



# **Frequency of Musculoskeletal Disorders and their Counter Measures Adopted by Final Year Students and Young Dentists: A Questionnaire Based Multicenter Study**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. Author HM manuscript writing, data analysis and interpretation of the results. Author MZ conception of idea, data collection, initial manuscript drafting. Author TS supervision, manuscript editing and final approval of the manuscript. Author MFK data collection and manuscript revision. All authors read and approved the final manuscript.*

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## **ABSTRACT**

**Aim:** Musculoskeletal disorders have significantly been related to poor ergonomics practice during clinics. There is limited data regarding the prevalence and reasons for work-related musculoskeletal disorders in young dentists. This study was conducted to find out the prevalence of musculoskeletal disorders in young dentists, identification of the perceived reasons for musculoskeletal disorders, and measures taken to manage them.

**Study Design:** Cross-sectional observational study.

**Methods:** A cross-sectional study was conducted on 408 house officers from ten dental institutes of twin cities and Karachi, Pakistan. The subjects were inquired through a validated questionnaire

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about the presence of muscular pain, affected body regions, frequency, intensity, nature of onset, aggravating factors, and average duration of the pain episodes. They were also asked about measures taken to counter musculoskeletal pain and their effectiveness.

**Results:** The overall prevalence of musculoskeletal disorders was n=231(56.6%) with n=172(39.2%) of participants reporting it to be work-related with a higher percentage of females n=138/172 (80.2%) The most affected body regions were the back n=101/172 (58.7%), shoulders n=91/172 (52.9%) and neck n=80/172(46.5%). Improper posture n=108(62.8%) followed by prolonged sitting n=88(51.2%) were the most common reasons perceived by the young dentists for their pain. Bed rest was adopted 93(54.1%) to alleviate pain followed by posture rectification 76(44.2%). Most n=134(77.9%) of them thought that these measures are helpful for the alleviation of pain.

**Conclusion:** The prevalence of work-related musculoskeletal disorders among young dentists is high. The back, shoulder, and neck areas were more frequently affected. A higher percentage of females suffered from MSD as compared to males. Bed rest was the most common measure adopted to alleviate the pain. Very few of them sought professional help for their musculoskeletal disorders.

*Keywords: Back pain; dentists; ergonomics; neck pain; musculoskeletal; dental students.*

## ABBREVIATIONS

*MSD : Musculoskeletal Disorders.*

*WMSD: Work-related Musculoskeletal Disorders.*

*IMDC : Islamabad Dental and Medical College.*

## 1. INTRODUCTION

Musculoskeletal disorders (MSDs) are common occupational hazards which are highly prevalent in dental professionals worldwide [1,2]. MSDs are injuries or disorders of the muscles, nerves, tendons, joints, cartilage, and spinal discs. Work-related musculoskeletal disorders (WMSD) are conditions in which the work environment and performance of work contribute significantly to the disorder; and/or the condition is made worse or persists longer due to work environment [3]. MSDs are undoubtedly a growing global concern among dental work force personnel that lead to increased physical limitation and inability to work. They do not occur abruptly, rather they build up over time because of poor ergonomics in dental practice [2,4]

Main risk factors for development of MSDs is inappropriate and uncomfortable static postures for prolonged periods of time every day to get a better view of the operative field, the oral cavity [1,2,5]. These postures cause more than 50% of the body muscles to strain and resist gravity especially when the upper extremities lack support [5]. Other risk factors may include, but are not limited to age and gender variations (more prevalent in females), non-ergonomic dental units and dental chairs/stools, repetitive

movements during dental procedures, prolonged dental procedures without enough breaks in between, low lighting, non-work-related factors like sleeping postures and lack of daily exercise [6] Psychological stressors such as coping with patient's anxiety and satisfying their treatment needs and expectations also contribute to MSDs in dentists [7].

In previous studies prevalence of MSD was found to be 90.2% in a Saudi Arabian Study [1], 81.4% in a Brazilian study [4], 63.5% in an Indonesian study [2] and 70.7% in a Pakistani study [8]. Al-Mohrej reported lower back as the most common region of pain in (68.1%) of participants [1]. According to Garbin et-al, neck was the most common region of pain (55.4%) followed by shoulders (52%) and lower back (48.5%) [4]. Saleem et-al stated that 64.5% of their participants had pain in back/waist region followed by neck/shoulders in 33.3% [8]. On the other hand, Phedy et-al reported that only 25.7% participants had pain in the neck region followed by pain in shoulders 24.9% [2].

Effects of MSDs are overlooked until they start posing a persistent threat to a dentist's well-being [7]. Early diagnosis and improving ergonomics can help reverse the effects of MSDs and prolong the professional life of a clinician. Therefore, it is important to determine the prevalence of MSDs in young dental professionals and explore remedies being adopted by them. Regrettably, insufficient statistics and data are available about prevalence of MSDs and its awareness

particularly among the young dentists in Pakistan.

Creating awareness and early recognition of MSDs in dental students and young dentists is important and the seriousness of this issue needs to be highlighted. This will help to employ preventive measures and develop corrective strategies for dentists to counter MSDs early in their careers. The present study was conducted to determine the frequency of MSDs and identify measures taken to counter them by final year students and house officers of dental institutes of Pakistan.

## 2. MATERIALS AND METHODS

This cross-sectional study was conducted over a period of one year from October 2017 to September 2018, in ten Dental Institutes (7 from Islamabad and Rawalpindi and 3 from Karachi), Pakistan, using a convenience sampling technique with quantitative approach. A pilot study was carried out on fifteen house officers of IMDC to assess face and content validity of the questionnaire, it was reconfirmed by a medical educationist and four specialists to ensure that the items are written in a simple and understandable language. Based on constructive criticism received, minor changes were made, and the questionnaire was finalized. The questionnaire comprised of three sections, first section was related to demographic details of subjects including gender, designation (final year student or house officer), and the name of their institute. Second section included eight questions with multiple options, which explored the presence of muscular pain, affected body regions, frequency, intensity, nature of onset, aggravating factors, and average duration of the pain episodes. Third section had six multiple choice questions related to measures taken to counter musculoskeletal pain and their effectiveness. The participants were allowed to choose more than one options for affected body regions, aggravating factors and the measures taken.

Written permission was sought from the competent authorities of dental institutes in twin cities and Karachi. An anonymous, self-administered questionnaire was distributed among all final year students and house officers of the institutes which allowed data collection. Bachelor of Dental Surgery is a four-year program and one year house job is mandatory in Pakistan. House officers and all final year

students who consented to take part in the study, were included. Those who refused to consent, submitted incomplete questionnaires, or had known congenital or acquired physical disabilities, history of accident/spinal trauma, and known MSDs not related to dentistry were excluded. All participants had less than 2 years of clinical experience. Verbal consent was taken from all participants and the questionnaire was explained to them by the researchers prior to distribution in the clinical departments. It was ensured that there was no interruption in patient care. The questionnaire took approximately 8-10 minutes to be answered. The questionnaires were then collected, and the collected data was encoded, entered, and analyzed using SPSS version 22.0. Descriptive statistics were applied, and the results of the qualitative variables are presented in frequencies and percentages and quantitative variable like age are presented as mean  $\pm$ SD. Prevalence was calculated with a 95% confidence interval.

## 3. RESULTS

The response rate of current study was  $n=408/438$  (93%). Majority of the participants  $n=306/408$  (75%) were females,  $n=241$  (59.1%) were house officers and  $n=167$  (41.9%) were final year students. The mean age of final year students was  $23.2 \pm 0.5$  years, and house officers was  $24.7 \pm 0.3$  years respectively.

More than half i.e.,  $n=231$  (56.6%) of participants reported that they suffered from muscular pain having  $n=183$  (45%) females and  $48$  (11.7%) males. Only  $n=172$  (39.2%) of the participants felt that this pain developed because of clinical work in departments (WMSD). Out of these  $n=172$  participants  $n=106$  (62%) were house officers and  $n=66$  (38%) were students. The remaining data is reported for the  $n=172$  participants who felt that the pain is related to their clinical work. Frequency and intensity of pain episodes is given in Tables 1 and 2 respectively.

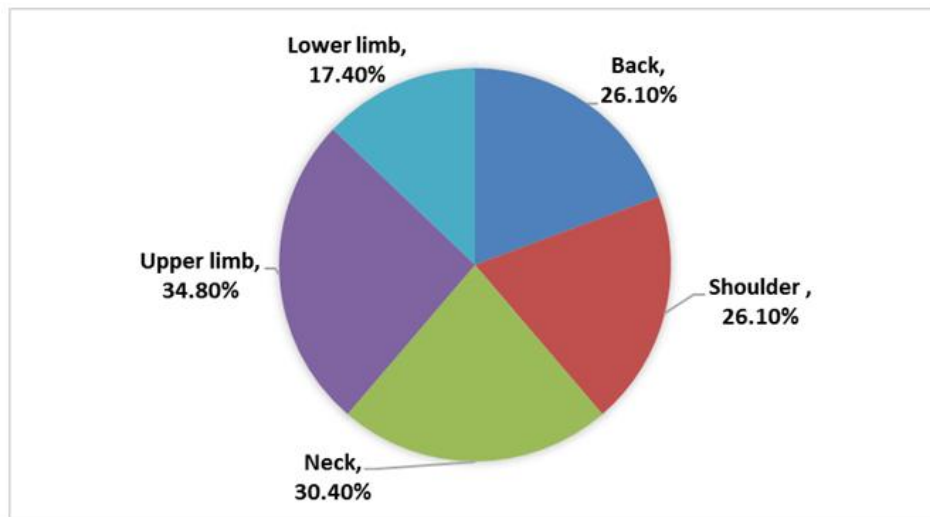
Frequencies of the body regions affected in the participants ( $n=23$ ) who reported that their MSD was related to clinical work is shown in Fig. 1 and those with MSD related to non-clinical work related is shown in Fig. 2. Almost  $n=36$  of participants, were unsure if the MSDs they are suffering from is work-related or due to other factors.

**Table 1. Frequency of pain episodes reported by participants with WMSD (n=172)**

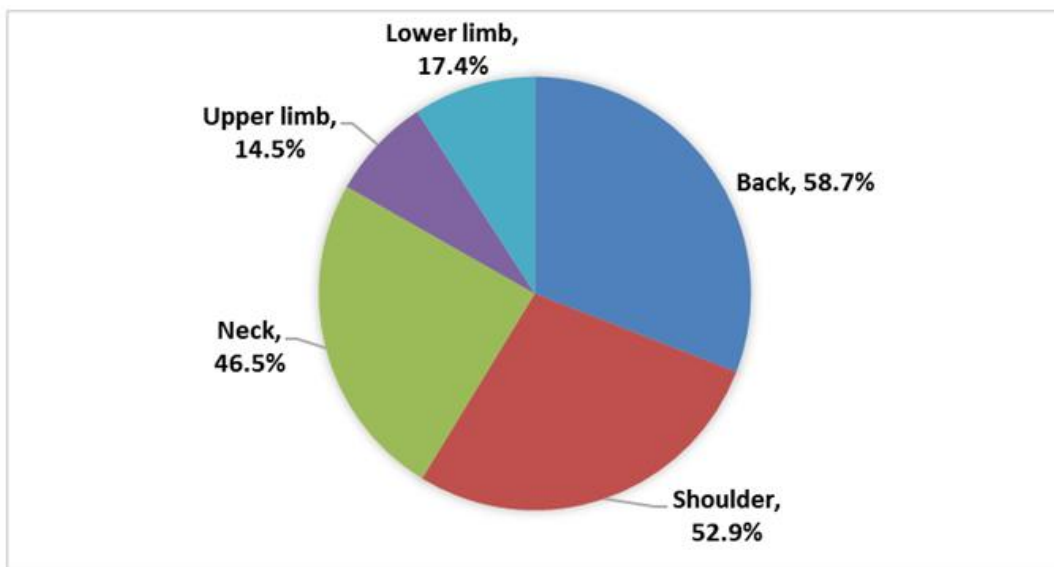
Frequency of pain episodes	Frequency (n)	Percentage (%)
Constant	13	7.6
Felt only during clinical work	35	20.3
Sometimes	104	60.5
Only once	20	11.6

**Table 2. Intensity of pain in participants with WMSD (n=172)**

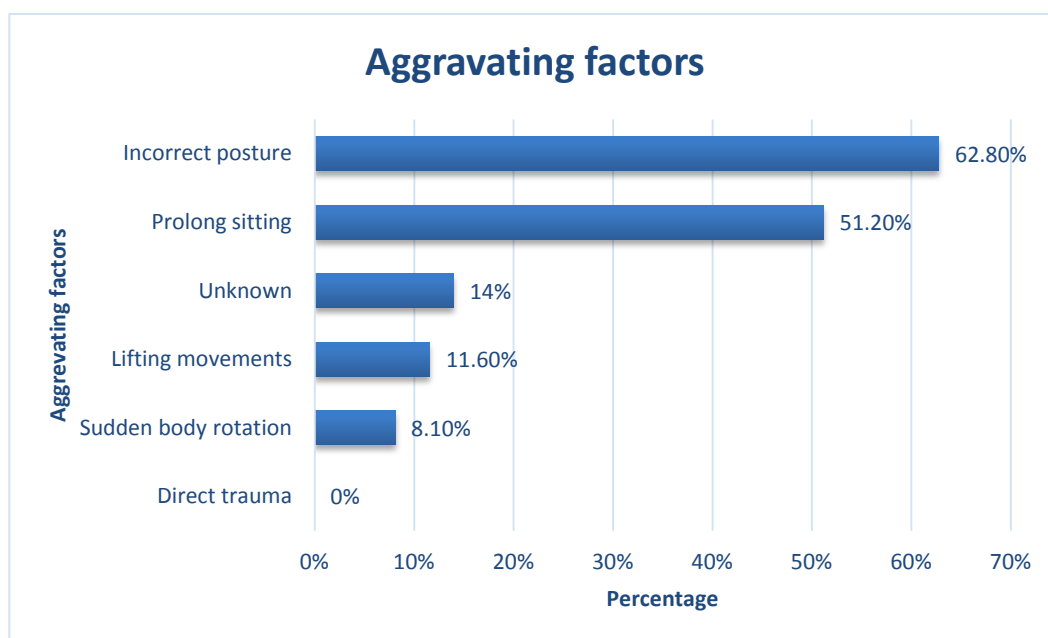
Intensity of pain episodes	Frequency (n)	Percentage (%)
Mild	43	25
Moderate episodic	43	25
Moderate long lasting	71	41.4
Severe episodic	11	6.4
Severe long lasting	4	2.3



**Fig. 1. Percentage of body regions affected by MSDs due to other reasons (n= 23)**



**Fig. 2. Percentage of body regions affected by MSDs due to clinical work (n= 172)**



**Fig. 3. Percentage of aggravating factors selected by the participants with WMSD (n=172)**

For onset of pain, it was sudden for n=51 (29.7%) participants and gradual for n=92 (53.5%) participants. Some participants n=29 (16.9%) reported that they were unsure of the nature of onset of pain episodes.

Participants were allowed to select more than one options for aggravating factors for pain and summary is presented in Fig. 3.

Out of n=172 participants with pain only n=15(8.7%) consulted a physician and n=40 (23.3%) were planning to seek some medical treatment, and n=157 (91.3%) were practicing self-measures. Among the n=15 who consulted physicians, n=12(80%) were prescribed analgesics while n=1(6.67%) was prescribed anti-inflammatory medication, n=1(6.67%) was

prescribed a combination of both and n=1(6.67%) was prescribed muscle relaxant.

Only n=45(26.2%) of the participants feeling pain were doing regular exercise, n=45(26.2%) did exercise irregularly and n=82(47.7%) did not exercise at all. Measures taken to alleviate pain are given in Table 3, one participant used cupping therapy and one more relied on sleeping on a flat surface to relieve their pain. Participants were allowed to select more than one options.

These measures were successful for n=134 (77.9%) however, n=14 (8.1%) participants reported that none of the measures taken helped in eliminating pain, and n=24 (14%), were not sure if their methods helped in relieving the pain or not.

**Table 3. Measures taken to alleviate pain in participants with WMSD (n=172)**

Measure Taken	Frequency	Percentage
Bed rest	93	54.1
Correct their posture	76	44.2
Massage	56	32.6
Topical analgesics	37	21.5
Take leave from institute	23	13.4
Physiotherapy	14	8.1
No measure at all	8	4.7
Cupping therapy	1	0.5
Sleeping on a flat surface	1	0.5

#### 4. DISCUSSION

Musculoskeletal disorders can lead to reduced physical function due to pain resulting in mental health decline and an early end to the career in dentistry if ignored [9]. Hence it is required to explore the frequency and factors contributing to MSDs along with the measures taken by young dentists to counter them. The present study analyzed these elements in participants who reported MSDs.

Overall prevalence of MSDs in the young dentists was  $n=231/408$  (56.6%) which is quite high whereas only  $n=172/408$  (39.2%) of them thought that it is due to clinical work. Phedy P. et al conducted a study on young dentists of Indonesia and found that  $n=153/241$ (63.5%) respondents suffered from MSDs [2] which is a higher prevalence when compared to present study. Work-related stress has rarely been differentiated in the previous studies which is highlighted in the results of the present study.

Prevalence of pain in females due to MSDs was higher  $n=138/172$  (80.2%) as compared to men  $n=34/172$  (19.8%) and is of concern for future female dentists. Literature reports MSDs to be more prevalent in females [4,8,10]. Some studies, on the contrary reported that gender wise comparison demonstrated no statistical difference in the frequency of pain [11,12] Perhaps detecting equal number of males and females with no gender wise difference was due to small sample size ( $n=50$ ) selected by Khan RS [11]. The other study reporting similar prevalence in both genders, included participants from all age groups and reported increase in MSDs with increasing age of the dentists [12]. Some authors reason that females may suffer from hormonal changes [13], have other domestic responsibilities with less time for leisure activities and rest [5], which may render them to be more effected from work-related tasks than male [4,13,14].

The data was further extrapolated for anatomical locations of pain and most prevalent of them was back  $n=101/172$  (58.7%), followed by the shoulders  $n=91/172$  (52.9%) and the neck  $n=80/172$ (46.5%). Other local studies also reported back as the most as common region of pain having prevalence of 53% to 64% with neck being the second prevalent region [8,12]. Studies conducted in Saudi Arabia also reported lower back region to be most prevalent [15]. However, a systematic review and meta-analysis, reported

higher prevalence of neck pain (58.5%) followed by lower back pain (56.4%) in western countries but when point prevalence was considered, lower back was most prevalent (49.2%) among all regions [16]. The difference in these results could be due to dissimilar methodologies used in these studies. Prolonged sitting [2] and improper postures, like forward bending and twisting of back [4,17] may result in ischemia and necrosis of muscles of back, neck and shoulders, resulting in structural damage and pain [17].

This study also explored the reasons of pain as perceived by the participants. Improper posture followed by prolonged sitting were highlighted as the most common reasons for the pain in young dentists. In this study  $n=47$  (27%) participants chose only incorrect posture as the foremost aggravating factor of MSDs while  $n=33$ (19%) chose prolonged sitting alone to be the cause,  $n=42$  (24%) participants thought that both factors were responsible for MSDs. Extensive literature is available which shows similar results [1,2,8,18]. Working conditions and occupational safety in the developing countries is significantly different from the industrial countries [19-21]. Due to increased workload the brunt of the work falls upon the young training dentists resulting in prolonged sitting hours for them [22]. The back pain might be related to the poor quality of dental stools provided to the students along with extended sitting hours [5,12,23]. Ergonomics is infrequently addressed in curriculum which results commonly in improper clinical work postures. Cervera-Espert et al. reported that despite having knowledge of ergonomics concept only 28.6% of young dental clinicians demonstrated acceptable postures [9]. This shows that constant reinforcement should be imposed to impart realization of significance of correct posture and prevent early onset of MSDs.

MSDs can be prevented by adopting ergonomic techniques such as working in a standing position, varying working position according to area of oral cavity being worked on, adjusting the height of the dentist's chair/stool, learning to use indirect vision, correctly seating the patient on the dental chair and taking small breaks in between work [5,8].

Various strategies are being adopted by the dentists to overcome MSDs, this study found that bed rest was the most common measure adopted by participants (54.1%)  $n=93$ , followed by posture rectification  $n=76$ (44.2%) and massage  $n=56$ (32.6%). Some  $n=23$  (13.4%) had

to take leave due to the severity of the pain. There were few n=8 (4.7%) who took no measures at all besides having pain and discomfort due to MSDs. Measures taken by dentists to alleviate symptoms of MSDs have rarely been addressed in the literature, a study done in Spain on postgraduate students and faculty reported that only 34% of the participants took preventive measures [24]. Unfortunately there is lack of assistance and awareness for the young professionals to seek guidance for this condition which reflects in the results of these studies.

Participants were also inquired about seeking professional consultation for their MSD. Only n=15 (8.7%) participants consulted a physician, n=40(23.3%), were planning to seek some medical treatment, and n=157 (91.3%) were attempting self-measures. International studies show that number of dentists suffering from MSDs seek professional help, take sick leave from respective institutes, change their work setting or reduce their working hour [24-26]. Indian studies reported that 13.9% - 47% dentists sought professional help, 35% used medication for symptomatic relief and 12% used physiotherapy [27,28]. According to a local study 40.7% of dental practitioners sought medical treatment and only 16% dentists and 11% dental students took sick leave [29]. The measures adopted to alleviate pain varies in these studies, this may be because the participants of the present study were undergraduate students and house officers as compared to the participants of other studies who are generally established dentists.

Another important component of this study was the perceived effectiveness of the measures taken by the participants to alleviate the pain. There was a small percentage who felt that the measures they are taking are not effective in relieving their symptoms hence reinforcing that a meticulous program is required covering all aspects of ergonomics in early years of dentistry.

Limitation of this cross-sectional study is that it only focused on perceptions of young dentists regarding reasons for their MSD. A direct observational study may be conducted to explore the reasons of MSD in dental setups of Pakistan. Further research needs to be done to explore reasons for not adopting proper measures, poor ergonomics and challenges that are faced by the dental setups of developing countries.

It is suggested that effective training and preventive programs related to awareness of MSDs and ergonomics should be conducted in early professional life, which may help to prevent early incidence and further aggravation of MSDs in young professionals. The young dentist should be educated to take small break intervals during work and ensure physical exercises.

## 5. CONCLUSION

The results of this study reveal high prevalence of MSD in young dentists and most importantly reflects the scarcity of knowledge and resources regarding measures that need to be adopted by them. Dental students and young dentists are at high risk of MSDs, especially the female dentists. Among all the regions, back and shoulders were the most prevalent where pain was felt because of incorrect posture followed by prolonged sitting. Majority of the participants were attempting self-measures for relief of pain with a very small number consulting a physician.

## CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

## ETHICAL APPROVAL

Ethical approval was attained from the Institutional Review Board, dental section, IM&DC (letter no. IMDC/DS/IRB/78, dated 30<sup>th</sup> August 2017) and in accordance with the ethical standards laid down in the Declaration of Helsinki (1964).

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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