

Association Between Work-Related Musculoskeletal Symptoms (WMSs) and Quality of Life of Dental Practitioners in Peshawar City: A Cross-sectional Study

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Abstract

Introduction: The frequency of Work-related musculoskeletal symptoms (WMSs) is high among dentists. WMSs such as pain can have adverse effects on the quality of life (QoL) of dental practitioners but very few studies have been conducted on it.

Objectives: The main purpose of this research study was to determine the frequency of WMSs i.e. pain in different body regions and also its effect on the physical and psychological aspects of the quality of life of dental practitioners in Peshawar city.

Materials and Methods: A cross-sectional study was conducted between January 2023 and April 2023 in dental teaching institutes of Peshawar city. Data was collected from 163 dental practitioners, recruited through the convenience sampling method. Basic demographics, dentistry work experience, and health-related characteristics were recorded. WMSs of the participants were scored with the Nordic Musculoskeletal Questionnaire (NMQ). A self-structured questionnaire was used to evaluate the physical and psychological aspects of QoL.

Results: Multiple linear regression analysis was used to reduce confounding bias and assess the association between predictor variables and QoL. The body regions with the most WMSs were the neck and lower back (56.4 % each) in the last 12 months while the most painful body region in the last 7 days was the lower back (46 %). A significant association was found between the most prevalent WMSs i.e. lower back pain and physical health ($\beta = -0.234$, p value = 0.002) and psychological aspects ($\beta = -0.205$, p value = 0.008) of QoL.

Conclusion: We can conclude that the lower back was the most commonly affected body regions due to WMSs. WMSs have a negative impact on the physical and psychological aspects of QoL. However, we only evaluated the association of WMSs with physical and psychological aspects of QoL and future studies should try to overcome this gap.

Keywords: Work-related musculoskeletal symptoms, Dental practitioners, Quality of life

Introduction

Work-related Musculoskeletal symptoms(WMSs) can be defined as any injury to the human support system that includes the bones, cartilage, muscles, ligaments, tendons, blood vessels, or nerves, caused or aggravated mainly by performing work-related tasks or as a consequences of the working environment ¹. The most common work-related musculoskeletal symptom (WMSs) experienced by a healthcare professional is found to be pain ^{2,3}. Apart from pain, some of the other commonly experienced WMSs are stiffness, swelling, weakness, redness, or paresthesia ⁴. Among all the healthcare professionals, general dentists are at particularly higher risk for developing these problems ^{5,6}. This is because of the high-risk factors involved with the profession of dentistry, including lengthy treatment sessions, constant pressure on the hand-wrist area, prolonged immobility and/or improper posture of the practitioner, the use of vibrating tools, and psychomotor abilities³. From the outset of the COVID-19 pandemic, the use of some up-to-date protective tools has become crucial. This has caused increased risks of imbalanced

postures and limited mobility. In order to accommodate these positions, muscles extend or shorten, which causes structural damage and pain and results in muscular imbalances ⁷.

Musculoskeletal disorders are considered a principal cause of disability all around the globe which can range from intermittent pain that does not affect work efficacy to pain that affects day-to-day activities including work ⁸. According to various studies, the prevalence of WMSDs showed wide variation between 10.8% to 97.9% among dentists worldwide ^{7,9-13}. The most frequently reported sites of WMSs are the lower back, neck, shoulders, and upper extremities ^{4,6,12,14}. The World Health Organization defines quality of life "individuals' perceptions of their position in life in relation to their goals, expectations, standards, and concerns, as well as the culture and value systems in which they live" ^{11,15}. The high frequency of WMSDs and the stress they cause in terms of absence from work, reduction in productivity, and early retirement are some of the main challenges faced by the dental community which ultimately has an adverse outcome on the quality of life of dentists ^{11,13,16}.

Ergonomics takes into account how workers interact with their workplace, including how workspace, equipment, and body posture are modified based on the type of job being done, in order to preserve workers' health and productivity ^{8,17}. It was reported factors like improvements in work posture, instruments used, physical activity, mental stress level, appointment scheduling, and work environment to be effective in preventing WMSDs and as a result, improving quality of life ^{11,18}.

Despite the widespread consequences of WMSs on the quality

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of life of dental practitioners. Past studies have mainly focused on the prevalence of WMSDs in dentists, and very few studies and almost none in the South Asian region are conducted about its impact on quality of life of dentists^{3,13}. The primary aim of this study is to evaluate the impact of WMSs on the physical and psychological aspects of quality of life, in order to raise awareness and implement the appropriate programs for proper ergonomics to help reduce these challenges faced by the dental community worldwide.

Materials and Methods

A cross-sectional and questionnaire-based study was conducted from January 2023 to April 2023 at Khyber College of Dentistry, Rehman College of Dentistry, Peshawar Dental College, and Sardar Begum Dental College, Peshawar, Pakistan. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline was followed.

A questionnaire with three separate portions was used. Section one was used to collect complete demographic information about the participants. Section two comprising of Standard Nordic Musculoskeletal Questionnaire (NMQ)¹⁹ was used to record data about WMSs during the last 12 months and last 7 days in the nine body regions i.e. neck, shoulders, elbows, wrists, and hands, upper back, lower back, hips and thighs, knees, ankles, and feet. Section three used to record the Quality of Life of dental practitioners consisted of a self-structured questionnaire that was formulated by taking help from the World Health Organization Quality of Life-Brief Form (WHOQOL-BREF)¹¹. It consisted of a total of ten close-ended questions that mainly recorded the physical and psychological aspects of the quality of life (QoL).

Physical Health Section: Consisted of 6 questions regarding day-to-day activities, energy level, quality of sleep, working capacity, ability to perform leisure activities, and use of medications for WMSs with a score ranging from 1 to 12 where a score of 1 indicated poor and 12 indicated good physical health.

Psychological Health Section: Consisted of 4 questions about experiencing positive and negative feelings, concentration level, self-esteem, and body appearance. The psychological aspect score ranged from 1 to 8 with 1 indicating poor and 8 indicating good psychological health.

The research subjects were dental practitioners. The term dental practitioners in this study refers to dentists (general practitioners and dental specialists), postgraduate dental trainees, and faculty members of dental teaching institutes who were included in this study. Exclusion criteria comprised of participants with incomplete questionnaires or any kind of congenital disorders. The reliability and validity of the questionnaire was confirmed by conducting a pilot study on 40 individuals, these individuals were not part of the original study to minimize the risk of potential bias. The validity and reliability of the questionnaire was evaluated by Cronbach's alpha. Validity was acceptable having a Cronbach's Alpha value of 0.677 for physical health section and 0.712 for psychological health section. The questionnaire was also verified by a group of public health specialists.

A minimum of 149 sample size was required according to OpenEpi software to achieve a 5% margin of error with a 95% confidence interval and a frequency outcome factor of 10.8%^{14,20}. A convenience sampling method which is a type of non-probability sampling, was used for this study. Keeping in view the minimum sample size of 149 calculated for our desired

confidence interval, a total of 169 individuals who met the inclusion criteria were invited to participate in the study, to increase the power and adjust for the 10% dropout rate/non-response rate anticipated which is calculated through the following formula²¹:

Adjusted sample size = Estimated Sample size / (1 - anticipated non-response rate).

The information about the research study was given verbally to the study groups. Informed consent was obtained and the questionnaires with instructions to fill them out correctly were distributed among participants. The questionnaire was in English language. The responses were kept incognito by not collecting any identifying information like email addresses or names of the participants.

Data analysis was done using Statistical Package for the Social Sciences (SPSS) version 24.0. The Kolmogorov-Simonov test was used to check the normality. Study variables were age, gender, dental specialty, years of practice, WMSs, physical health, and psychological health. Descriptive statistics were used for categorical variables and presented as frequencies and percentages. In the case of continuous variables, Mean \pm Standard Deviation was used for normally distributed data, and median and range were used to report data that was non-normally distributed. A linear regression test was run by using physical and psychological health as dependent variables and WMSs, age, gender, practice hours, dental specialty, and physical activity as independent variables. Multiple Linear regression analysis was used to adjust for confounding factors and to verify the statistical significance of our results. A p-value ≤ 0.05 is considered statistically significant.

Result

Out of 169 participants recruited, 5 participants did not consent to participate and also one participant returned an incomplete questionnaire and was therefore excluded from the study. Among 163 dental practitioners included, 63.2% of participants were female and 36.8% were male. The age of participants ranged from 23- 61 years with a mean age of 30.39 ± 7.30 years.

The majority of the participants (60.1%) had a normal BMI score with 37.4% having a BMI score above the normal range. Only 9.4% of the participants had a BMI score below the normal range.

Only 5.5% of the participants were diagnosed with a musculoskeletal disorder (non-disabling) indicating that the majority of the participants (94.5%) were not yet diagnosed.

Most of the participants were from the prosthodontics department (26.4%) followed by OMFS, (17.8%), General dentistry (16.6%), orthodontics (14.7%), operative dentistry (13.5%), and so on.

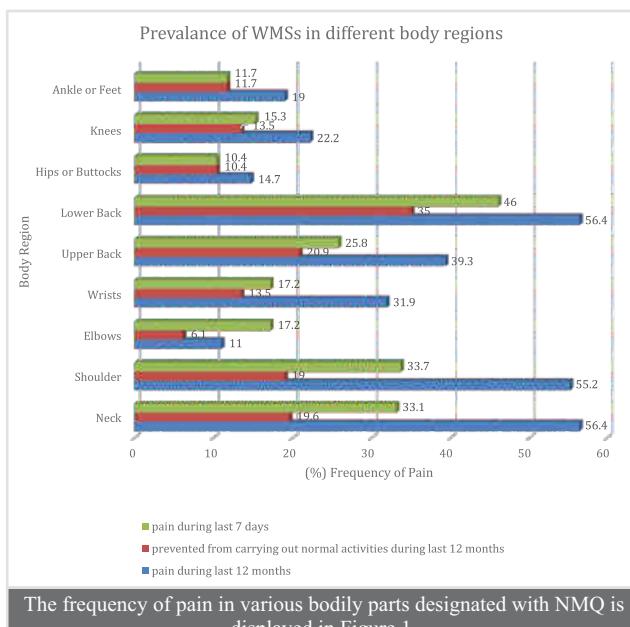
More than half (64.4%) of the participants had work experience ranging from 0 to 5 years with 15.3% having work experience of 5 to 10 years and 13.5% with work experience of 10 to 15 years. Table 1 displays the basic demographics and health-related baseline variables of the participants.

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Variables	N (%)
Gender	
Female	103 (63.2)
Male	60 (36.8)
Body Mass Index (BMI)	
Underweight	9 (5.6)
Normal	98 (60.1)
Obese	48 (29.4)
Overweight	8 (4.9)

Presence of a diagnosed systematic problem	
Yes	13 (8)
No	150 (92)
Presence of a diagnosed musculoskeletal disorder (except disabilities)	
Yes	9 (5.5)
No	154 (94.5)
Regular physical sports activity	
Yes	98 (60.1)
No	65 (39.9)
Dental Specialty	
Operative dentistry	22 (13.5)
Prosthodontics	43 (26.4)
Orthodontics	24 (14.7)
OMFS	29 (17.8)
Periodontics	6 (3.6)
General Dentistry	27 (16.6)
Basic Sciences	9 (5.5)
Pediatric Dentistry	3 (1.8)
Years of Practice	
Less than 5 years	105 (64.4)
5 to 10 years	25 (15.3)
10 to 15 years	22 (13.5)
15 to 20 years	2 (1.2)
more than 20 years	9 (5.5)
Most Common Position During Dental Procedure	
Standing	70 (42.9)
Sitting	93 (57.1)

In the last 12 months, musculoskeletal pain was prevalent in both the neck and lower back with a frequency of 56.4 % each. Females reported the highest frequency of pain in the neck and lower back region in the last 12 months with a frequency of 65.2 % respectively. Whereas, in the last 7 days the most painful body region was lower back (46 %). The participants were prevented from doing normal activities in the last 12 months mostly due to pain in the lower back (35 %). The frequency of pain in various bodily parts designated with NMQ is displayed in Figure 1.



The frequency of pain in various bodily parts designated with NMQ is displayed in Figure 1.

Table 2: Association between WMSs and QoL using linear regression model

Variables	QoL Physical Health		QoL Psychological Health	
	β	P-value	β	P-value
Constant		0.130		0.061
Age	0.255	0.191	0.033	0.870
Gender	0.226	0.008	0.105	0.220
Systematic Illness	0.198	0.014	-0.153	0.063
Physical activity	0.055	0.474	0.030	0.702
Position while doing	0.013	0.859	0.004	0.956

dental Procedures				
Lower back trouble last 12 months	0.234	0.002	-0.205	0.008
Years of practice	0.389	0.048	-0.088	0.661
Specialty	0.080	0.300	0.071	0.374
Practice hrs. per week	0.01	0.209	-0.0016	0.843
R2	0.429		0.141	
F	3.378	0.001	2.466	0.009

The median score for physical health was 9 while for psychological health was 6. A significant association between gender and physical health was found (p-value = 0.008) while no significant association with psychological health was seen (p-value = 0.220). After adjusting for age, gender, physical activity, years of practice, dental specialty, practice hours and systemic illness, a significant association was found between the most prevalent WMSs i.e. lower back pain with physical ($\beta = -0.234$, p value = 0.002) and psychological aspects ($\beta = -0.205$, p value = 0.008) of quality of life (Table 2).

Discussion

The primary objective of this study was to find the association of work-related musculoskeletal symptoms with two main aspects of quality of life: physical health and psychological well-being.

There are numerous studies conducted that discusses the prevalence, frequency, and distribution of work-related musculoskeletal symptoms in dentists. According to the literature search done no study of its kind was found that could detect an association of WMSs and the psychological and physical health subscales of dental practitioners' quality of life while a study that was done on dental students found a negative impact of WMSs on quality of life³. Therefore, this study provides an insight on how the prevalence of work-related musculoskeletal symptoms among dentists can affect the two main aspects of quality of life that is physical health and psychological health.

Our research revealed that the neck and lower back were the most painful body regions throughout the previous 12 months. A systematic review also revealed that the lower back was found to be the area with the highest prevalence of musculoskeletal disorders among dental workers (29% to 94.6%) followed by shoulders and neck²². In senior dental students WMSs in the last 12 months was prevalent in the neck region³. In a meta-analysis conducted discussing the prevalence of work-related musculoskeletal symptoms and pain in Western countries neck was also reported as the body region affected the most followed by lower back²⁰. Additionally, in our study, the lower back was the most painful region in the previous seven days, which significantly affected the capacity to perform tasks. In a study conducted in India, the most affected body region with WMDS was also found to be lower back among different healthcare professionals²³. However a study in Iran revealed that the musculoskeletal pain was prevalent in the shoulders, which was not in accordance with our study^{24,25}. According to Botta et al. several factors, including prolonged periods of unilateral bending, inadequate lumbar support during prolonged work times, and dental stool designs that are not ergonomically designed, have been linked to the prevalence of lower back pain²⁶.

When WMSs are assessed based on quality of life, engaging in regular physical sports activity has a significant impact on physical health as expected. It is well-recognized that people

with chronic musculoskeletal discomfort have long-term limitations to their activities²⁷. Studies do suggest a decrease in quality of life due to work-related musculoskeletal disorders among healthcare professionals^{3,28}. WMSs can have a significant impact on people's quality of life as well as the continuity of employment and services which can have detrimental effect at both individual and community levels. Brown et al. noted that the leading cause of ill health retirement among dental practitioners was musculoskeletal disorders²⁹. According to numerous research findings, WMSs were found to have a negative impact on people's quality of life across a variety of occupations apart from dentistry³⁰⁻³². While on the other hand, a study conducted in India revealed that Quality of Life was not affected by WMSDs in nurses³³. In our study majority of the participants who had work experience of less than five years reported the presence of pain(WMS) revealed in such a short period after graduation is quite alarming which is parallel with the Italian dentists having work experience of 2-5 years had the most prevalence of WMSs¹⁰. WMDs are preventable in dental practitioners, as yoga in particular is useful for MSDs when it comes to stretching activities³⁴⁻³⁸ by easing muscle tension and increasing blood flow to the body regions. Yoga was found to be effective for back and neck pain^{39,40} shoulder pain, wrist and forearm disorders^{35,37} and tension headache, and cervicogenic headache³⁷. Recent studies have examined yoga-based movements that can be performed at work to aid with painful ailments of the muscles, tendons, and nerves (such as tendinitis, thoracic outlet syndrome, tension neck syndrome, and carpal tunnel syndrome)^{37,38}.

In our study, female participants had a higher prevalence of pain due to WMDs which was also noted to be prevalent in female dentists in Iran^{24,41}, Italy¹⁰, and Colombia⁴² as compared to males. A relationship between dental work and the reported sexual dimorphism for pain perception could offer a plausible explanation for this higher occurrence. Dental work often requires extended durations of head tilting, which can result in the overworking of neck muscles and cervical spine joints whereas the cause for lower back pain is due to incorrect posture⁴³.

The implementation of the ergonomic intervention was seen as successful in reducing WMDs in office workers⁴⁴ who like the majority of dental practitioners spend most of their time sitting during their work. Campaigns could be launched to raise awareness with the aid of physiotherapists and chiropractors to implement ergonomic training like frequent breaks, avoiding stiff postures for a prolonged period of time, using magnification to prevent neck bending, focusing on strengthening the body's muscles through weight training and exercise, and occasionally using nerve flosses to prevent irritation. Continuing Professional Development (CPD) courses could also be offered to dentists to ease the physical strain of the workplace.

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The limitations of this study were that it only evaluated the association of WMSs with physical and psychological aspects of QoL leaving out two other important aspects i.e. social aspect and the environmental aspect. This study was limited to only a single region so the results can cause a limitation of generalization of the results to a larger population and restrict the outcomes' relevance to certain racial groups. As the responses were self-reported by the participants, subjective bias could have been introduced. Also, as we used the convenience sampling method therefore selection bias can also be found in this study which can be seen in terms of the female majority and most of the participants having less than 5 years of experience. It is possible to assess the effects of numerous sociodemographic and sociocultural factors on WMSs and associated QoL. Therefore, this study cannot be used to determine the direct causal relationship as possible confounding factors might be present due to the cross-sectional study design.

Conclusion

Our study highlights that dentists' lower back and neck are the regions most commonly affected by WMSs. WMSs have a negative impact on the physical and psychological aspects of the quality of life of dental practitioners.

Recommendations

Dental professionals should observe the precautionary measures that reduce the risk of WMSs. The dentist should make an effort to develop the habits of keeping optimal posture with precise supervision and prompt interventions, taking breaks, and receiving the right amount of rest while working and improving the working environment. At the workplaces, the emphasis should extend to continuing professional development courses on how to improve workplace ergonomics. Now, more clinical research is required to evaluate the effects of WMSs on the social and environmental aspects of quality of life and to formally assess if preventative factors, such as ergonomics education and prompt treatments can be applied as WMSD precautionary measures to improve the quality of life of dental practitioners.

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Author Contributions

1. Amna Amjad: Data Collection and Analysis.
2. Hafsa Rehman: Study design and article writing.
3. Aliya Khan: Analysis and Interpretation