pain in dental work may prolong professional careers (Smith *et al*., 2002). In the dental healthcare setting, performing tasks in abnormal posture for a long duration is nature for dental personnel. Static work in sitting posture which requiring spinal flexion and rotation has been associated with increased risk of back pain (Werner *et al*., 2005). Much dental work requires high precision, and the muscles used in sustaining such activity are at risk of becoming fatigued and causing discomfort. The dental team also has to work in limited work area and these working restrictions frequently caused a clinician to assume stressful body positions to achieve good access and visibility inside the oral cavity (Al Wazzan *et al*., 2001). Figure 1.1, figure 1.2, figure 1.3 and figure 1.4 show working posture of dental personnel. Risk factors for back pain can either be of individual origin or related to the workplace. The main occupational risk factors are lifting and handling of patients, uncomfortable and immobile postures, inadequate equipment, improper workplace design, heavy physical work, and inadequate work organization (Alexandrea *et al*., 2001). A cross sectional study in Norway showed that obesity is also associated with low back pain (Heuch *et al*., 2010).

Figure 1.1: One of the common working posture of a dentist

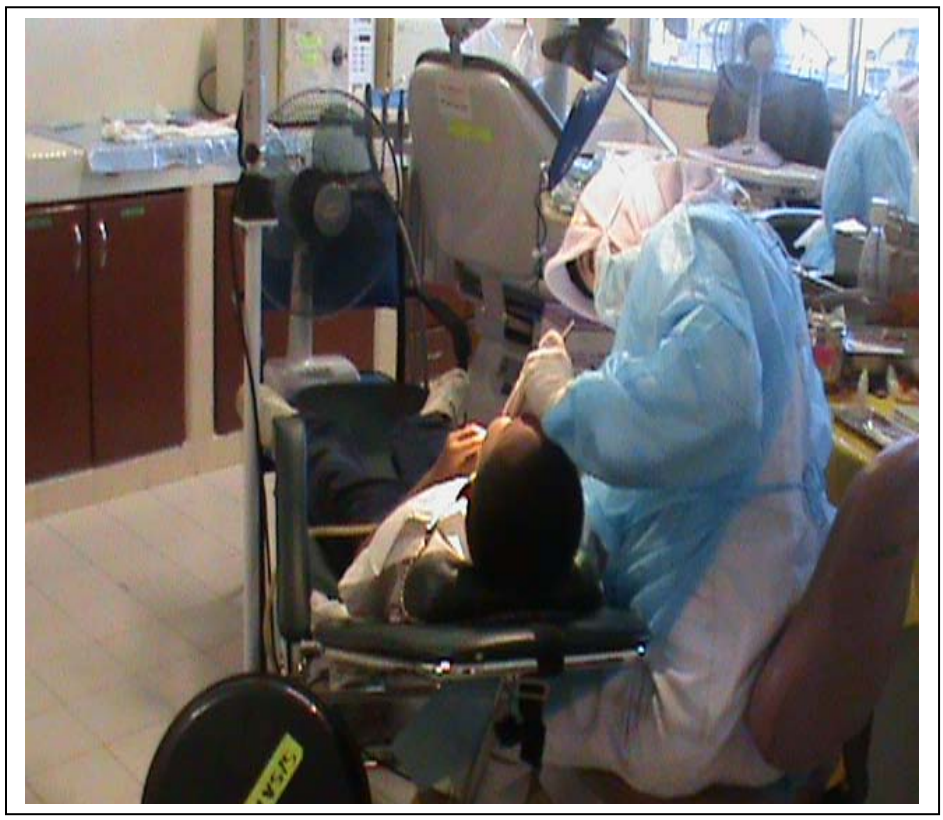

Figure 1.2: Working posture of a Dental Staff Nurse

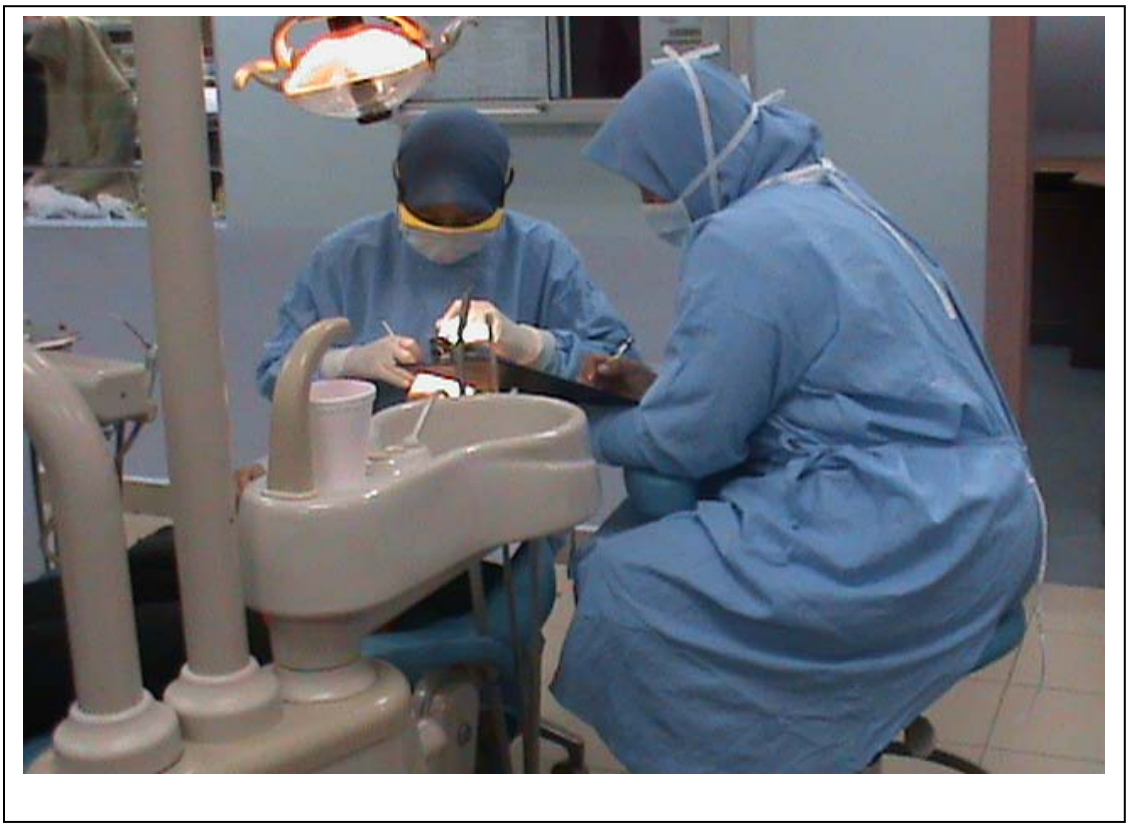

Figure 1.3: Working posture of a Dental Surgery Assistant

Figure 1.4: Working posture of a Dental Technician

1.2 Pathogenesis and clinical features

The natural history and pathogenesis of back pain and degenerative spinal changes are still not fully understood (Briggs *et al*., 2009). Among experts the consensus is that in the majority of cases there is no conclusive knowledge about the exact etiology of back pain (Johanning, 2000). According to World Health Organization (WHO), dorsopathies or back disorders are classified in the International Classification of Diseases 10 (ICD-10) into deforming dorsopathies (kyphosis and lordosis, scoliosis, spinal osteochondrosis and others), spondylopathies (ankylosing spondylitis, other inflammatory spondyloses, spondylosis, others), and other dorsopathies (intervertebral disc disorders, other dorsopathies not classified elsewhere, and dorsalgia with several subcategories) (WHO, 1992). This classification is not very useful from the point of view of epidemiological research. For acute back pain it has been estimated that for 70 percent of the cases a specific diagnosis cannot be determined, for example most of the cases fall into the category dorsalgia in the ICD-10. A large proportion of the societal burden due to back disorders is attributable to non-specific back pain (Riihimaki, 2005).

The spine made up of the bones, muscles and ligaments. There are three vertebral groups that comprise this twenty-four bone structure: the neck (seven cervical vertebrae), the middle back (12 thoracic vertebrae), and the lower back (five lumbar vertebrae).The muscles that connect the upper extremity to the vertebrae column are the latissimus dorsi and the trapezius muscles. The postures in which dentists sit require over half of the body's muscles to work to hold the body motionless while resisting gravity. Therefore,

when the supporting muscles begin to reflect fatigue, a process of pain and discomfort begins and could very well lead to musculoskeletal injury. An article by Valachi and Valachi. (2003) cited a flowchart of muscle activity and pain leading to a musculoskeletal disorder as shown in figure 1.5.

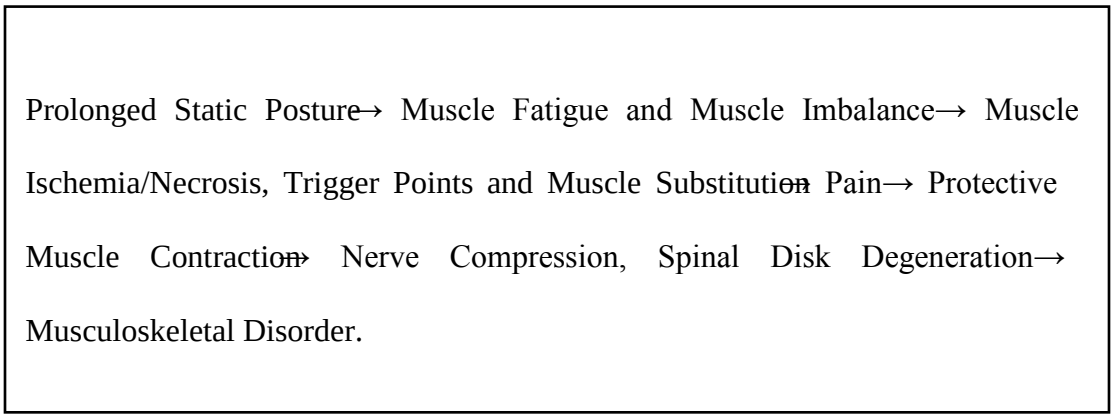

Figure 1.5: Flowchart of muscle activity leading to a musculoskeletal disorder

Muscle imbalances could result from an awkward posture. As this posture becomes the normal working position, the muscles responsible for supporting the working posture become stronger and shorter while the contrasting muscle group becomes weaker and elongated.

There are three types of back pain, acute if the pain is shorter than four weeks, chronic if the pain lasts more than three months, and subacute for pain lasting between four weeks and three months (Benoist and Lenoir, 2010).

Back pain is not a diagnosis, it is a symptom. Symptoms associated with back pain vary. Pain may be present centrally in the lumbar region and extend to one or both sides. The pain may be constant or intermittent and may occur or worsen only with certain postures. The pain may describes as sharp, shooting or radiating, a dull ache or just stiffness. If a nerve is impinged because of some pathology, numbness described as pins and needles may appear, along with cramping or burning in one or both lower limbs. In chronic cases, weakness and an inability to coordinate lower limb muscles may interfere with daily activities (Zaerian, 2009).

Acute back pain is the most common presentation and is usually self-limiting, lasting less than three months regardless of treatment. Chronic back pain is a more difficult problem, which often has strong psychological overlay: work dissatisfaction, boredom, and a generous compensation system contribute to it. Chronic back pain not only gives trouble to dental personnel but also to their patients and colleagues. It can become very debilitating and affect the quality of life of the dental professional (Zaerian, 2009). Back pain will limit the number of patients seen per day by dentists. This may result in re-scheduling and/or cancellation of appointments of million patients. As a consequence, this will affect patients and the government in terms of money. Therefore, it is important to asses and identify the risk factors in order to improve work practice and safe working environment for the dental workforce (Rising *et al*., 2005).

1.3 Rationale of the study

Back pain is a major cause of morbidity in high, middle and low income countries (Hoy *et al*., 2010). Research has indicated that back pain disability in dental personnel is growing 14 times faster than the population and accounts for 33 percent of all workers' compensation costs (Aminian *et al*., 2003). Back pain among dental personnel represents an important occupational health issue but local data on this are still lacking. Hopefully, this study will provide a database among dental personnel in our country.

The natural history and pathogenesis of back pain are still not fully understood. The consensus among expert is that back pain is a complex ailment with multiple etiologies that range from primary spinal causes to referred sources. Primary spinal back pain originates from the spinal structures, such as the vertebral bodies, discs, nerve roots, muscles and tendons. Secondary spinal sources for back pain include infection, systemic disease, metabolic and neoplastic causes (Benoist and Lenoir, 2010).

In the dental profession, dentists and dental auxiliaries spend majority of their work days in an awkward static position performing extremely precise procedures in an approximately two inches times two inches workspace, which is the patient's mouth. As there is no room for error, a steady hand and awkward posture must be assumed and maintained during the procedures. However, maintaining the steady hand and posture comes at a cost to the back, neck and shoulder area of the dentist. This study will identify

the risk factors for back pain among dental personnel. Identifying these factors are important, especially in strategizing its prevention and control. The risk factors associated with back pain range from external causes, such as occupational and non occupational activities, to intrinsic risk factors such as physiological and psychological composition of each individual patient. Occupational factors such as heavy labor and jobs that require lifting and bending have been cited as being the chief cause of pain by more than 60 percent of patients with back pain (Brown *et al.*, 2005). Physical risk factors at work include heavy manual work, lifting and carrying, whole body vibration, frequent bending and twisting, and static work postures. Repetitive or static awkward body posture resulting from excessive bending (forward and lateral) and twisting (trunk rotation or torsion) will increase the spinal stress and disproportionate loading of spinal structures. Work in forced, extreme body posture can lead to temporary or chronic spinal postural defects and neurological compression. Risk is likely to be increased with the speed of the trunk motion and the deviation from the normal (neutral) spinal posture as well as the intensity and duration of the exposure. Rapid twisting can generate shear or rotational forces on the lower back resulting in trauma (Marras *et al*., 1995). Work while in a non-neutral body posture such as stooped position, kneeling, lifting, and twisting with straight knees and extreme work positions are associated with back disorders. Prolonged sitting in poorly designed chairs within adequate lumbar support or adjustability can result in muscular fatigue and back pain (Leggat and Smith, 2006).

The psychological and social aspect of back pain is one that is challenging and complex. The psychological component alone may cause the perpetuation of symptoms and may play a major role in those with chronic back pain. Psychosocial risk factors at work include perceived high pressure on time and workload, low job control, job dissatisfaction, monotonous work, and low support from co-workers and management (Brown *et al.*, 2005). The pain suffered by dentists may lead to reduced productivity in terms of missed time from work or reduced work hours. It may also lead to inefficient movements while working, causing an increase in time spent per patient. Hence, results from this study can be used as a baseline in innovating ergonomically friendly dental unit and safe working environment. Consequently, this could improve the work practice and health of the dental personnel through relevant occupational health programs.

CHAPTER TWO

2 LITERATURE REVIEW

2.1 Back pain

Back pain is one of the most common health problems and affects 80–85 percent of people over their lifetime (WHO, 2003). It is associated with major costs, in terms of health resource usage and worker disability in the western world (Cunningham *et al.*, 2006). It is also a major cause of pain, injury, illness, reduced productivity, and work absenteeism among health care workers and dental profession.

Historically, researchers had found out that back pain is the most common problem among dental personnel (Alexopoulos *et al.*, 2004; Newella and Kumarb, 2004; Leggat *et al.*, 2006; Valachi, 2008). Dentists are usually included among the professionals with a higher incidence of back pain in the course of their professional life (Harutunian *et al.*, 2007) because of the nature of the work that require them to fully use their mental and physical abilities. As dental personnel, the level of precision and control is quite high, having to look into someone's mouth, and to work with fine tools in a confined space for long periods of time. They have to have good visual acuity, hearing, depth perception, psychomotor skills and manual dexterity and the ability to maintain occupational postures over long periods (Ayers *et al.*, 2009). Many abnormal position and uncomfortable postures that are incurred during an average work day by the dental personnel has a huge

impact on the body, and it carries with it a high prevalence of back pain. Failure to adapt to or contend with the working environment can predispose them to develop back pain (Ayers *et al.*, 2009).

It is accepted that the dental personnel suffer from all kind of musculoskeletal disorders particularly back pain due to harmful working habits and postures (Murtomaa, 1982; Moen and Bjorvatn, 1996; Marshall *et al*., 1997). Static postures of long duration, sitting or standing are characteristic of dentist's work and these have been found to be associated with symptoms of the back (Kerosuo *et al*., 2000). Fixed prosthodontic procedures were cited as the dental activity most likely to produce the symptoms (Sadig, 2000). The common postural faults among dentists and dental auxiliaries are craning and/or excessive bending and twisting of the neck, bending forward from the waist, elevation of the shoulders, and general bending or twisting of the back and neck (Al Wazzan *et al*., 2001).

Many epidemiological studies that examine issues of back pain related to ergonomic use three types of measurements (Branson *et al*, 2002). These include subjective judgments, direct measurements, and systematic observations. Examples of subjective judgements include self reports of musculoskeletal discomfort and expert judgements, such as physician diagnoses. These measurements are cost effective and data are easy to gather. However, they are limited in that they report the level and location of musculoskeletal discomfort after the trauma has occurred. Examples of direct measurements include examinations of load and measurements of stress and muscle activity using recognized

technology, such as electromyography. These investigations are more effort-intensive and involve a greater cost. The third method is systematic observations include direct analysis at the workplace or observation of video tapes. These types of systematic measurements can isolate specific information about postural features during occurrence and offer suggestions for correction before discomfort is experience by the operator. Recently, Branson's Posture Assessment Instrument (BPAI) was developed based on expert opinion of a panel of clinical dental hygienists, physical therapists, occupational therapists and educators. Branson's Posture Assessment Instrument (BPAI) has been shown to be a valid and reliable method to examine posture over a period of five minutes (Branson *et al.,* 2002). During a five minute period, the evaluators examine ten components of the body's postures and then, using established criteria, rates the postures in one of three categories: acceptable, compromised and harmful. A weighted composite score is then computed such that the final score represents posture impact over the five minute time frame. This instrument provides a means for measuring posture outside of ideal range (Branson *et al*., 2002).

The history and physical examinations are the most important components of the initial evaluation of the patient with back pain (Aminian *et al*., 2003). A primary goal of the initial evaluation is to distinguish back pain, which is generally self-limited and is not associated with neurological dysfunction, from disorders of the back which are associated with neurological signs and symptoms. This evaluation should include an investigation of signs and symptoms of spinal abnormalities and movement dysfunctions, especially of the lower back, utilizing standardized approaches and tests. Radiographic investigations

such as plain x-ray, magnetic resonance imaging (MRI) and computed tomography (CT scan) are helpful to find the cause of back pain (Johanning, 2000).

2.1.1 Prevalence of back pain among dental personnel worldwide

In Australia, musculoskeletal disorders have been shown to affect between 64 percent and 93 percent of all dental personnel (Hayes *et al.*, 2009). Musculoskeletal problems represent a significant burden for the dental profession and the most prevalent regions for pain in dentists (36.3–60.1%) have been shown to be the back (36.3–60.1%) (Hayes *et al.*, 2009). Prevalence of back pain varies across countries. The study from Nigeria reported that 77 percent of dentists complained of back pain in the study (Udoye and Aguwa, 2007) whereas a Lithuanian study found that the prevalence of back pain among dentists was 50.1 percent (Puriene *et al.*, 2008).

According to Sanders (2010), low back pain was the initial concern for dentists while carpal tunnel syndrome was identified as the primary musculoskeletal discomfort for dental hygienist (job description is quite similar to dental staff nurses). A study done in Finland reported that musculoskeletal disorders of the back and neck were more frequent experienced by the dentists than the assistants (Murtomaa, 1982). Conversely, a study in Norway found that there were no differences in musculoskeletal problem among dentists and dental auxiliaries (Moen and Bjorvatn, 1996). In Saudi Arabia, 204 dentists and dental auxiliaries were surveyed to determine the prevalence of postural problems. The candidates were interviewed and observed during practice. The data obtained showed that

111 (54.4%) of the subjects complained of neck pain and 150 (73.5%) complained of back pain (Al Wazzan *et al.,* 2001). The study also found out that dentists had relatively more neck and back pain compared to auxiliary staff. Among dentists in New Zealand, the most commonly reported sites for musculoskeletal problems were the neck (59%), lower back (57%) and shoulders (45%) (Ayers *et al*., 2009). Another survey among sixty eight dentists from Nepal revealed that back pain was the most common complaint affecting almost 80% of the study population, followed by neck pain (58.8%) and shoulder pain (47%) (Shrestha *et al.*, 2008). A questionnaire was sent to a random sample of dental practitioners in Belgium, more than half (54%) of the respondents reported low back pain (Gijbels *et al*., 2009). While a study in Australia, a self reporting questionnaire was mailed to general dentists and specialist, about 53.7 percent reported of having experienced pain at the lower back (Leggat *et al*., 2007).

A good seating and correct posture is vital for the efficient practice and to avoid chronic back pain. In order to do this, it is important to begin earning the correct posture to use while treating patients early in the dental career. A study among dental student population concluded that body pain is common even among students and men reported having the worst pain in their mid to lower back regions (Rising *et al*., 2005). This was support by a cross sectional study which was conducted to investigate the prevalence and correlates of musculoskeletal disorders among dental hygiene students. Result revealed that 57.9 percent of the dental hygiene students reported lower back pain (Hayes *et al*., 2009). Table 2.1 show the summary of previous study reports of back pain among dental personnel.

Table 2.1: Previous study reports of back pain among dental personnel

Year	Authors and place	Population group	Prevalence of back pain (%)
1987	Shugars *et al*. (United States)	Dentists	60.0
1991	Rundcrantz (Sweden)	Dentists	43.0
1996	Moen and Bjorvatn (Norway)	Dentists	38.0
2000	Kerosuo *et al*. (Finland)	General dental practitioners,office employees,orthodontists	28.0
2001	Al Wazzan *et al*. (Saudi Arabia)	Dentists and dental auxillaries	73.5
2002	Szymanska (Poland)	Dentists	60.1
2004	Newell and Kumar, (Alberta)	Orthodontists	59.0
2006	Gijbels *et al*. (Belgium)	Dentists	54.0
2007	Leggat *et al. (*Australia)	Dentists	53.7
2007	Udoye and Aguwa, (Nigeria)	Dentists	77.1
2007	Li *et al.* (Hong Kong)	Dentists	43.0
2008	Puriene *et al*. (Lithuania)	Dentists	50.1
2008	Shrestha *et al.* (Nepal)	Dentists	80.0
2008	Cameron *et al.* (Canada)	Nurses	57.0
2009	Hayes *et al*. (Australia)	Dental hygiene student	58.0
2009	Ayers *et al.* (New Zealand)	General dental practitioner	57.0
2010	Dajpratham *et al.* (Thailand)	Clinical instructors, postgraduate students, dental assistants	50.6
2010	Pargali and Jowkar, (Iran)	Dentists	28.0

2.1.2 Prevalence of back pain in Malaysia

In Malaysia, limited information is available regarding prevalence of back pain among dental personnel. Research regarding the occupational health status of dental personnel is also rare, although there are data on other healthcare workers such as nurses. In Sibu Hospital, Sarawak, a convenience sample survey design (non-intervention) using a self-administered questionnaire was conducted on staff nurses and community nurses working in surgical and orthopedic wards. The lifetime prevalence of low back pain among nurses was 74.8 percent; annual prevalence was 71.4 percent while point prevalence was 51.4 percent. There was significant strenuous activities such as lifting and bending both at work and outside work but there was no association found between these activities and low backache. Seventy-three percent reported that their low back pain affected their work significantly with lifting patient (p=0.02) and that they needed help with lifting the patients (p<0.001) (Yieng, 2007). A cross sectional study was done involving a total of 760 bus drivers from 11 bus companies in central, northern and eastern regions of Malaysia in 2005. Modified Nordic Questionnaires was used to determine the prevalence of back pain and a high prevalence of back pain (60.4%) was found among the bus drivers (Tamrin *et al*., 2007). Another cross-sectional study to asses the prevalence of musculoskeletal problems and work-related risk factors was conducted among 906 women semiconductor workers in Peninsular Malaysia. Highest prevalence were pain in the lower limbs, neck, and upper back (Chee and Rampal, 2004).

2.1.3 Risk factors of back pain among dental personnel

Backache had been attributed to many causes. The major causes of back pain are mechanical strains and sprains, lumbar spondylosis, prolapsed intervertebral disc and spinal stenosis. When it is not possible to make a specific mechanical diagnosis, then the backache is termed as non-specific backache. Non-mechanical causes include inflammatory disorders such as ankylosing spondylitis and infection, neoplasms, and osteoporosis (Morse *et al.,* 2007). In dentistry, back pain is multi-factorial in origin, organizational, personal and psychological factors may contribute to development of back pain (Sanders and Turcotte, 2002).While Driessen *et al*. (2009) stated that occupational risk factors such as lifting, physically heavy work, a static posture, frequent bending and twisting, repetitive work and exposure to vibration are risk factors for back pain.

Other primary occupational risk factors are repetition force, mechanical stresses, posture, vibration, cold temperature, extrinsic stress (Martin *et al*., 2004). Sitting in combination with other co-exposures such as whole body vibration and awkward posture does increase the association with the presence of low back pain (Lis *et al*., 2007). Medical students reporting high mental pressure were 2.9 times more likely to suffer low back pain (Smith *et al*., 2005). Repetitive movements of arms and hands, as often performed in dentistry, are known risk factors for musculoskeletal disorders (Gijbels *et al*., 2006). When comparing genders, back pain is more common in males between the ages of 35 and 55

years (Johanning, 2000). There is a higher risk of back pain in very obese people and it has been postulated that the combination of weak abdominals and increased anterior load leads to stress on the posterior elements of the lumbar spine (Hamann *et al*., 2004).

Length of appointment time was also influence back problem in a study of Danish dentists, with those dentists providing longer appointments experiencing more musculoskeletal disorders (Hayes *et al.,* 2009). According to Valachi (2008), infrequent breaks is known to be risk factor for musculoskeletal injuries.

2.1.4 Prevention and control

Chronic back pain is responsible for huge medical and compensation expenses (Benoist and Lenoir, 2010). So, early intervention is of the utmost importance. Dental personnel can reduce their risk of developing back pain by using proper body posture and positioning during clinical procedures, incorporating regular rest periods, maintaining good general health, and performing exercises for affected body area. Commonly seen postures in dentistry include the head positioned too far forward, rounded shoulders, and leaning forward at the low back. This causes stress on the ligaments and muscles that hold the joints in proper alignment. Proper position of the spine and shoulders during clinical procedures can prevent musculoskeletal and ligament fatigue that leads to injury and pain. Positioning the patient properly also assist dental personnel in maintaining his or her own optimal posture. The patient should be in the supine position with the back of the chair approximately parallel with the floor. The dentist chair should be raised or

lowered so that the patient's mouth is at the dentist's elbow level. Furthermore, the light should be utilized properly to provide good visibility and allow the dentist to maintain good posture. Adequate rest breaks should be taken as muscle contraction is required to maintain the postures that dentists use when treating patients. If any position, even a neutral one, is held too long, the muscles may fatigue and develop a tightness or spasm in response to this overworking muscle.

Several basic types of breaks are given by Lalumandier *et al*. (2001). One way is to periodically stop work, allow arms to fall relaxed to the side, and shake them for 15 seconds. This short rest from constant tension activities allow muscles to relax long enough to let blood flow into them to replenish the nutrients required for continued muscle contraction. Secondly, between patient breaks, two to three minutes can be taken to move in the direction opposite the position used to deliver the clinical services. By moving out of the maintained position, alternate muscles take over and allow relaxation of the posture muscles used most commonly. For example, if the head has been bent forward, the dental personnel should look up toward the ceiling and to each side as far as possible. These opposite motions should be performed through as much range of motion as is comfortable and performed eight to ten repetitions each. Thirdly, recovery breaks, which involves breaks of longer duration should occur every two or three hour and last for 10–15 minutes. These breaks should be scheduled throughout the day to allow complete recovery for the involved muscles. During these breaks, dental personnel can perform the same type of movements noted above to allow relaxation of posture muscles and use of alternate muscles to move the body part in the opposite direction. This does

not necessarily mean the dental personnel would have to stop working, but need only to perform alternate activities that do not require the same muscle action as the posture just performed. Moreover, they can help avoid muscle injuries by maintaining good general health. Proper diet and exercise provides the muscles with nutrients needed for constant muscle action. The heart and lungs must function well enough for adequate circulation so that the blood can get to the muscles where it is needed. Aerobic exercise promotes efficiency of the heart and lungs in providing adequate circulation to the muscles (Lalumandier *et al*., 2001). An alternative way to avoid back pain is to choose hobbies and activities that do not stress the same soft tissues that are stressed during work activities.

2.2 Conceptual framework

Figure 2.1 shows the outline of the conceptual framework in this study. There are various determinants of back pain.