Research Article

Disability of Neck and Shoulder among Female Dental Students: A Pilot Study

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ABSTRACT

Background: The dentistry profession may lead to musculoskeletal pain. Although the literature highlights the high rates of neck-shoulder pain in dentists, clear evidence about the prevalence of musculoskeletal disability among female dental students is lacking. This study aimed to assess the disability level of neck and shoulder pain among dentistry students, to compare the disability level between clinical and pre-clinical dentistry students, and to assess the association between neck-shoulder pain, the Neck Disability Index (NDI), Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH).

Methods: This pilot study included 46 female dentistry students aged 19–26 years. Participant's demographics were recorded. Pain intensity was obtained using the Numerical Pain Rating Scale. Neck and shoulder disability were measured by the NDI and the QuickDASH score, respectively.

Results: 46 female dentistry students aged (21.3 ± 1.58) were included. Neck and shoulder pain occurrence were higher in clinical students compared to pre-clinical students. Pain and related disability were significantly and positively correlated.

Conclusion: This study demonstrates high rates of neck-shoulder pain in female dentistry students and a significant difference in the prevalence rate between clinical and pre-clinical students.

1. INTRODUCTION

Musculoskeletal pain is a widespread health problem. Such pain may result from various physiological changes that impact joint mobility. (Barghout et al., 2011) Neck pain is an unpleasant feeling that extends from the superior nuchal line to the level of the scapular spine, generally owing to tissue damage. (Wiederhold & Riva, 2014) Shoulder pain is in or around the sternoclavicular, acromioclavicular, glenohumeral joints, and scapulothoracic articulation. (Roach et al., 1991)

Healthcare professionals, especially dentists and dental students, are at a high risk of evolving musculoskeletal pain.(So et al., 2019) Dentistry is a profession that involves long work hours with certain postures, which can lead to musculoskeletal pain.(Samoladas et al., 2018) Samotoi et al. reported a 57% occurrence of neck pain and a 52% occurrence of shoulder pain among dentists.(Samotoi et al., 2008) In Riyadh, 90.2% of dentists suffer from musculoskeletal pain.(Al-Mohrej et al., 2016) While working on patients, dentists usually adopt an uncomfortable and asymmetric static position and sustain their head rotated, with the neck in flexion and shoulders in abduction for prolonged periods, leading to muscular weakness, discomfort, or pain.(Feng et al., 2014) Musculoskeletal pain seems to have a significant impact not only on dentists' performance but also on daily activities, such as shopping or cooking. This leads many dentists to take medical leave, reduce their working hours, and seek treatment to alleviate the pain. (Lindfors et al., 2006) Dentists' high neck and shoulder pain rates are a serious problem for their health, society, and economy. (Alghadir et al., 2015)

Musculoskeletal pain can develop early during dental education or practice and impair students' academic performance. (Hayes et al., 2009) Ohlendorf et al. investigated the prevalence of musculoskeletal pain among 450 dentists and dental students. Overall, dentists had a high

prevalence of MSD, ranging from 65.6% to 95.8%. The neck was the most affected body region (42.7%–70.9%–78.4%), followed by the shoulders (29.8%–55.6%–66.2%). Moreover, pain was more significant and frequent in females. (Ohlendorf et al., 2020) Additionally, Zafar & Almosa., assessed the prevalence of WMSDs among 142 dental students. The study found that the prevalence of neck and shoulder pain among females was (43%), (47%) respectively. (Zafar & Almosa, 2019) Whereas the prevalence of neck and shoulder pain among males was (26% and 24%) respectively. (Iqbal & Alghadir, 2015) In another study, 46.1% of dentistry students reported shoulder pain, and 37.2% reported neck pain. The neck and shoulders are the most commonly affected areas in work-related musculoskeletal disorders. These symptoms arise early in pre-clinical training years. Possible reasons include the working hours, the nature and environment of work, and the workload during the preclinical and during the pre-clinical and clinical years. (Rayyan et al., 2016)

According to several studies, female dentists had an increased prevalence of musculoskeletal pain compared to male dentists. (Al-Mohrej et al., 2016; Hayes et al., 2009; Lindfors et al., 2006) However, clear evidence of the effect of musculoskeletal pain on function among female dental students is lacking. Therefore, the primary aim of this pilot study was to assess the disability level of neck and shoulder pain among dentistry students, to compare clinical and pre-clinical dentistry students on the level of disability, and to assess the association between neck-shoulder pain, the NDI, QuickDASH.

2. MATERIALS AND METHODS

This pilot study was performed in Riyadh at Princess Nourah Bint Abdulrahman University. The inclusion criteria were female dentistry students of different study levels aged between 19–and 26 years with no pre-existing medical conditions. Female students with previous neck or shoulder injuries or surgeries and a history of medical conditions such as rheumatism and arthrosis were excluded. We recorded the participants' demographics data, including age, height, weight, body mass index (BMI), academic level, hours spent studying per day, and daily phone usage, as well as their general health status (normal body weight, physical activity and any previous medical conditions). All participants provided informed consent, which was included on the first page of the self-administered questionnaire. Ethical approval was obtained from the Institutional Review Board of PNU No. 20-0061

2.1 Pain Intensity

The pain level was assessed using the Numerical Pain Rating Scale (NPRS). The NPRS is an 11-item questionnaire in which respondents self-report pain intensity on a scale from 0 ("no pain") to 10 ("worst pain imaginable"). The NPRS can be administered verbally or self-administered graphically. The test-retest reliability for the NPRS is 67%. (Young et al., 2019) Its validity has been established previously. (Young et al., 2010) The participants rated their current pain and their pain in the past three and six months. The measurements were taken once, and the mean NPRS score was calculated.

2.2 Neck Pain–Related Disability

Disability developed by neck pain was assessed using the Neck Disability Index (NDI), a 10-item questionnaire assessing neck pain's effects on a patient's functional ability. Developed by Howard Vernon in 1989, the NDI is the frequently used questionnaire for neck pain and has high test-retest reliability and validity.(Vernon & Mior, 1991) The test-retest reliability for the NDI is 88%. Each element is rated from 0 (no disability) to 5 (maximum disability). The higher the score, the more serious the perceived disability due to neck pain.(Young et al., 2010)

2.3 Shoulder Pain–Related Disability

The Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH) is a valid and reliable self-reported questionnaire that assesses disability related to arm, shoulders, and hands pain. It is the short form of the original DASH developed by Hudak in 1996. The test-retest reliability for QuickDASH is 90%.(Angst et al., 2011) It includes 11 items (three for symptoms and eight for function) rated from 1 ("no difficulty/symptoms") to 5 ("extreme difficulty/unable to do"). It's a quick and easy-to-use questionnaire for assessing symptoms and physical function in persons with upper extremity musculoskeletal problems.(Angst et al., 2011)

2.4 Procedure

All participants received a study invitation by WhatsApp link to complete an online questionnaire from 13 February to 28 March 2020. The questionnaire consisted of two sections. The first section of the questionnaire asked about the demographic and clinical features of the participants, and the second section included the outcome measures: QuickDASH, NDI, and NPRS. The informed consent was included on the first page of the self-administered questionnaire. It contained a clear statement regarding the study's aims and procedure and clarified that participation in the study is voluntary. They could withdraw at any time, and privacy and confidentiality of participants' information would be completely protected. By proceeding to respond to the questionnaire, the subject agreed to participate in the study.

2.4 Data Analysis

The data were analysed using IBM SPSS Statistics version 22 (IBM Corp., Armonk, NY, USA) for Windows. Categorical variables were presented as frequencies, and quantitative variables were expressed as means and standard deviations. The Kolmogorov-Smirnov test was used to determine the normality of the data distribution. Associations between variables were assessed using Spearman's correlation test. The Mann-Whitney U test assessed differences between pre-clinical and clinical students. Z-test for proportion was used to assess differences of percentages in the two study populations. The level of statistical significance was set to $P < 0.05$.

3. RESULTS

Forty-six female dentistry students completed the questionnaire. Of those, 25 were pre-clinical students, and 21 were clinical students. The sampling method is a non-probability sampling technique utilizing convenience

sampling. The Kolmogorov-Smirnov test indicated that some parameters were not normally distributed; therefore, nonparametric statistical tests were used. The mean age of the participants was 21.3 ± 1.58 years (range: 19–25 years). The mean BMI was 22.7 ± 4.32. The mean time spent using a phone was 5.85 ± 3.19 hours a day, and the mean time spent studying was 5.02 ± 3.37 hours a day. The mean age and study hours differed significantly between the pre-clinical and clinical groups. No statistically significant differences in BMI and phone usage were found between the two groups (Table 1).

Table 1:Demographic of the participants (N = 46)

Variables	Overall (n = 46)	Pre-clinical group (n = 25)	Clinical group (n = 21)	P value
Age, years (mean ± SD)	21.3 (1.58)	20.2 (0.8)	22.6 (1.2)	0.001*
BMI, kg/m² (mean ± SD)	22.7 (4.32)	22.4 (4.7)	23.1 (3.8)	0.275
Daily phone usage, hours (mean ± SD)	5.85 (3.19)	6.6 (3.4)	5.1 (2.9)	0.164
Daily hours of study (mean ± SD)	5.02 (3.37)	6.4 (4.06)	4.0 (1.58)	0.017*
Prevalence of neck pain (%)	46	44	47	≤0.05*
Prevalence of shoulder pain (%)	61	48	76	≤0.05*
Neck Pain (mean ± SD)	2.52 (1.75)	2.47(1.74)	2.57 (1.80)	0.842
Shoulder Pain (mean ± SD)	2.48 (1.88)	2.30 (1.93)	2.69 (1.86)	0.371
NDI (mean ± SD)	10.6 (10.12)	11.20 (11.12)	9.86 (9.0)	0.724
QuickDASH (mean ± SD)	11.4 (10.4)	12.6 (12.2)	10.06 (7.38)	0.825

NDI = Neck Disability Index; QuickDASH = Quick Disabilities of Arm, Shoulder, and Hand.; *Significant at P ≤ 0.05.

3.1 Neck– Shoulder Pain

The results of the present study showed that 46% of the subjects had neck pain, while 61% of the subjects demonstrated shoulder pain. However, higher rates of neck and shoulder pain were observed among the clinical group, 47% and 76%, respectively. Whereas the neck and shoulder pain in the pre-clinical group was 44% and 48%, respectively. The difference was statistically significant between the groups (Figure 1).
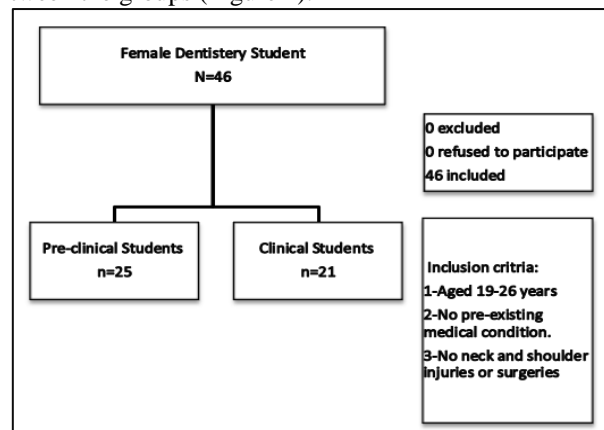

Figure 1:Flow chart of subject distribution.

3.2 Pain Intensity

The overall mean NPRS score for neck pain was 2.52 ± 1.75. The mean score in the pre-group was 2.47 ± 1.74, whereas that in the clinical group was 2.57 ± 1.80. More than half (52%) of the pre-clinical students had mild neck pain, and 24% had moderate pain. A slightly higher number of clinical students (57%) had mild neck pain, and 24% had moderate pain (Figure 2). Similarly, the overall mean NPRS score for shoulder pain was 2.48 ± 1.88. The mean score in the pre-clinical group was 2.30 ± 1.93, and that in the clinical group was 2.69 ± 1.86. In the pre-clinical group, 48% of the students had mild shoulder pain, and 20% had moderate pain. Among clinical students, 57% had mild shoulder pain, 19% had moderate pain, and 5% reported severe pain (Figure 3). There were no statistically significant differences in neck (U = 271.50, P = 0.842) and shoulder pain (U = 303, P = 0.371) between the clinical and pre-clinical groups (Table 1).
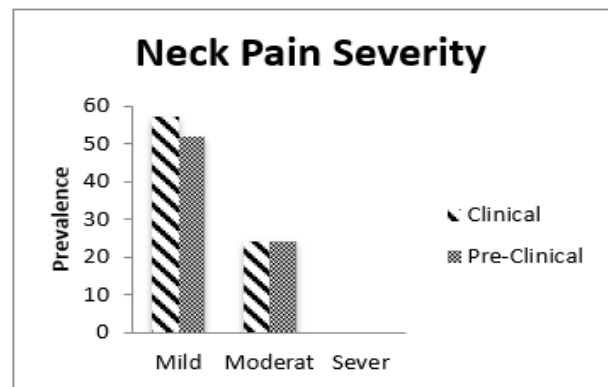

Figure 2: Neck pain severity in the pre-clinical and clinical dentistry student groups.
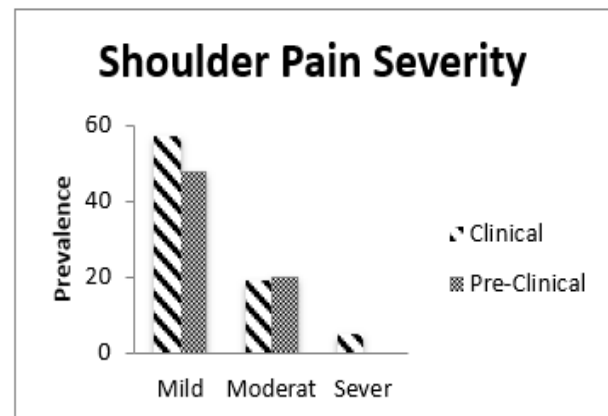

Figure 3:Shoulder pain severity in the pre-clinical and clinical dentistry student groups.

3.3 Neck Pain–Related Disability

The overall mean NDI score was 10.6 ± 10.12 (range: 1.5–36). In the pre-clinical group, the mean NDI score was 11.20 ± 11.12. In the clinical group, the score was 9.86 ± 9.0. The overall results indicated 41% disability. In the pre-clinical group, 28% of the participants reported mild disability, and 12% reported moderate disability. In the clinical group, 38% of the participants reported mild disability, and 5% reported moderate disability. There was no statistically significant difference in the NDI

score between the pre-clinical and clinical groups ($U = 246.5$, $P = 0.724$; Table 1).

3.4 Shoulder Pain–Related Disability

The mean QuickDASH score for all participants was 11.4 ± 10.4 (range: 0–40). The mean score in the pre-clinical group was 12.6 ± 12.2, while the mean score in the clinical group was 10.06 ± 7.38. No difference was obtained in the QuickDASH score between the two groups ($U = 252.5$, $P = 0.825$; Table 1).

3.5 Correlations

Moderately significant positive associations were found between the NDI and neck ($r = 0.46$, $P < 0.001$) and shoulder pain ($r = 0.39$, $P < 0.003$). A strong, significant positive correlation was observed between QuickDASH and neck pain ($r = 0.50$, $P < 0.001$), and moderately significant positive correlations were found between Quick-DASH and shoulder pain ($r = 0.49$, $P < 0.001$) and between QuickDASH and the NDI ($r = 0.44$, $P < 0.001$). There was also a moderately significant correlation between the NDI and the hours of study per day ($r = 0.38$, $P < 0.004$) and a weak significant correlation between the NDI and daily phone usage ($r = 0.26$, $P < 0.044$). No correlations were found between the other parameters (Table 2).

Table 2:Table 2: Correlation among Neck Pain, Shoulder pain, NDI, and QuickDash.

	Neck Pain	Shoulder Pain	NDI	Quick Dash	Study Hour	Phone Usage
Neck Pain	1	0.81**	0.46**	0.50**	0.14	0.03
Shoul der Pain		1	0.39**	0.49**	0.14	0.05
NDI			1	0.44**	0.38**	0.26*
Quick Dash				1	-.01	0.19
Study Hours					1	0.18
Phone Usage						1
* Significant < 0.05						
** Significant < 0.01 level.						
NDI: Neck Disability Index						

4. DISCUSSION

The prevalence of neck and shoulder pain and impairment among female dentistry students was studied at both the preclinical and clinical stages in this study. We found 46% of participants suffering from neck pain and 61% of the participants complaining of shoulder pain. This finding was consistent with Zafar & Almosa., where the prevalence of shoulder pain was higher (47%) than that of neck pain (43%) among dental students.(Zafar & Almosa, 2019) In contrast, Santos *et al.* found that the prevalence of neck pain in dentistry students was higher (51.5%) than that of shoulder pain (42%).(dos Santos et al., 2019) Additionally, Ohlendorf *et al.* found that the prevalence of neck pain was higher (42.7%–70.9%–78.4%) than shoulder pain (29.8%–55.6%–66.2%) among dentists and dental students.(Ohlendorf et al., 2020) Conversely, Feng *et al.* reported a considerably higher prevalence of neck and shoulder pain among dentists (83.8% and 73.5%, respectively).(Feng et al., 2014)

This difference may be due to the longer work hours and heavier workload of dentists than those of students and may also be attributed to age differences.

The prevalence of neck and shoulder pain was significantly higher in clinical than in pre-clinical students. These findings were similar to previous studies reporting differences in neck and shoulder pain prevalence between pre-clinical and clinical dentistry students. (Rayyan et al., 2016; Vernon & Mior, 1991; Vijay & Ide, 2016; Young et al., 2010; Young et al., 2019) This suggests that the prevalence of neck pain can increase during the clinical years, which is consistent with our findings. Another study investigated the prevalence of musculoskeletal pain in the workplace among female dentistry students at the pre-clinical and clinical levels and compared them to their counterparts at earlier academic stages. The findings showed that musculoskeletal pain signs and symptoms begin to develop early during the pre-clinical training years and increase as students advance to the clinical stage. Possible causes include the long work hours, the nature of work, the work environment, and the workload. The study found that the neck and shoulders are the body parts most affected among pre-clinical and clinical students.(Rayyan et al., 2016)

The NDI scores indicated neck disability in 41% of the participants. The rate was higher in the clinical than in the pre-clinical group, although the difference was not statistically significant. The observed significant differences in study hours between the two groups and the significant correlation between them and the NDI suggest that the study hours might increase the NDI score in both groups other than the clinical training factor. The mean NDI score indicates mild to moderate disability in dentistry students. No previous studies have used the NDI to assess disability in dentistry students. However, Rahmani *et al.* used the NDI in dental practitioners and found significant functional disability (40.14 ± 20.11), which also significantly correlated with pain intensity.(Rahmani et al., 2013)

Shoulder pain and disability were related and Quick-DASH scores ranged from 0 to 40. However, there is no categorization or benchmark for interpreting the Quick-DASH score in the literature. Moreover, we found no previous studies using QuickDASH to assess disability in dental students' or practitioners' upper extremities.

There was an association between neck and shoulder pain. This might be due to the anatomical associations between the two regions, such as the muscles (upper trapezius and levator scapulae) connecting the shoulder girdle and the cervical spine.(Wu et al., 2018) Another potential link between neck and shoulder pain may be related to a sustained static and dynamic spine posture. Static muscle contraction due to prolonged posture leads to an accumulation of lactic acid and decreases oxygen levels, causing fatigue and pain.(Rafie et al., 2015)

Another finding was the association between neck-shoulder disability and pain. This is in line with Gurav & Panhale., who reported a strong correlation between neck pain and disability of the upper extremity.(Gurav &

Panhale, 2017) No previous studies have assessed the correlations between neck and shoulder pain or between the NDI and QuickDASH in dentistry students or practitioners.

This study has certain limitations. All participants were recruited from a single university. We could not perform a regression analysis because the observed correlations were weak and the small sample size was small. Further studies involving large samples from different universities in Saudi Arabia are needed to assess the correlation between CROM and neck pain in dentistry students.

5. CONCLUSION AND RECOMMENDATION

This study demonstrates a high neck and shoulder pain rate in female dentistry students. It is possible that neck and shoulder pain develops during the pre-clinical years and intensifies during the clinical years. Students who suffer from neck and shoulder pain may experience upper limb disability that may affect their daily living activities. Our findings may help raise awareness of musculoskeletal risk factors for dental students and educate future students about preventive measures.

AUTHOR CONTRIBUTION
All authors equally contributed to the research and provided final approval for the manuscript.

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CONFLICT OF INTEREST
The Authors declared no conflict of interests.

REFERENCES
Al-Mohrej, O. A., AlShaalan, N. S., Al-Bani, W. M., Masuadi, E. M., & Almodaimegh, H. S. (2016). Prevalence of musculoskeletal pain of the neck, upper extremities and lower back among dental practitioners working in Riyadh, Saudi Arabia: a cross-sectional study. *BMJ open*, 6(6), e011100.

Alghadir, A., Zafar, H., & Iqbal, Z. A. (2015). Work-related musculoskeletal disorders among dental professionals in Saudi Arabia. *Journal of physical therapy science*, 27(4), 1107-1112.

Angst, F., Schwyzer, H. K., Aeschlimann, A., Simmen, B. R., & Goldhahn, J. (2011). Measures of adult shoulder function: Disabilities of the arm, shoulder, and hand questionnaire (DASH) and its short version (QuickDASH), shoulder pain and disability index (SPADI), American shoulder and elbow surgeons (ASES) society standardized shoulder assessment form, constant (Murley) score (CS), simple shoulder test (SST), oxford shoulder score (OSS), shoulder disability questionnaire (SDQ), and Western Ontario shoulder instability index (WOSI). *Arthritis care & research*, 63(S11), S174-S188.

Barghout, N. H., Al-Habashneh, R., & Al-Omiri, M. K. (2011). Risk factors and prevalence of musculoskeletal disorders among Jordanian dentists. *Jordan Medical Journal*, 45(2), 195-204.

dos Santos, R. R., Garbin, C. A. S., Batista, J. A., Saliba, T. A., & Garbin, A. J. I. (2019). Prevalence of musculoskeletal pain in dental students and associated factors. *Brazilian Journal of Oral Sciences*, 18, e191668-e191668.

Feng, B., Liang, Q., Wang, Y., Andersen, L. L., & Szeto, G. (2014). Prevalence of work-related musculoskeletal symptoms of the neck and upper extremity among dentists in China. *BMJ open*, 4(12), e006451.

Gurav, R. S., & Panhale, V. P. (2017). The association between neck pain and upper limb disability in patients with non-specific neck pain. *The International Journal of Health Sciences and Research*, 7, 92-97.

Hayes, M. J., Cockrell, D., & Smith, D. R. (2009). A systematic review of musculoskeletal disorders among dental professionals. *International journal of dental hygiene*, 7(3), 159-165.

Iqbal, Z., & Alghadir, A. (2015). Prevalence of work-related musculoskeletal disorders among physical therapists. *Medycyna Pracy*, 66(4), 459-469.

Lindfors, P., Von Thiele, U., & Lundberg, U. (2006). Work characteristics and upper extremity disorders in female dental health workers. *Journal of occupational health*, 48(3), 192-197.

Ohlendorf, D., Naser, A., Haas, Y., Haenel, J., Fraeulin, L., Holzgreve, F., Erbe, C., Betz, W., Wanke, E. M., & Brueggmann, D. (2020). Prevalence of musculoskeletal disorders among dentists and dental students in Germany. *International Journal of Environmental Research and Public Health*, 17(23), 8740.

Rafie, F., Zamani Jam, A., Shahravan, A., Raoof, M., & Eskandarizadeh, A. (2015). Prevalence of upper extremity musculoskeletal disorders in dentists: symptoms and risk factors. *Journal of environmental and public health*, 2015.

Rahmani, N., Amiri, M., Ali Mohseni-Bandpei, M., Mohsenifar, H., & Pourahmadi, M. R. (2013). Work related neck pain in Iranian dentists: An epidemiological study. *Journal of back and musculoskeletal rehabilitation*, 26(1), 9-15.

Rayyan, M. R., Hetou, S. C., Al Salem, R. F., Tokhtah, H. A., Alrajhi, A. D., Mohamed, L. H., Alkhouja, K. M., Al Zaben, R. M., & Al Shahri, A. A. (2016). Work-related musculoskeletal disorders among dental students of different academic levels. *Journal of International Oral Health*, 8(4), 471.

Roach, K. E., Budiman-Mak, E., Songsiridej, N., & Lertratanakul, Y. (1991). Development of a shoulder pain and disability index. *Arthritis & Rheumatism: Official Journal of the American College of Rheumatology*, 4(4), 143-149.

Samoladas, E., Barmpagianni, C., Papadopoulos, D. V., & Gelalis, I. D. (2018). Lower back and neck pain among dentistry students: a cross-sectional study in dentistry students in Northern Greece. *European Journal of Orthopaedic Surgery & Traumatology*, 28, 1261-1267.

Samotoi, A., Moffat, S., & Thomson, W. (2008). Musculoskeletal symptoms in New Zealand dental therapists: prevalence and associated disability. *The New Zealand Dental Journal*, 104(2), 49-53; quiz 65.

So, B. C., Szeto, G. P., Lau, R. W., Dai, J., & Tsang, S. M. (2019). Effects of ergomotor intervention on improving occupational health in workers with work-related neck-shoulder pain. *International Journal of Environmental Research and Public Health*, 16(24), 5005.

Vernon, H., & Mior, S. (1991). The Neck Disability Index: a study of reliability and validity. *Journal of manipulative and physiological therapeutics*, 14(7), 409-415.

Vijay, S., & Ide, M. (2016). Musculoskeletal neck and back pain in undergraduate dental students at a UK dental school—A cross-sectional study. *British dental journal*, *221*(5), 241-245.

Wiederhold, B. K., & Riva, G. (2014). Annual Review of Cybertherapy and Telemedicine 2014: Positive Change: Connecting the Virtual and the Real.

Wu, W.-T., Chang, K.-V., Han, D.-S., Lin, C.-P., & Özçakar, L. (2018). Cross-talk between shoulder and neck pain: an imaging study of association between rotator cuff tendon tears and cervical foraminal stenosis. *Medicine*, *97*(36).

Young, I. A., Cleland, J. A., Michener, L. A., & Brown, C. (2010). Reliability, construct validity, and responsiveness of -the neck disability index, patient-specific functional scale, and numeric pain rating scale in patients with cervical radiculopathy. *American journal of physical medicine & rehabilitation*, *89*(10), 831-839.

Young, I. A., Dunning, J., Butts, R., Mourad, F., & Cleland, J. A. (2019). Reliability, construct validity, and responsiveness of the neck disability index and numeric pain rating scale in patients with mechanical neck pain without upper extremity symptoms. *Physiotherapy theory and practice*, *35*(12), 1328-1335.

Zafar, H., & Almosa, N. (2019). Prevalence of work-related musculoskeletal disorders among dental students of King Saud University, Riyadh, Kingdom of Saudi Arabia. *Journal of Contemporary Dental Practice*, *20*(4), 449-453.