The prevalence of musculoskeletal disorders (MSD) among dental students, general dental practitioners and dental specialists in Kuwait

Fatema Al Rayes, BA. BDS.

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Department of Periodontology

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APPROVED BY

Principle Investigator  Terrence Griffin, DMD.

Committee Member 1  Areej AlKabbaz, BDS, MS

Committee Member 2  Matthew Finkleman, PhD.

Committee Member 3  Rory O’Neill, BDS, DMD, MSc.
DEDICATION

To my father who inspired me, believed in me and knew I would succeed.

To my family and dear friends who always stood behind me and encouraged me.

To the people in my life who gave me strength to move forward.

I owe you all a great debt of gratitude.
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The prevalence of musculoskeletal disorders (MSD) among dental students, general dental practitioners and dental specialists in Kuwait
ABSTRACT

Objectives: This research was conducted to investigate the prevalence of musculoskeletal disorders (MSD) among dental students, general dental practitioners (GDPs) and dental specialists in Kuwait.

Material and Methods: In this cross-sectional study, a questionnaire was distributed to dental students in Kuwait University, GDPs and dental specialists working in government or private sectors in Kuwait. The questionnaire was distributed in a hard copy version and a web-based version. A modified version of the Standardized Nordic Questionnaire was used to allow the screening of musculoskeletal disorders in nine different body regions (neck, shoulders, upper back, lower back, elbows, low back, wrist/hands, hips/thighs, knees and ankles/feet).

Results: This cross-sectional study included 403 subjects. A total 88% responded to the hard copy version and 12% to the web-based version of the questionnaire. Completed questionnaires were collected from 397 subjects. Responses composed of dental students 14.4% (57/397), GDPs 45.8% (182/397) and dental specialists 39.8% (158/397). The sample consisted of 58.1%(230/396) males. The mean age (+/-SD) of the respondents was 33.32 (+/-9.88) years old and the mean body mass index (BMI) was 26.56 (+/-8.35) kg/m². Dental students had the lowest BMI with a mean of 23.53 (+/-5.18) kg/m² (P=0.003). In the total population, 92.4% of all subjects reported at least one general MSD in the past 12 months. The current study also showed that the 12-month period prevalence of work-related musculoskeletal complaint reported in at least one body
region is 91.4%. The most prevalent regions reported were the neck 66% (217/329) and low back 62.2% (202/325), while the hips/thighs 10.1% (36/358) and elbows 12.8% (45/352) regions were the least prevalent regions.

**Conclusions:** The results demonstrate that the prevalence of musculoskeletal symptoms among dental students, GDPs and specialists in Kuwait is high. The neck and low back regions were the most prevalent regions.
INTRODUCTION

The musculoskeletal system consists of components (bones, muscles, tendons, ligaments, joints, cartilage, and other connective tissue), which work together to provide body movement and support (Watkins, 2009). Musculoskeletal disorders (MSD) are identified as injuries or dysfunctions affecting the human support system of muscles, ligaments, tendons, nerves, blood vessels, bones and joints, and can cause pain in different body regions (da Costa and Vieira, 2010; Hayes et al., 2009).

According to the European Agency for Safety and Health at Work, work-related musculoskeletal disorders (WMSD) are defined as impairments of musculoskeletal system caused or worsened by work activity and by the effects of the work environment (European Agency for Safety and Health at Work, 2008). WMSD occur when the physical requirements of the work exceeds the capacity of the body. These are usually cumulative disorders, resulting from repeated exposures to loads over a long period of time (European Agency for Safety and Health at Work, 2008). According to the Health and Safety Executive report, WMSD are a major source of pain, disability, restricted activity, absenteeism, lost productivity, and costs to the employers (Parkes, 2008). In 2001, it was reported that WMSD account for a major cost of work-related illness in the United States (National Occupational Research Agenda for Musculoskeletal Disorders, 2001). It was estimated that the annual costs associated with WMSD is very high and ranges from $13 to $54 billion (National Occupational Research Agenda for Musculoskeletal Disorders, 2001).
Given the significance of this health issue, many studies have been conducted in different countries reporting the prevalence of musculoskeletal disorders among the study population. Despite this fact, little is known about the prevalence of these disorders among dental professionals in Kuwait. This study was formulated to provide further insight into the prevalence of general and work-related musculoskeletal disorder among dental workers in Kuwait.
BACKGROUND

Work-Related Musculoskeletal Disorders

A healthy person is able to perform his duty without any disturbance or impairment. To achieve optimum work performance by dental students, general dental practitioners and dental specialists, it is of paramount importance to consider the impact of their work environment on their general health. In general, dental workers may be at an increased risk of occupational hazards such as infections, allergies, toxicity, hearing impairment, musculoskeletal disorders, percutaneous or ocular injuries and psychological problems (Leggat et al., 2007). However, it has been reported that musculoskeletal disorders (MSD) is one of the major occupational health problems for dental workers (Hayes et al., 2009).

Dental work is very demanding. The posture assumed by dental professionals is often awkward. Inappropriate fixed or uncomfortable working postures with repeated, forceful and unsupported hand exertions along with inadequate equipment or workplace designs place the dentist at increased risk of MSD (Abduljabbar, 2008; Guay, 1998; Valachi and Valachi, 2003a). The field of treatment; i.e. oral cavity, usually limits dentists and forces them to acquire such unfavorable positions during work. The posture usually depends on the site of treatment in the mouth and the surface of the tooth being examined (Gijbels et al., 2006; Runderantz, 1991). Due to chronic poor posture, a forward head position is common among dentists. This unbalanced position can affect the vertebrae and may result in chronic musculoskeletal disease (Valachi and Valachi, 2003b). The treatment
also entitles repetitive movements using vibrating tools with occasional forceful hand excursions (Gijbels et al., 2006). Such cumulative pressure on the musculoskeletal system put the dental workers at high risk of developing work-related musculoskeletal disorders (Valachi and Valachi, 2003a). Dentists may experience episodic or chronic musculoskeletal symptoms during their career. Chronic pain or discomfort should be addressed and treated (Andrews and Vigoren, 2002). The cumulative load on the musculoskeletal system can lead to permanent disorder and disability (Tandon et al., 2010; Valachi and Valachi, 2003a). Thus, an optimal working environment should be maintained to lower the stresses on the musculoskeletal system.

Symptoms of MSD can present as pain, tenderness, tingling, stiffness, swelling, burning, cramping numbness, fatigue or weakness (Akrouf et al., 2010; Eltayeb et al., 2011). This can result in a decreased range of motion and loss of muscle strength or function over time (Pargali, 2010). Human muscles need recovery periods after prolonged repeated static contractions acquired from poor body posture. Muscle fatigue can lead to regional ischemia and subsequently damaged muscular tissue. As a result of these, symptoms are initiated (Pargali, 2010; Valachi and Valachi, 2003a).

The etiology of musculoskeletal disorders is multifactorial. It was established that not everyone reporting MSD complaints was exposed to occupational risk factors, and not everyone exposed at such factors develops MSD (National Research Council, 2001). MSD is a chronic condition that has multiple risk factors, both occupational and non-occupational (Punnett and Wegman, 2004; Valachi and Valachi, 2003b). In addition to
work stresses, other aspects of daily life activities may add physical stresses to the musculoskeletal tissues (Punnett and Wegman, 2004).

**The Prevalence of Musculoskeletal Disorders Among Dental Personnel**

The prevalence of musculoskeletal complaints among dental professionals is high and similar to other health care workers (Puriene et al., 2007). A recent systematic review suggested that musculoskeletal complaints represent a significant burden for dental workers (Hayes et al., 2009). The reported prevalence of general musculoskeletal disorders ranges from 64% - 93% (Hayes et al., 2009). It was also shown that dentists have a higher prevalence of pain and discomfort in certain body regions; neck, shoulders and low back, compared to other occupational groups (Guay, 1998; Rundcrantz, 1991).

There is little information on the prevalence MSD among dental students. Consequently, there is little information as to when this condition develops. Melis el al (2004) conducted a study to determine how early in a dental career musculoskeletal problems develop. The study was performed by comparing the prevalence of MSD reported by a group of dental students with a group of psychology students attending the University of Cagliari, Sardinia, Italy; and a group of dental students from the University of Saint Joseph, Beirut, Lebanon (Melis et al., 2004). The results showed that there was no difference between the Italian and Lebanese dental students. Nevertheless, the Italian dental students reported more low back pain compared to the psychology students (Melis et al., 2004). Also, a study in the United Stated by Rising et al (2005) revealed that musculoskeletal discomfort appears early in the dental profession. The study indicated
that prevalence was high, with greater than 70% of dental students reporting symptoms by their third year. Another study noted a similar observation that symptoms were more intense during the third year of dental school, with a linear increase from the first to the third year, and then decreasing until the fifth year (Abou-Atme et al., 2007). The authors hypothesized that students are taught ergonomy during their fifth year, thus their awareness on their work position is possibly improved. Hence, the impact of risk factors at work on the occurrence of symptoms is reduced (Abou-Atme et al., 2007).

**Measuring Musculoskeletal Disorders**

Choosing a certain type of questionnaire changes based on the anticipated prevalence of the health issue in a given population (Lenderink et al., 2011). Self-reported complaints or symptoms by workers may provide helpful information on the presence of work related disease. Nevertheless, it was reported that generalizing the results are limited primarily to musculoskeletal and skin disorders (Lenderink et al., 2011).

Due to the high prevalence of MSD among dental professionals reported in the literature in various countries, a self-report measure with high specificity (90%) and adequate sensitivity (70–90%) is a recommend choice (Lenderink et al., 2011). This will reveal the actual prevalence with a limited number of false negative responses (Lenderink et al., 2011).
Musculoskeletal complaints can be measured using the Standardized Nordic Questionnaire (SNQ) (Kuorinka et al., 1987). The SNQ has been applied to different occupational groups for the evaluation of musculoskeletal complaints and considered as a useful repeatable survey tool with acceptable sensitivity (Crawford, 2007). An assessment of the usefulness of SNQ screening questionnaire found adequate sensitivity (66-92%) and acceptable specificity (71 and 81%) when comparing pain in the neck and upper extremities with clinical examination (Ohlsson et al., 1994).

This questionnaire allows the screening of musculoskeletal disorders in different body regions (neck, shoulders, upper back, lower back, elbows, low back, wrist/hands, hips/thighs, knees and ankles/feet) (Kuorinka et al., 1987). The localization of symptoms or disorders in a certain region may reveal the cause of loading. Screening for musculoskeletal symptoms may serve as a diagnostic tool and facilitate the analysis of the dental work strain (Kuorinka et al., 1987). The Nordic Musculoskeletal Questionnaire was developed to standardize the measurement of reported musculoskeletal complaints and thus facilitate comparison of results between studies. This questionnaire is not indicated as a basis for clinical diagnosis, but for the identification of MSD and, as such, can provide an important diagnostic tool (Pinheiro et al., 2002).
PURPOSES AND HYPOTHESES

Given the significance of musculoskeletal disorders (MSD) and since little is known about the prevalence of this health issue among dental professionals in Kuwait, this research is aimed to report the prevalence of general and work-related musculoskeletal disorders among dental students, general dental practitioners and dental specialists in Kuwait.

The hypothesis is that the prevalence of general musculoskeletal disorders (MSD) and work-related musculoskeletal disorders (WMSD) experienced by dental students, general dental practitioners and dental specialists in Kuwait is similar to the reported prevalence in other countries.

Objectives:

1. To determine the prevalence of general musculoskeletal disorders (MSD) among dental students, GDPs and dental specialists in Kuwait in any of the nine body regions (i.e. neck, shoulders, upper back, lower back, elbows, low back, wrist/hands, hips/thighs, knees and ankles/feet).

2. To report the prevalence of work-related musculoskeletal disorders (WMSD) among dental students, GDPs and dental specialists in Kuwait in any of the nine body regions.

3. To compare the prevalence of work-related musculoskeletal disorders (WMSD) between dental students, GDPs and dental specialists in each of the nine body regions.
RESEARCH DESIGN AND METHODS

Study Design

This cross-sectional study consisted of a survey that was distributed to dental students in Kuwait University as well as general dental practitioners and dental specialists in different dental centers in Kuwait in both government and private sectors. The study was approved by the Committee for the Protection of Human Subjects in Research, Health Sciences Centre, Kuwait University, Kuwait.

The questionnaire was pilot-tested for comprehensibility and relevance on 5 dentists prior to its finalization. The questionnaire was designed in a hard copy version and a web-based version to reach as many participants as possible. Subjects were asked to answer either the online or hard copy version of the questionnaire and not both.

The hard copy version of the questionnaire was distributed to different dental centers across the country. The centers included primary and secondary health centers of the Ministry of Health. The primary health centers i.e. polyclinics are spread over the country. The services offered by them, include general dental services by general dental practitioners. Secondary healthcare services i.e. specialized dental care services are provided by the five major hospitals in different districts. These hospitals are Al-Amiri Hospital and Bned Alqar Hospital (Capital Health District), Aladan Hospital (Ahmadi Health District), Farwaniya Hospital (Farwaniya Health District), and Al-Jahra Hospital (Al-Jahra Health District). The structure of each one of these specialized dental centers
includes specialized clinics for Oral Maxillofacial Surgery, Periodontics, Prosthodontics, Orthodontics, Pedodontics and Orthodontics. Also, the questionnaire was distributed to the dental clinics at the Ministry of Defense Hospital as well as the Kuwait National Guard Clinic.

The web-based version was prepared using SurveyMonkey (www.surveymonkey.com). The e-mail list of all general dental practitioners and dental specialists was obtained from the Kuwaiti Dental Association. The e-mail list of dental students (3rd - 7th year) was obtained from the Office Of Vice Dean For Research And Student Affairs at Kuwait University, Faculty of Dentistry. Thus, the web-based version of the questionnaire was e-mailed to the third, fourth, fifth, sixth and seventh year dental students at Kuwait University as well as all dentists and specialists registered with the Kuwaiti Dental Association.

Consent was obtained from all subjects participating in the study. A consent sheet was attached to the hard copy version. Also, it was included at the beginning of the web-based version of the questionnaire. All subjects were informed that they have the right to accept or refuse participating in this study. Upon agreement, the investigators acknowledged to keep the participant's personal information strictly confidential, not to share any information outside the spectrum of this study, and not to send any data abroad for other purposes.
Questionnaire Design

The questionnaire included open and closed-ended questions. Closed-ended questions allow the participants to pick an answer from multiple choices, whereas open-ended questions let the participants to formulate their own answers.

It included four main sections. The first section contained socio-demographic data (i.e. nationality, age, gender, weight, height and number of pregnancies). The second section included dental related questions (i.e. current position, years of practice, working hours, working posture, breaks between appointments, working with a trained nurse, practicing four-handed dentistry, use of magnifying loops, work-related stress). The third section contained questions specifically related to the occurrence of musculoskeletal complaints. Information regarding the musculoskeletal disorders was obtained using a modified version of the Standardized Nordic Questionnaire. This questionnaire was aided by a body map to illustrate nine body regions (neck, shoulders, upper back, lower back, elbows, low back, wrist/hands, hips/thighs, knees and ankles/feet). Respondents were asked if they have had any musculoskeletal symptoms in the last 12 months and last 7 days which have prevented normal activity. Subjects were also asked about the functional impact of MSD on work (i.e. change of job or duties, reduce working hours or absenteeism from work). Finally, information regarding other activities such as daily exercise, contact sport activity, the use of computers and watching television were obtained in the fourth section.
Sample Size

A sample size of 57 students, 182 general dental practitioners and 158 specialists was measured to be adequate to obtain a statistical power of 80%, assuming that the effect size of $\Delta^2 = 0.025$. (nQuery Advisor version 7.0).

Statistical Analysis

Data analyses were done in two parts. The first part of the analysis represents only a partial analysis of the collected data. Data analyses were conducted by means of the IBM-SPSS version 19 and R software version 2.13. The collected data for the first part of this research were summarized by calculating the frequency and the percentage for categorical variables; and the mean with the standard deviation for continuous variables. The analysis was performed using Fisher’s exact test to identify associations between categorical variables. One-way ANOVA was used to compare means among groups. The alpha ($\alpha$) was set at 0.05.
RESULTS

This cross sectional study included 403 participants. Data analyses were conducted in two parts. The first part is presented in this research, which represents only a partial analysis of the collected data. The second part of the analysis will be presented in second report. A total of 280 hard copy version of the questionnaire was distributed to different dental centers in Kuwait. The web-based version was e-mailed to 1600 potential recipients. A total of 321 rebounded e-mails were excluded from the total. Thus, the total of delivered e-mails to potential recipients was counted to be 1279. A total of two attempts to contact potential respondents were made over 6 weeks period from the start to the end of the questionnaire collection.

The response rate was 88% (247/280) responding to the hard copy version and 12% (159/1279) to the web-based version of the questionnaire (Figure. 1). Six subjects did not wish to participate and a total of 397 responses were collected. Responses were composed of dental students 14.4% (57/397), general dental practitioners 45.8% (182/397) and dental specialists 39.8% (158/397) (Figure. 2).
Figure 1: Response rate to the hard copy and web-based versions of the survey

Figure 2: Response rate to the survey by occupation
Descriptive analysis showed a statistical difference between dental students, GDPs and specialists in terms of their mean age, nationality, gender and mean body mass index (BMI) (Table. 1). Since, some participants did not answer all the questions, the frequencies and the percentages were calculated from the total completed response to each entry. Hence, the total number for each entry is different from the total response and was identified for each entry. The predominant nationality of the respondents is Kuwaiti with a total of 67.3% (266/395); whereas the total of the non-Kuwaiti is 32.7% (129/395). The sample consisted of 58.1% (230/396) males and 41.9% (166/396) females. The mean age (+/- SD) of the respondents was 33.32 (+/- 9.88) years old and the mean BMI (+/- SD) was 26.56 (+/- 8.35) kg/m². Dental students had the lowest BMI with a mean of 23.53 (+/- 5.18) kg/m².
### Table 1: Personal characteristics among participants

<table>
<thead>
<tr>
<th></th>
<th>Dental Students</th>
<th>GDPs</th>
<th>Dental Specialists</th>
<th>Total</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>22.46 (.808)</td>
<td>30.87 (7.700)</td>
<td>40.12 (9.040)</td>
<td>33.32 (9.876)</td>
<td>0.001**</td>
</tr>
<tr>
<td><strong>Nationality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kuwaiti</td>
<td>N 52</td>
<td>141</td>
<td>73</td>
<td>266</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>%</td>
<td>19.5%</td>
<td>53%</td>
<td>27.4%</td>
<td>67.3%</td>
<td></td>
</tr>
<tr>
<td>Non-Kuwaiti</td>
<td>N 4</td>
<td>41</td>
<td>84</td>
<td>129</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>3.1%</td>
<td>31.8%</td>
<td>65.1%</td>
<td>32.7%</td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>N 4</td>
<td>103</td>
<td>123</td>
<td>230</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>%</td>
<td>1.7%</td>
<td>44.8%</td>
<td>53.5%</td>
<td>58.1%</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>N 52</td>
<td>79</td>
<td>35</td>
<td>166</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>31.3%</td>
<td>47.6%</td>
<td>21.1%</td>
<td>41.9%</td>
<td></td>
</tr>
<tr>
<td><strong>BMI (kg/m²)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>23.527 (5.1835)</td>
<td>26.375 (4.6396)</td>
<td>27.866 (11.6518)</td>
<td>26.566 (8.3525)</td>
<td>0.003**</td>
</tr>
</tbody>
</table>

*Fisher's Exact Test; ** One-way ANOVA, “N” represents total responses for each entry.
The prevalence of general musculoskeletal disorders among the participants was reported for any musculoskeletal symptoms in the last 12 months and the last 7 days which have prevented normal activity in any body region (Table. 2, Figure. 3, Figure. 4). In the total population, 92.4% (353/382) of all subjects reported at least one musculoskeletal complaint in the past 12 months and 67.0% (254/379) in the last 7 days. There was no statistical significant difference between dental students, GDPs and dental specialists in both time periods.

**Table 2:** Percentage of participants reporting MSD complaint in any region

<table>
<thead>
<tr>
<th>Any Region</th>
<th>Total response</th>
<th>% With MSD (last 12 mo)</th>
<th>p-value*</th>
<th>Total response</th>
<th>% With MSD (last 7 days)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dental Students</td>
<td>57</td>
<td>93.0% (53/57)</td>
<td>0.354</td>
<td>57</td>
<td>71.9% (41/57)</td>
<td>0.112</td>
</tr>
<tr>
<td>GDPs</td>
<td>174</td>
<td>94.3% (164/174)</td>
<td></td>
<td>172</td>
<td>70.9% (122/172)</td>
<td></td>
</tr>
<tr>
<td>Dental Specialists</td>
<td>151</td>
<td>90.1% (136/151)</td>
<td></td>
<td>150</td>
<td>60.7% (91/150)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>382</td>
<td>92.4% (353/382)</td>
<td></td>
<td>379</td>
<td>67.0% (254/379)</td>
<td></td>
</tr>
</tbody>
</table>

*Fisher's Exact Test
Figure 3: Percentage with MSD symptoms in any region among participants during the last 12 months

Figure 4: Percentage with MSD symptoms in any region among participants during the last 7 days
The prevalence of work-related musculoskeletal disorders among the participants was determined by excluding those who reported other reasons for any musculoskeletal symptoms i.e. due to a diagnosed musculoskeletal disease (autoimmune, genetic, metabolic) or due to an injury or trauma (skeletal, muscular, tendon or ligament injury). The percentage was determined for any symptom reported in the last 12 months as well as the last 7 days which have prevented normal activity in any body region (Table. 3, Figure. 5, Figure. 6).

In total, 91.4% (296/324) of all subjects reported at least one musculoskeletal complaint in the past 12 months and 61.3% (204/333) in the last 7 days. There was a statistical significant difference between dental students, GDPs and dental specialists with a complaint in the last 7 days (p=0.024).
Table 3: Percentage of participants reporting WMSD symptoms in any region

<table>
<thead>
<tr>
<th>Any Region</th>
<th>Total response</th>
<th>% with WMSD (last 12 mo)</th>
<th>p-value*</th>
<th>Total response</th>
<th>% with WMSD (last 7 days)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental Students</td>
<td>55</td>
<td>92.7% (51/55)</td>
<td>0.192</td>
<td>54</td>
<td>70.4% (38/54)</td>
<td>0.024</td>
</tr>
<tr>
<td>GDPs</td>
<td>147</td>
<td>93.9% (138/147)</td>
<td></td>
<td>154</td>
<td>65.6% (101/154)</td>
<td></td>
</tr>
<tr>
<td>Dental Specialists</td>
<td>122</td>
<td>87.7% (107/122)</td>
<td></td>
<td>125</td>
<td>52.0% (65/125)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>324</td>
<td>91.4% (296/324)</td>
<td></td>
<td>333</td>
<td>61.3% (204/333)</td>
<td></td>
</tr>
</tbody>
</table>

*Fisher's Exact Test
Figure 5: Percentage with WMSD in any region among participants during the last 12 months

Figure 6: Percentage with WMSD in any region among participants during the last 7 days
The percentage of subjects reporting any work related musculoskeletal symptom (WMSD); which have prevented normal activity in the last 12 months and the last 7 days, was calculated for each body region (i.e. neck, shoulders, upper back, lower back, elbows, low back, wrist/hands, hips/thighs, knees and ankles/feet) (Tables 5-12).

The most prevalent regions reported with symptoms in the last 12 months were the neck 66% (217/329) (Table. 5) and low back 62.2% (202/325) (Table. 9), while the hips/thighs 10.1% (36/358) (Table. 10) and elbows 12.8% (45/352) (Table. 6) regions were the least prevalent regions (Figure. 7). On the other hand, the most reported regions with WMSD complaints in the last 7 days was in neck 32.7% (114/349) (Table. 5) and low back 32.7% (112/342) (Table. 9), while wrists/hands 4.1% (13/319) (Table. 7) and elbows 4.7% (17/363) (Table. 6) regions were the least reported regions.

There was a statistical difference between dental students, GDPs and dental specialists in the shoulder region in the last 12 months (p= 0.041) and the last 7 days (p= 0.005), wrists/hands region in the last 12 months and 7 days period (p<0.001) as well as the upper back (p= 0.021) and ankles/feet (p= 0.027) regions in the last 12 months.

Dental students had the highest percentage of WMSD complaints in the last 12 months in seven out of the nine body regions (neck, shoulders, wrists/hands, upper back, low back, hips/thighs and ankles/feet).
Table 4: Percentage of participants reporting WMSD in the neck region

<table>
<thead>
<tr>
<th>NECK Region</th>
<th>Total Response</th>
<th>% With WMSD (last 12 mo)</th>
<th>p-value*</th>
<th>Total response</th>
<th>% With WMSD (last 7 days)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental Students</td>
<td>55</td>
<td>72.7% (40/55)</td>
<td>0.245</td>
<td>55</td>
<td>40.0% (22/55)</td>
<td>0.458</td>
</tr>
<tr>
<td>GDPs</td>
<td>152</td>
<td>67.8% (103/152)</td>
<td></td>
<td>163</td>
<td>31.3% (51/163)</td>
<td></td>
</tr>
<tr>
<td>Dental Specialists</td>
<td>122</td>
<td>60.7% (74/122)</td>
<td></td>
<td>131</td>
<td>31.3% (41/131)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>329</td>
<td>66.0% (217/329)</td>
<td></td>
<td>349</td>
<td>32.7% (114/349)</td>
<td></td>
</tr>
</tbody>
</table>

*Fisher’s Exact Test
**Table 5:** Percentage of participants reporting WMSD in the shoulders region

<table>
<thead>
<tr>
<th>SHOULDER Region</th>
<th>Total response</th>
<th>% with WMSD (last 12 mo)</th>
<th>p-value*</th>
<th>Total response</th>
<th>% with WMSD (last 7 days)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental Students</td>
<td>57</td>
<td>64.9%</td>
<td>0.041</td>
<td>56</td>
<td>42.9%</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(37/57)</td>
<td></td>
<td></td>
<td>(24/56)</td>
<td></td>
</tr>
<tr>
<td>GDPs</td>
<td>154</td>
<td>57.8%</td>
<td></td>
<td>161</td>
<td>28.6%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(89/154)</td>
<td></td>
<td></td>
<td>(46/161)</td>
<td></td>
</tr>
<tr>
<td>Dental Specialists</td>
<td>131</td>
<td>46.6%</td>
<td></td>
<td>136</td>
<td>19.9%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(61/131)</td>
<td></td>
<td></td>
<td>(27/136)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>342</td>
<td>54.7%</td>
<td></td>
<td>353</td>
<td>27.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(187/342)</td>
<td></td>
<td></td>
<td>(97/353)</td>
<td></td>
</tr>
</tbody>
</table>

*Fisher's Exact Test
Table 6: Percentage of participants reporting WMSD in the elbows region

<table>
<thead>
<tr>
<th>ELBOWS Region</th>
<th>Total response</th>
<th>% with WMSD (last 12 mo)</th>
<th>p-value*</th>
<th>Total response</th>
<th>% with WMSD (last 7 days)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental Students</td>
<td>57</td>
<td>12.3% (7/57)</td>
<td>0.827</td>
<td>57</td>
<td>5.3% (3/57)</td>
<td>0.416</td>
</tr>
<tr>
<td>GDPs</td>
<td>160</td>
<td>11.9% (19/160)</td>
<td></td>
<td>167</td>
<td>6.0% (10/167)</td>
<td></td>
</tr>
<tr>
<td>Dental Specialists</td>
<td>135</td>
<td>14.1% (19/135)</td>
<td></td>
<td>139</td>
<td>2.9% (4/139)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>352</td>
<td>12.8% (45/352)</td>
<td></td>
<td>363</td>
<td>4.7% (17/363)</td>
<td></td>
</tr>
</tbody>
</table>

*Fisher's Exact Test
Table 7: Percentage of participants reporting WMSD in the wrists/hands region

<table>
<thead>
<tr>
<th>WRISTS/HANDS Region</th>
<th>Total response</th>
<th>% with WMSD (last 12 mo)</th>
<th>p-value*</th>
<th>Total response</th>
<th>% with WMSD (last 7 days)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental Students</td>
<td>39</td>
<td>25.6% (10/39)</td>
<td>&lt;0.001</td>
<td>47</td>
<td>12.8% (6/47)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>GDPs</td>
<td>125</td>
<td>18.4% (23/125)</td>
<td></td>
<td>144</td>
<td>4.9% (7/144)</td>
<td></td>
</tr>
<tr>
<td>Dental Specialists</td>
<td>98</td>
<td>1.0% (1/98)</td>
<td></td>
<td>128</td>
<td>0.0% (0/128)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>262</td>
<td>13% (34/262)</td>
<td></td>
<td>319</td>
<td>4.1% (13/319)</td>
<td></td>
</tr>
</tbody>
</table>

*Fisher's Exact Test
### Table 8: Percentage of participants reporting WMSD in the upper back region

<table>
<thead>
<tr>
<th>UPPER BACK Region</th>
<th>Total response</th>
<th>% with WMSD (last 12 mo)</th>
<th>p-value*</th>
<th>Total response</th>
<th>% with WMSD (last 7 days)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental Students</td>
<td>54</td>
<td>57.4% (31/54)</td>
<td>0.021</td>
<td>53</td>
<td>30.2% (16/53)</td>
<td>0.091</td>
</tr>
<tr>
<td>GDPs</td>
<td>157</td>
<td>43.9% (69/157)</td>
<td></td>
<td>164</td>
<td>21.3% (35/164)</td>
<td></td>
</tr>
<tr>
<td>Dental Specialists</td>
<td>138</td>
<td>35.5% (49/138)</td>
<td></td>
<td>138</td>
<td>15.9% (22/138)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>349</td>
<td>42.7% (149/349)</td>
<td></td>
<td>355</td>
<td>20.6% (73/355)</td>
<td></td>
</tr>
</tbody>
</table>

*Fisher's Exact Test
Table 9: Percentage of participants reporting WMSD in the low back region

<table>
<thead>
<tr>
<th>LOW BACK Region</th>
<th>Total response</th>
<th>% with WMSD (last 12 mo)</th>
<th>p-value*</th>
<th>Total response</th>
<th>% with WMSD (last 7 days)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental Students</td>
<td>50 68.0% (34/50)</td>
<td>0.057</td>
<td>53 37.7% (20/53)</td>
<td>0.108</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDPs</td>
<td>149 67.1% (100/149)</td>
<td>155 36.8% (57/155)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dental Specialists</td>
<td>126 54.0% (68/126)</td>
<td>134 26.1% (35/134)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>325 62.2% (202/325)</td>
<td>342 32.7% (112/342)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Fisher's Exact Test
Table 10: Percentage of participants reporting WMSD in the hips/thighs region

<table>
<thead>
<tr>
<th>HIPS/THIGHS Region</th>
<th>Total response</th>
<th>% with WMSD (last 12 mo)</th>
<th>p-value*</th>
<th>Total response</th>
<th>% with WMSD (last 7 days)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental Students</td>
<td>56</td>
<td>14.3% (8/56)</td>
<td>0.258</td>
<td>57</td>
<td>5.3% (3/57)</td>
<td>0.850</td>
</tr>
<tr>
<td>GDPs</td>
<td>163</td>
<td>11.0% (18/163)</td>
<td></td>
<td>166</td>
<td>5.4% (9/166)</td>
<td></td>
</tr>
<tr>
<td>Dental Specialists</td>
<td>139</td>
<td>7.2% (10/139)</td>
<td></td>
<td>143</td>
<td>4.2% (6/143)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>358</td>
<td>10.1% (36/358)</td>
<td></td>
<td>366</td>
<td>4.9% (18/366)</td>
<td></td>
</tr>
</tbody>
</table>

*Fisher's Exact Test
Table 11: Percentage of participants reporting WMSD in the knees region

<table>
<thead>
<tr>
<th>KNEES Region</th>
<th>Total response</th>
<th>% with WMSD (last 12 mo)</th>
<th>p-value*</th>
<th>Total response</th>
<th>% with WMSD (last 7 days)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental Students</td>
<td>54</td>
<td>14.8% (8/54)</td>
<td>0.258</td>
<td>55</td>
<td>9.1% (5/55)</td>
<td>0.265</td>
</tr>
<tr>
<td>GDPs</td>
<td>148</td>
<td>19.6% (29/148)</td>
<td></td>
<td>158</td>
<td>10.8% (17/158)</td>
<td></td>
</tr>
<tr>
<td>Dental Specialists</td>
<td>136</td>
<td>12.5% (17/136)</td>
<td></td>
<td>143</td>
<td>5.6% (8/143)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>338</td>
<td>16.0% (54/338)</td>
<td></td>
<td>356</td>
<td>8.4% (30/356)</td>
<td></td>
</tr>
</tbody>
</table>

*Fisher's Exact Test
### Table 12: Percentage of participants reporting WMSD in the ankles/feet region

<table>
<thead>
<tr>
<th>ANKLES/FEET Region</th>
<th>Total response</th>
<th>% With WMSD (last 12 mo)</th>
<th>p-value*</th>
<th>Total response</th>
<th>% With WMSD (last 7 days)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental Students</td>
<td>54</td>
<td>20.4% (11/54)</td>
<td>0.027</td>
<td>57</td>
<td>7.0% (4/57)</td>
<td>0.304</td>
</tr>
<tr>
<td>GDPs</td>
<td>155</td>
<td>15.5% (24/155)</td>
<td></td>
<td>162</td>
<td>7.4% (12/162)</td>
<td></td>
</tr>
<tr>
<td>Dental Specialists</td>
<td>142</td>
<td>7.7% (11/142)</td>
<td></td>
<td>143</td>
<td>3.5% (5/143)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>351</td>
<td>13.1% (46/351)</td>
<td></td>
<td>362</td>
<td>5.8% (21/362)</td>
<td></td>
</tr>
</tbody>
</table>

*Fisher's Exact Test*
Figure 7: Percentage of WMSD Among Students, GDPs and Specialists (by Region)
DISCUSSION

Recent studies have identified that dental professionals experience a very high level of musculoskeletal complaints (Hayes et al., 2009). To the best of our knowledge, there is no published data on the prevalence of general and work-related musculoskeletal disorders among dental workers in Kuwait. Thus, the current study was uniquely formulated to assess the prevalence of general and work-related musculoskeletal disorders among dental students, general dental practitioners and specialists in Kuwait. The findings also provide further insight into the frequency of musculoskeletal complaints reported in nine different body regions.

The results of the current study indicated that 92.4% of all subjects reported at least one musculoskeletal complaint in the past 12 months and 67.0% in the last 7 days. This result cannot be directly compared to other studies looking at the same profession. Different studies looked at different groups, whereas the current study evaluated dental students, GDP and dental specialists in Kuwait.

Akesson et al (1999) reported the prevalence among female dental personnel (dentists, dental assistants and hygienists) in Sweden. The total prevalence among dentists was 92% of the subjects reported symptoms from at least one body region during the past 12 months, and 69% subjects reported such symptoms over the previous 7 days (Akesson et al., 1999). In southern Thailand, a total of 78% dentists reported musculoskeletal pain in the previous 12-month period and 36.1% in the last 7 days (Chowanadisai et al., 2000). Dentists reporting at least one musculoskeletal complaint in the last 12 months is lower in
Greece with a total of 62% (Alexopoulos et al., 2004). Anton et al. (2002) reported a high prevalence of MSD in the United States; however, the study was among dental hygienists only. The reported prevalence was 93% with at least one complaint in the last 12 months. One of the drawbacks of this study was that the survey was conducted at a continuing education program on ergonomics in dental hygiene practice. This created the possibility of selection bias and may have lead to such a high percentage (Anton et al., 2002). In Australia, the reported prevalence of musculoskeletal complaint among dentists is 82%; however, this cannot be compared to the current study since it was reported for the past month only (Marshall et al., 1997). Also, a high prevalence is also experienced by dentists in Hong Kong with 73% of dentists reporting at least one work-related MSD problem. However, the study only recorded complaints during the previous 3 months to the survey (Li et al., 2006).

The prevalence of work-related musculoskeletal disorders among the participants was determined in this study by excluding those who reported other reasons for their symptoms i.e. due to a diagnosed musculoskeletal disease (autoimmune, genetic, metabolic) or due to an injury or trauma (skeletal, muscular, tendon or ligament injury). The results showed that 91.4% of all participants reported at least one work-related musculoskeletal complaint in the past 12 months and 61.3% in the past 7 days. This finding cannot be compared with those of other studies, since no indication of exclusion of such reasons were specified in particular, but only the occurrence of general symptoms was reported.
Participants were asked to note the occurrence of the MSD complaint in nine different body regions following the SNQ (Kuorinka et al., 1987). The results revealed that the most prevalent regions with WMSD complaints in the last 12 months were the neck (66%) and low back (62.2%) regions, while the hips/thighs (10.1%) and elbows (12.8%) regions were shown to be the least prevalent.

Many studies in different countries revealed a similar pattern among the dental professionals. Al Wazzan et al (2001) showed that dentists had significantly more neck and back symptoms than dental hygienists, dental assistants, and dental technicians practicing in Saudi Arabia. The present frequencies of WMSD in the neck and low back were similar to frequencies reported for dentists in other countries. The one-year prevalence in Denmark was 65% for the neck/shoulder and 59% for the low back (Finsen et al., 1998). Likewise, in New Zealand, the highest regions reported by dentists were the neck and the low back in the last 12 months with a total of 59% and 57% respectively. On the other hand, the elbows (10%), ankles/feet (13%) and hips/thighs (15%) were the least prevalent regions (Ayers et al., 2009). Similarly, in Australia, the most prevalent musculoskeletal complaints among dentists during the previous one year were reported in the neck (57.5 %), low back (53.7 %) and shoulders (53.3 %), while the least regions reported were ankles/feet (11.5%), hips/thighs (12.6%) and elbows (13%) (Leggat and Smith, 2006).

Akesson et al (1999) presented data related to female dentists in Sweden. The data were reported only selected body regions i.e. neck, shoulders, elbows, wrists/hands, or hips.
This makes the comparison for each body region inapplicable. Yet, interestingly, the results showed a similar pattern with the most prevalent region is the neck (73%) and the least reported regions are the hips (23%) and the elbows (27%) over the last 12 months (Akesson et al., 1999). Also, the one-year prevalence of complaints in Greece was reported for certain body parts i.e. the back, neck, shoulder and hand/wrist. Low back was the most affected part with 46% (Alexopoulos et al., 2004).

In general, studies revealed that the most commonly reported sites by dental workers are the neck and back areas (Guay, 1998). Therefore, the result of this study is in agreement with other studies. However, this pattern was different than those reported for dental hygienists in the United States. Anton et al showed that the majority of the symptoms were in the wrist/hand region (69.5%), neck (68.5%), and upper back (67.4%) (Anton et al., 2002).

A noteworthy finding of the present study is that dental students had the highest percentage of WMSD complaints in the last 12 months in seven out of the nine body regions (neck, shoulders, wrists/hands, upper back, low back, hips/thighs and ankles/feet). This result indicate that WMSD symptoms starts early in the dental career. Melis et al (2004) showed a similar finding with the appearance of musculoskeletal complaints after a relatively short clinical work period among Italian and Lebanese dental students. Likewise, a study carried out in Colombia, concluded that WMSD is a common condition among dentists which begins during dental school and may continue during their professional career (Diaz-Caballero et al., 2010). In Saudi Arabia, an observational
survey evaluating the posture of dental students and pain experience after clinical work in King Abdulaziz University (KAU) revealed that 60% of the students reported neck or back pain after clinical training (Yousef and Al-Zain, 2009).

It is important to compare the current results with other workers in Kuwait. The literature is still lacking on the prevalence MSD among different workers in Kuwait. In the best of our literature search, only one study was found (Akrouf et al., 2010). Akrouf et al (2010) reported the prevalence of general MSD among bank office workers in Kuwait. Out of the 750 employees included in the study, 80% suffered at least one complaint of MSD during the previous 12 months and 57% during the previous 7 days. This indicates that the prevalence of general MSD among dental professionals in Kuwait seems to be higher than the bank office workers across the country.

Also, he reported that the most prevalent body regions among his study population were the neck (53.5%) and low back (51.1%) and the least areas are the elbows (11.5%) and the hips/thighs (13.3%) (Akrouf et al., 2010). This indicates that the pattern of affected body parts are similar for both groups and the reported symptoms among dental professionals across the country seems to be slightly higher compared to the bank office workers in Kuwait for the neck and low back regions. This is in agreement with Rundcrantz (1991) study who noted that dentists have a higher prevalence of pain in neck, shoulders and low back regions than other occupational groups (Rundcrantz, 1991). We hypothesize that this finding might be related to the nature of dental workers’ job. Unlike office workers; who are still at increased risk of developing MSD because of
possible poor workstation design, prolonged use of computers and other office tools, dental workers usually acquire awkward posture for a prolonged period of time. Office workers usually assume a better upright posture with less need to bend or lean down as dental workers do while providing dental care. This may puts dental workers at a higher risk of developing MSD.

Overall, self-report questionnaires of a work-related health symptoms are used for evaluation of the prevalence of a work-related health issue in a given population (Lenderink et al., 2011). A modified version of the Standardized Nordic Questionnaire developed by Kuorinka et al was used to estimate the prevalence of MSD among dental students, GDPs and specialists in Kuwait. Usually, a bias can be introduced to a given sample during surveys, as subjects who have symptoms are usually willing to participate in such a study rather than those who are asymptomatic. However, distributing the questionnaire in two versions allowed the inclusion of dental workers from across the country, facilitated the collection of more responses and provided a sample that represents the population adequately. This approach may have influenced the results and limited the impact of such bias. Also, approaching dentists at their clinic with a hard copy version alone may introduce a bias of excluding those who are possibly taking sick leave due to musculoskeletal reasons. There are some problems encountered in the format of the questionnaire that can be corrected in future research and applications. The format of the questionnaire caused the loss of cases as many subjects failed to register the "no" answer in the appropriate field. Thus, errors due to nonresponse may exist. Hence, the questionnaire can be modified to record only "yes" answers, which requires less effort to
Another difficulty faced in the questionnaire was separating those who have suffered from musculoskeletal disorders due to trauma or diagnosed musculoskeletal conditions in one or more body regions as well as suffering from possible work-related MSD in the same or other body regions. This can be altered by asking a direct question to indicate the presence of MSD in different body region that is not due to trauma or diagnosed musculoskeletal conditions.

Despite these limitations, the results indicated that the prevalence of musculoskeletal symptoms (MSD) among dental students, GDPs and specialists in Kuwait is high and comparable to reported frequencies in other countries.
CONCLUSION

The results demonstrate that the prevalence of general musculoskeletal symptoms (MSD) among dental students, GDPs and specialists in Kuwait is high. Several factors can contribute to the development of musculoskeletal disorders. However, the unfavorable physical load assumed by dental workers put them at higher risk of developing musculoskeletal symptoms (Rundcrantz, 1991). The current study showed that the 12-month period prevalence of general MSD reported in at least one body region is 92.4%. Also, the prevalence of work-related musculoskeletal disorders (WMSD) reported in any body region was measured to be 91.4%. The neck and low back regions were the most prevalent regions with 66% and 62.2%, respectively. On the other hand, the least prevalent regions were the hips/thighs with a frequency of 10.1% and the elbows with 12.8%.

Additionally, dental students had the highest percentage of WMSD complaints in the last 12 months in seven out of the nine body sites (neck, shoulders, wrists/hands, upper back, low back, hips/thighs and ankles/feet). This result indicate that MSD symptoms starts early in the dental career. The literature is still lacking on the prevalence MSD among dental students and there is insufficient data indicating the time of onset of this condition. Thus, further studies are needed to fill in the gap in the current knowledge. It seems crucial to pay attention to this young group in order to reduce the impact of early occurrence of MSD on their life career.
In conclusion, the collected information is useful for dental workers in Kuwait. The results provide updated information regarding the prevalence of MSD among dental workers in Kuwait. This information may be used to increase the awareness of the workers on the current high prevalence of work-related musculoskeletal disorders and motivate them to improve their musculoskeletal health.

The first part of this study provided information about the prevalence of general and work-related musculoskeletal disorders in Kuwait among dental students, GDPs and specialists. The present analysis, which represents only a partial analysis of the collected data, did not allow for finding relationships between risk factors and presence of musculoskeletal symptoms. The second part of this research will include further analysis of the collected data to find possible correlation with specific factors and the occurrence of MSD. These factors include both occupational and non-occupational factors. Moreover, the functional impact of musculoskeletal disorders on work will be reported.
REFERENCES


APPENDICES

APPENDIX 1: INFOMRED CONSENT FORM

APPENDIX 2: SURVEY QUESTIONNAIRE
APPENDIX 1: Informed Consent Form

JOINT COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS IN RESEARCH

INFORMED ADULT CONSENT

Kuwait University
Faculty of Dentistry
Department of Surgical Sciences
Division of Periodontics

Title of the Study: The prevalence of musculoskeletal disorders (MSD) among dental students, general dental practitioners and dental specialists in Kuwait.

Purpose of the Study: The aim of this research is to investigate the prevalence of musculoskeletal disorders among dental students, general dental practitioners and dental specialists in Kuwait.

This study involves answering a total of 34 questions on a questionnaire, which may take 5-10 minutes.

Every participant has the right to accept or refuse participating in this study. Upon agreement, the investigators promise to keep the participant's personal information strictly confidential, not to share any information outside the spectrum of this study, and not to send any samples abroad for other purposes. There is no obligation or compulsion for you to participate. All participants have the right to withdraw from the study at any time.

Please indicate below if you wish to participate or decline to do so:

☐ I wish to participate
☐ I do not wish to participate

Thank you for your cooperation
APPENDIX 2: Survey Questionnaire

The prevalence of musculoskeletal disorders (MSD) among dental students, general dental practitioners and dental specialists in Kuwait

<table>
<thead>
<tr>
<th>1- Socio-demographic:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please mark your answer or write your response in the space provided:</td>
</tr>
</tbody>
</table>

a. What is your nationality?  
   - [ ] Kuwaiti  
   - [ ] Non-Kuwaiti

b. What is your age?  
   - [ ] Years old

c. What is your height?  
   - [ ] cm

d. What is your weight?  
   - [ ] Kg

e. What is your gender?  
   - [ ] Male  
   - [ ] Female

(For females, please answer question f)

f. Please indicate the total number of pregnancies?  
   - [ ]
2- Dental work

Please mark your answer or write your response in the space provided:

a- What is your occupation?

☐ Dental Student Specify the year (1st-7th)……… (Please go to question c)

☐ General dental practitioner ²

☐ Dental Specialist ³ Specify the specialty………………………………

b- How long have you actually been practicing dentistry?

☐ Years

c. What is the average numbers of hours you practice dental work per day?

☐ Hours /day

d. Do you take frequent breaks between your patients’ appointments?

☐ No

☐ Yes
e- What type of posture do you usually take while working?

☐ Always standing

☐ Mostly standing

☐ Always sitting

☐ Mostly sitting

f- Do you perform your dental procedures with the help of a trained nurse/assistant?

☐ Yes, with all procedures

☐ Yes, with most procedures

☐ Yes, with limited procedures

☐ No

g- Do you practice four-handed dentistry with your trained nurse/assistant?

☐ Yes, with all procedures

☐ Yes, with most procedures

☐ Yes, with limited procedures

☐ No
<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>h- Do you perform your dental procedures with magnifying loupes?</td>
<td>□ Yes with all procedures</td>
</tr>
<tr>
<td></td>
<td>□ Yes with most procedures</td>
</tr>
<tr>
<td></td>
<td>□ Yes with limited procedures</td>
</tr>
<tr>
<td></td>
<td>□ No</td>
</tr>
<tr>
<td>i- How stressful is your working environment?</td>
<td>□ Not stressful</td>
</tr>
<tr>
<td></td>
<td>□ Mildly stressful</td>
</tr>
<tr>
<td></td>
<td>□ Moderately stressful</td>
</tr>
<tr>
<td></td>
<td>□ Extremely stressful</td>
</tr>
</tbody>
</table>
3- Musculoskeletal disorders

In this part, you will be asked about the presence of musculoskeletal symptoms in nine different regions as illustrated in the diagram below using a modified Nordic questionnaire.

Please mark your answer in the table provided for each region:

(Kuorinka et al., 1987)
<table>
<thead>
<tr>
<th>Region</th>
<th>Have you at any time during the last 12 months had trouble (ache, pain, discomfort) in:</th>
<th>Have you had trouble at any time during the last 7 days?</th>
<th>When did it first occur?</th>
<th>Is it more severe than before?</th>
<th>Is it due to a diagnosed musculoskeletal disease (autoimmune, genetic, metabolic...etc.)</th>
<th>Is it due to an injury or trauma (skeletal, muscular, tendon or ligament injury)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Shoulders</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Elbows</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Wrists/Hands</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Upper back</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Lower back</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Hips/Thighs</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Knees</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Ankles/Feet</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
If you answered 'Yes' to any of the above regions, please answer the following questions:

a. When do your symptoms usually occur?

☐ Early morning  ☐ During work  ☐ After work

☐ During sleep  ☐ All the time

b. Have you ever had treatment for your musculoskeletal disorder?

☐ No

☐ Yes  Please specify ......................................

c. Have you ever been hospitalized because of your musculoskeletal disorder?

☐ No

☐ Yes

d. Have you ever had to change jobs or duties because of your musculoskeletal disorder?

☐ No

☐ Yes
e. Have you ever been incapacitated or had to take sick leave because of your musculoskeletal disorder?

☐ No

☐ Yes  Average absenteeism days during the last 12 months ………..

f. Have you ever had to reduce your working hours?

☐ No

☐ Yes
4- Other activities

Please write your answer in the space provided:

a. On average, how many hours per day you perform physical activities like walking, jogging, aerobics, swimming or bicycling?

   [ ] Hours/day

b. On average, how many hours per day you perform physical contact sport activities like basketball, football, volleyball, karate or boxing?

   [ ] Hours/day

c. On average, how many hours per day you use your computer?

   [ ] Hours/day

d. On average, how many hours per day you watch Television?

   [ ] Hours/day