

ORIGINAL ARTICLE

A quasi-experimental study of a pilot intervention programme among UiTM dental students to curb work-related musculoskeletal disorder as an effect of performing dental extractions

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Abstract:

The effects of educational programme and the risk for work-related musculoskeletal disorders (WMSDs) among dental students were investigated. Sixty clinical dental students from year three (first clinical year) and year four (second clinical year) were participated. All participant's posture while performing dental extractions were analysed by Rapid Entire Body Assessment (REBA) to assess risk of for getting WMSDs. Participants were divided into control group and intervention group respectively from both cohorts. The Extended Nordic Musculoskeletal Questionnaire (NMQ-E) was distributed to assess the presence of pain during last 12-month, last month and today. All received a face to face (F2F) exercise session, exercise note and workout diary. The intervention group received additional educating tool of the exercise video. Post NMQ-E assessment was carried out after 4 weeks. There is statistically significant differences between year three and year four ($p < 0.00$) in which year three had a higher risk to get WMSDs based on REBA. There is no statistically significant differences between pre and post assessment of educational training on each of the body regions based on NMQ-E, neck ($p < 0.388$), shoulder ($p < 0.508$), upper back ($p < 0.146$), lower back ($p < 0.118$). It can conclude that year three has a higher risk for WMSDs compared to year four. It is imperative that this educational training should be carried out in the dental curriculum along with ergonomic training while performing clinical tasks to curb WMSDs.

Keywords: Dental students, intervention, work-related musculoskeletal disorder (WMSD)

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1. INTRODUCTION

Work-related musculoskeletal disorder (WMSD) is an injury of muscles, tendons, tendon sheathes, bursa, ligaments, joints, cartilages, nerves, blood vessels, or spinal disc related to their nature of work. WMSD occur when there is a mismatch between physical requirements of the job and the physical capacity of the human body [1]. It has been proven that it can occur from a single or repeated event of microtrauma [2].

The prevalence of WMSD among dentists is inclining worldwide [3] in their meta-analysis found that 60% of dentists in New Zealand, 68% in the United Arab Emirates (UAE), 78% in India, 78% in Thailand, 73% in Iran, and 87.2% in Australia had reported experienced WMSD. [4] also found there were high prevalence of WMSD symptoms reported from clinical dental students. Therefore, an action

had been taken to curb this problem among dentist population through exercise therapy [5-6] and ergonomics educations; in which it is found to provide positive effects.

However, there is lack of intervention had been taken on dental students in Malaysia in curbing WMSD symptoms during their educational training year [7]. It is essential for the dental students to get an exposure on how to manage their pain through exercise and ergonomics education. Even though ergonomics had been found effective in managing the WMSD in first study, but in [4] implies that there might be a gap between theory and practice when it comes to WMSD prevention. Thus, acquisition of ergonomics knowledge during early years of dental programs should be emphasizing to allow students to apply their theoretical knowledge to their clinical practice and help preventing harm habit formation.

2. MATERIALS AND METHODS

2.1 Respondent recruitment

This study used a quasi-experimental study design. It was conducted on sixty UiTM dental students at UiTM Sungai Buloh during period of October 2018 - May 2019. Prior to data collection, inform consent was obtained from participants and was approved by The Research Ethics Committee of University Technology Mara (UiTM), Selangor, Malaysia. Ethics No: REC/329/18).

Sample size was calculated by using PS software version 3.0 and participants were selected through convenience sampling method. Sample included year three (first clinical year) and year four (second clinical year). Thirty participants were from year three and year four respectively. Participants were divided into control group (n=15 y3, n=15 y4) and intervention group (n=15 y3, n=15 y4) respectively from both cohorts. Full time undergraduate students who perform upper maxillary teeth extraction were selected in this study. Meanwhile, participants with chronic problems were excluded from the study. Figure 1 shows dental student extracting the premolar teeth.

Primarily, the Extended Nordic Musculoskeletal Questionnaire (NMQ-E) [8] and Physical Activity Readiness Questionnaire (PAR-Q) assessment was distributed to all participants to assess the presence of pain during last 12-month, last month and today. Meanwhile, PAR-Q act as a tool to excluded students' presence with chronic problems. On second phase, all participant's posture while performing upper maxillary extractions were analyzed by Rapid Entire Body Assessment (REBA) [9] to assess risk of getting WMSDs from both cohorts by occupational therapists. All participants received a face to face (F2F) exercise session, exercise note and workout diary. The intervention group received additional educating tool of the exercise video. Post NMQ-E assessment was carried out to all participants to determine the effects of the educational programme after four weeks.

The questionnaire is self-administered, reliability and validity of questionnaire were established. The primary outcome of variable was the effect of the educational programme by comparing the percentages of participants reported presence of pain on pre and post programme after 4 weeks. Secondary outcome of variables was which cohort were having high risk of getting WMSDs between year three and year four.

2.2 Statistical analysis

Data were entered and analysed by using Statistical Packages for Social Sciences (SPSS) version 21.0. Mc-Nemar test were used to identify percentages of pre and post variables. Results with p-values of less than 0.05 were taken as statistically significant.



Figure 1: Dental student extracting the premolar teeth (upper maxillary jaw)

3. RESULTS

A total of 60 dental students participated in this study. Half of the participants were from year three and year four respectively. Overall majority of participants were female (90%), followed by male (10%). Most of participants have normal body mass index (71.7%). The demographic characteristics of participants are shown in Table 1.

Table 1: Demographic characteristics of participants, n=60

Variables	n (%)
Year	
Three	30 (50)
Four	30 (50)
Gender	
Male	6 (10)
Female	54 (90)
Category of Body Mass Index (BMI)	
Underweight <18.5	7 (11.7)
Normal 18.5-24.9	43 (71.7)
Overweight >25	10 (16.7)

3.1 Description reported complained region of having pain on last 12 months

Table 2 shows reported complained region experiencing pain during last 12 months. Majority of participants from year three and year four reported experiencing pain on neck region during the last 12 months which were 70% and 56.7% respectively. Among year three, more than half of participants reported pain on lower back (60%), followed by upper back pain (53.3%) and the least complained were shoulder pain (50%). Meanwhile, among year four students almost half (46.7%) of the participants complained shoulder pain followed by lower back pain (43.3%) and 26.7% reported having upper back pain.

Table 2: Reported region having pain during last 12-month, n=60

Baseline	n (%) Y3	n (%) Y4
Last 12 month		
Neck	21 (70)	17 (56.7)
Shoulder	15 (50)	14 (46.7)
Upper Back	16 (53.3)	8 (26.7)
Lower Back	18 (60)	13 (43.3)

3.2 Description of pre and post assessment of NMQ-E

Table 3 shows pre and post of NMQ-E results in assessing the effect of the educational programme between intervention and control group respectively. There was no statistically significant for neck ($p=0.388$), shoulder ($p=0.508$), upper back ($p=0.146$) and lower back ($p=0.118$) after 4 weeks. However, an improvement still can be seen between pre and post in which there is reduction of number of participants reported having pain. For neck region, almost 86.7% and 93.3% of participants from intervention and control group respectively reported having no pain. Meanwhile, for shoulder region, 93.3% and 83.3% reported the same. For upper back region, improvement can be seen when almost 96.7% of participants from control group and 83.3% of participants and meanwhile, for lower back 83.3% and 93.3% of participants from intervention and control group.

Table 3: Pre- and post-NMQE results on the effect of educational training programme between intervention and control groups

Q	Pre		Post		P-value
	IG n (%)	CG n (%)	IG n (%)	CG n (%)	
Do you have trouble today (ache, discomfort, pain) today on neck?					
Yes	6 (20)	4 (13.3)	4 (13.3)	2 (6.7)	0.388
No	24 (80)	26 (86.7)	26 (86.7)	28 (93.3)	
Do you have trouble today (ache, discomfort, pain) today on shoulder?					
Yes	6 (20)	4 (13.3)	2 (6.7)	5 (16.7)	0.508
No	24 (80)	26 (86.7)	28 (93.3)	25 (83.3)	
Do you have trouble (ache, discomfort, pain) today on upper back?					
Yes	6 (20)	5 (16.7)	4 (13.3)	1 (3.3)	0.146
No	24 (80)	25 (83.3)	26 (86.7)	29 (96.7)	
Do you have trouble (ache, discomfort, pain) today on lower back?					
Yes	9 (30)	5 (16.7)	5 (16.7)	2 (6.7)	0.118
No	21 (70)	25 (83.3)	25 (83.3)	28 (93.3)	

3.3 Description of risk of getting WMSD among year three (Y3) and year four (Y4)

Table 4 shows the reported risk of getting WMSD among year three and year four. Most of participants from year three were having more risk to get WMSD. More than half participants (51.6%) from year three experienced high risk, only 51.7% participants from year four having high risk. Less than half of participants (45.2%) participants from year three were having medium risk to get WMSD. The lowest percentage was from them having very high risk to get WMSD.

As compared to year three, year four (48.3%) were having more numbers of participants who experienced very high risk of getting WMSD. There was significant difference between year 3 and year 4 ($p<0.001$) regarding the risk of getting WMSD.

Table 4: Reported risk of getting WMSD among Y3 and Y4

Year	REBA Score			p-value
	Medium	High	Very High	
	n (%)	n (%)	n (%)	
Year 3	14 (45.2)	16 (51.6)	1 (3.2)	<0.001
Year 4	0 (0)	15 (51.7)	14 (48.3)	

4. DISCUSSION

Work-related musculoskeletal disorder (WMSD) is one of the main occupational health hazards affecting dental professionals. The prevalence of WMSD is increasing worldwide especially among dental practitioners and dental students. The results of a study conducted among UiTM undergraduate dental students experienced high prevalence sites of pain included on neck (68.2%), shoulders (47.4%), upper back (33.8%), lower back (37%).

Therefore, our study highlights to identify an effect of educational training programme in curbing WMSD among UiTM undergraduate dental students on neck, shoulder, upper back and lower back regions. In addition, review by Khan and Chew [1] suggest that prevention programme should be introduced into dental education to prevent musculoskeletal discomfort during educational training year and working life later.

Based on Table 2, the frequency of musculoskeletal pain complaints was high in the last 12 months among year three compared to year four. This difference may occur because the senior dental students are more confident in conducting basic dental procedures on patients. From this study, it further emphasized that confidence is crucial and acts as an added-value for a student to gain clinical competency [10].

Based on Table 3, results showed high frequency and percentage of musculoskeletal pain for neck region, lower back followed with shoulder areas. Researchers reported that cervical areas are typical areas of WMSD features and they are generally symptomatic injury-prone areas due to high neck muscles activity such as sternocleidomastoid (SCM) muscles [2]. Dental clinical tasks require high demands of visual concentration in a duration based on operators' clinical skills. In this occasion, SCM muscles bear a crucial role. In a study conducted by Akesson et al. [11] using electromyograph (EMG) to record the descending part of the upper trapezius muscles bilaterally and result in high muscular activity. This study proves that SCM muscles contraction lead to contraction of trapezius muscles on the same side. Hence, high load is placed on the upper trapezius muscles (shoulders region).

However, there were reduction in musculoskeletal complaints on neck, shoulder, upper back and lower back regions after one month pursuing training programme in both participants groups. Even though there is no statistically significant difference between pre and post assessment for each of the four-body region. This may be due to lack of compliance and adherence towards the exercise by the participants. Based on a study conducted by Ahmad et al. [12] reported that common stressors to third year dental students were academic-related issues such as 91.9% worried regarding examination and grading, 85.1% are afraid of failure, 78.4% having trouble in completing class work, 73% worried about completing prerequisite clinical requirements to sit for Professional Examinations. Hence, juggling academic-related and patient-related stressors may generate low adherence and compliance to the prescribed exercise regime and ergonomic training in this study.

The positive effect on this study also still can be seen among the participants from both groups even though result is not really satisfied. Most of previous study support that stretching, specific strengthening helps to alleviate the pain on neck, shoulder and lower back pain symptoms. Besides, study showed positive effect of corrective exercise training involving warm up, light exercise, special strength trainings, special resistance trainings and recovery among dentist in treating upper crossed syndrome [6].

Table 4 shows high number of third year dental students obtain a high risk for work-related musculoskeletal disorder compared to year four. This may be due to lack of dexterity in handling instruments, still new in practicing correct posture or not motivated to practice it while dental extraction as subjects are in their first clinical year.

5. CONCLUSION

In conclusion, education programme involving exercise training and ergonomics education showing positive effect in short term and still give an impact for participants who comply with the exercise.

ACKNOWLEDGEMENTS

Our heartiest gratitude to all respondents for their time and commitment. Deepest thanks to Dr Mohamad Ghazali Masuri, Senior Lecturer/Occupational Therapist, Faculty of Health Sciences, UiTM Puncak Alam Campus and Nur Nasihah Bt Ahmad Fauzi, Bachelor of Physiotherapy (Hons.) Student, Faculty of Health Sciences, UiTM, Puncak Alam Campus.

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