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An Occupational Ergonomic Study of Musculoskeletal Disorders among Dental Professionals: Prevalence, Contributing Factors, and Impact on Professional Life

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ABSTRACT

Background: Work-related musculoskeletal disorders (WMSDs) are prevalent occupational health concerns among various professional groups, including dental practitioners. These disorders can adversely affect physical health, work efficiency, and quality of life. The present study aimed to identify the factors contributing to the prevalence of musculoskeletal disorders among dentists and evaluate their impact on social and professional wellbeing.

Methods: A total of 185 male and female dentists were randomly selected from Kolkata and Garhwa District, Jharkhand, India. Data were collected using a modified Nordic Musculoskeletal Questionnaire, along with postural assessment, to identify the prevalence of musculoskeletal symptoms and associated occupational risk factors.

Results: The findings indicated that lower back pain, neck pain, and shoulder discomfort were the most reported musculoskeletal complaints among dental professionals. Questionnaire analysis revealed that these disorders negatively affected participants' social and professional lives. Postural assessment further highlighted the association between prolonged static postures, awkward body positioning, and repetitive movements with musculoskeletal discomfort. Statistical analysis demonstrated significant associations between musculoskeletal disorders and factors such as job autonomy, workstation ergonomics, and occupational stress.

Conclusion: The study highlights the substantial burden of work-related musculoskeletal disorders among dental professionals, primarily associated with prolonged constrained postures, repetitive movements, inadequate ergonomic workstation design, and poorly designed dental instruments. These occupational risk factors not only compromise dentists' physical health and professional performance but also adversely affect their social wellbeing and financial stability. The findings emphasize the need for ergonomic interventions, improved workplace design, and appropriate occupational health strategies to prevent musculoskeletal disorders and enhance the overall quality of life of dental professionals.

KEYWORDS: Dental professionals; Work-related musculoskeletal disorders; awaked posture; Repetitive movements; Social well-being.

INTRODUCTION

Musculoskeletal disorders (MSDs) have emerged as a major occupational health concern worldwide, affecting individuals across a wide range of professional sectors [1],[2]. Dental professionals are particularly vulnerable to these disorders because of the physical demands and ergonomic challenges associated with their clinical practice. During dental procedures, dentists frequently maintain uncomfortable, awkward, and asymmetrical working postures, including forward bending and lateral rotation of the head, as well as prolonged positioning of the arms away from the body [3],[4]. In addition to occupational factors, individual characteristics such as genetic predisposition, advancing age, and physical and psychological stress may further contribute to the development and progression of musculoskeletal problems [5],[6].

Like many other occupational groups, dental professionals are susceptible to work-related musculoskeletal disorders due to the specific nature of their clinical responsibilities. Dentistry requires sustained attention, high levels of concentration, precision, and prolonged maintenance of static working postures [7]. Furthermore, repetitive movements, inadequate ergonomic practices, restricted visibility, and continuous use of the upper limbs place considerable physical strain on the musculoskeletal system. These occupational demands make the neck, shoulders, lower back, and lumbar region particularly vulnerable to pain and discomfort. Over time, such conditions may reduce work efficiency, impair professional performance, and potentially contribute to premature occupational disability among dental practitioners [8],[9].

Low back pain (LBP) is one of the most frequently reported musculoskeletal complaints among dentists and is often associated with prolonged sitting and improper working postures. Previous studies have indicated that work-related musculoskeletal

symptoms predominantly affect the lumbar region, with considerable involvement of the cervical and shoulder regions. Despite advancements in dental equipment design and improvements in workplace ergonomics, neck and shoulder pain and functional limitations continue to be commonly reported among dental professionals [9],[10]. This suggests that existing ergonomic improvements may not be sufficient to eliminate occupational musculoskeletal risks.

Therefore, the present study aimed to investigate the prevalence of work-related musculoskeletal disorders among dental professionals, with particular emphasis on lower back and neck pain. It also sought to identify the occupational and ergonomic factors contributing to these conditions and examine the extent to which musculoskeletal disorders interfere with dentists' social activities, professional responsibilities, and overall quality of life.

METHODS

Selection of Subjects

In the present investigation, the questionnaire was given to 185 registered dental practitioners from different clinics, hospitals and educational institutes of Kolkata and Jharkhand. Interviews and direct observation were used to collect information about the demographics, occupational history, salary, and health history of the dentists. All interviews were completed individually. The study was approved by the Institutional Ethical Committee of Vananchal Dental College and Hospital **(Ref No. VDCH/IEC/03/2018)**. The study was conducted from April to September 2018.

Measurement of Physical Parameter

The height and weight of the dentists were measured by an anthropometer (Martin's Anthropometer) and "Crown" weighing machine (Mfg. by Raymon Surgical Co.) respectively. The Body Surface Area (BSA) [11] and Body Mass Index (BMI) [12][3] of all the subjects were also computed.

Questionnaire Study

A detailed study based on Modified Nordic Questionnaire information about LBP (current—pain in immediate past 7 days and previous—pain in the last 12 months) [14] was performed on the Experimental group. Palmer et al have concluded that the Nordic questionnaire is repeatable and sensitive and is likely to have a high utility in screening and surveillance [15].

The questionnaire was divided into 3 parts; the first part included the demographic characteristics regarding gender, age, work duration and type of clinic. The second section deals with the work conditions (such as working posture, working with or without an assistant) and the organization of dentist's work (number of breaks and their purpose) and the last section was concerned with the MSDs and different type of discomfort or problems faced during and after work. The questionnaire consists of a series of objective-type questions with multiplechoice responses. Pain intensity and discomfort were measured using the Body Parts Discomfort (BPD) scale, which rates pain and discomfort on a scale from 1 to 10 [16].

Posture Assessment

Common posture was assessed by RULA (Rapid Upper Limb Assessment) provides an easily calculated rating of musculoskeletal loads in tasks where people have a risk upper-limb loading. This technique uses observations of postures adopted by the upper limbs, the neck, back and legs and on this basis stick diagrams are drawn. Then the RULA score is computed [17].

Observational study

Dentists were observed in their assigned duty, while observing and performing medical treatment to their patients. The dentists were observed in their sitting and standing dynamic posture (i.e., torso against backrest, torso straight, torso bent, torso twisted, torso bent and twisted simultaneously), which was noted and recorded once in every minute.

Statistical analysis

Statistical analyses were performed using Statistical Package for the Social Sciences (SPSS v. 20). The mean and standard deviation of the various physical parameters were calculated. The differences in ergonomic and psychosocial factors between groups with and without LBP and NP were examined by a $\chi 2$ test and the associations were described by the odds ratio with 95% confidence interval.

RESULTS

Altogether 185 dental professionals successfully completed the questionnaire and physical assessment. Finally, the obtained information was tabulated in various headings. 133 of them having low back pain and 97 having neck pain were selected for further study, viz., for detailed study. The results of the questionnaire interview were examined in the following three aspects:

Individual and work characteristics of participants

Demographic factors relating to the study population, including age, weight and stature, years of experience and duration of working hours per day are tabulated in Table 1. The study participants had an average working experience of 11.1 years and hospital

employees worked for 6 h a day for 6 days and private practitioner 8 to 10 hours for 6 days. One hundred seven (57.8 %) of the respondents were males and seventy-eight (42.2%) were females.

The study group presented various specialties in different fields of dentistry, including endodontists (19.8%), prosthodontists (12.4%), oral maxillofacial surgeons (23%), pediatric dentists (13.2%), periodontists (17%), and orthodontists (14.6%).

Forty-seven (25.4.1%) of them were working in governmental institutions, seventy-one (38.4%) are involved in dental college and remaining sixty-seven (36.2%) as private practitioner. All of them were righthanded. [Table 1]

Table 1: Demographic details of dentists who participated in the study (n=185)

Variable	**Range**	**Mean**	**±SD**
Stature (cms)	143-178.6	162.86	5.16
Weight (kgs)	42-80	52.98	6.8
BMI (kg/m^2)	15.22-23.03	19.95	2.23
BSA (m^2)	1.34-1.98	1.61	0.11
Year of Experience	1-25	11.1	6.9
Duration of Work	6-8	6.0	1.9
		N	**(%)**
Gender	Male	118	64
	Female	68	36
Age (years)	20-30	70	37.8
	31-40	51	27.6
	41-50	47	25.4
	50-60	17	9.2
Clinical Professional	Intern	32	17.3
	GP	68	36.8
	Specialist	85	46
Working Institutions	Government Hospital	37	20
	Dental College	91	49.2
	Private Practitioner	57	30.8
Years of Practice	≤ 5	41	16.7
	6-10	37	25.4
	11-15	55	26.5
	16-20	33	22.2
	≥20	19	9.2

QUESTIONNAIRE STUDY

Musculoskeletal Disorder

Participants were asked to identify the body regions in which they had experienced musculoskeletal discomfort during the preceding 12 months using the Modified Nordic Musculoskeletal Questionnaire. Analysis of the responses indicated that the lower back was the most frequently affected anatomical region, followed by the neck/shoulder and wrist/hand regions. The findings of the Body Part Discomfort (BPD) scale further supported these observations, indicating that lower back pain was the predominant complaint among dental professionals, followed by discomfort in the neck and wrist/hand regions.

A comparative analysis of dentists with and without musculoskeletal symptoms in the lower back, neck/shoulder, and wrist/hand regions was conducted to examine the associations with job autonomy, workstation-related conditions, and occupational stress factors. The findings obtained from the interview-based responses to the Modified Nordic Musculoskeletal Questionnaire are presented in Table 2.

Regarding job autonomy, restricted flexibility in work methods and prolonged working hours were identified as significant factors associated with the occurrence of musculoskeletal symptoms in the lower back, neck/shoulder, and wrist/hand regions. These findings suggest that limited control over work procedures and extended working periods may contribute to increased

musculoskeletal discomfort among dental practitioners. Among the workstation-related factors, inadequate or uncomfortable back support while sitting demonstrated a tendency towards an association with lower back symptoms. Furthermore, restrictions in body movement were significantly associated with the development of discomfort in the lower back, neck/shoulder, and wrist/hand regions, highlighting the importance of appropriate workstation design and freedom of movement during clinical procedures. Regarding occupational stress factors, monotonous work patterns were significantly associated with musculoskeletal symptoms across all three anatomical regions. Similarly, the adoption of awkward and uncomfortable body postures during various dental procedures emerged as a significant factor associated with symptoms in the lower back, neck/shoulder, and wrist/hand regions. These findings indicate that repetitive clinical activities and sustained awkward postures may contribute substantially to the development of work-related musculoskeletal disorders.

Further assessment of pain characteristics revealed that episodes of lower back pain varied in duration, ranging from a few minutes to several hours, with some episodes persisting for one to two days. The reported symptoms were commonly associated with muscular pain, stiffness, and sprain-like discomfort. In terms of pain occurrence, dentists reported experiencing severe discomfort predominantly during periods of rest, followed by discomfort during working hours. Overall, the findings highlight the multifactorial nature of work-related musculoskeletal disorders among dental professionals, emphasizing the combined influence of job autonomy, workstation ergonomics, repetitive work patterns, and awkward working postures.

Table 2: Association of musculoskeletal disorders with job autonomy, workstation factor, and work stress factors (n=185)

Predictors	**Low back Pain**			**Neck Pain/Shoulder Pain**			**Wrist/Hand Pain**		
	OR	**95% CI**	***P* value**	**OR**	**95% CI**	***P* value**	**OR**	**95% CI**	***P* value**
Job Anatomy									
Rigidity in work methods	**6.1**	**2.4-15.6**	**0.00**	**3.7 2.9**	**1.4-9.9**	**0.01**	**3.9**	**1.3-**	**0.02**
Prolonging working time	**4.5**	**1.1-14.9**	**0.02**	1.3	**1.1-7.5**	**0.04**	**3.5**	**11.6**	**0.02**
Inadequate rest period during the working day	2.2	0.8-5.9	0.16		0.5-3.1	0.73	1.3	**1.3-9.6** 0.5-3.3	0.08
Workstation Factors									
Uncomfortable seat back 3.8 1.1- 0.7 0.3-1.9 0.68 **support**			**12.1**	**0.04**	1.3	0.5-3.3	0.07		
Constrain in body movement 4.7 0.01 3.4 1.3-8.8 0.01			**6.1-**	**13.8**	**0.00**	**5.0 1.5-**	**16.6**		
Clinical Environment 2.2 0.9-5.3 0.5-4.8 0.54			0.12	2.2 0.7-	6.1	0.23	1.6		
Work stressing factors									
Monotonous Job	**3.1**	**1.3-7.8**	**0.02**	**4.1 4.0**	**1.3-12.1**	**0.01**	**3.2**	**1.2-8.5**	**0.03**
Awkward body movement	**4.5**	**1.7-12.2**	**0.00**	1.7	**1.5-10.9**	**0.01**	**3.6**	**1.2-**	**0.04**
Dissatisfaction regarding earnings	4.8	1.2-19.6	0.05	1.9	0.7-4.3	0.37	0.4	**10.7**	0.14
Difficulty in falling asleep	2.4	0.8-6.9	0.17		0.7-5.2	0.27	0.7	0.1-1.1 0.3-1.9	0.73
(P < 0.05) *p* value based on the χ^2. OR = odds ratio; 95% CI = 95% confidence interval for the OR.									

From the questionnaire analysis it was found that LBP restricted their social and professional life to a greater extent. Low back pain mainly restricted their sitting posture (66.5%), pain intensity (44.9%), social life (42.1%) and standing of long period (40.5%) and travelling (37.8%) [Fig 1]. This result is an absolute reflection of the alarming situations of dental professionals.

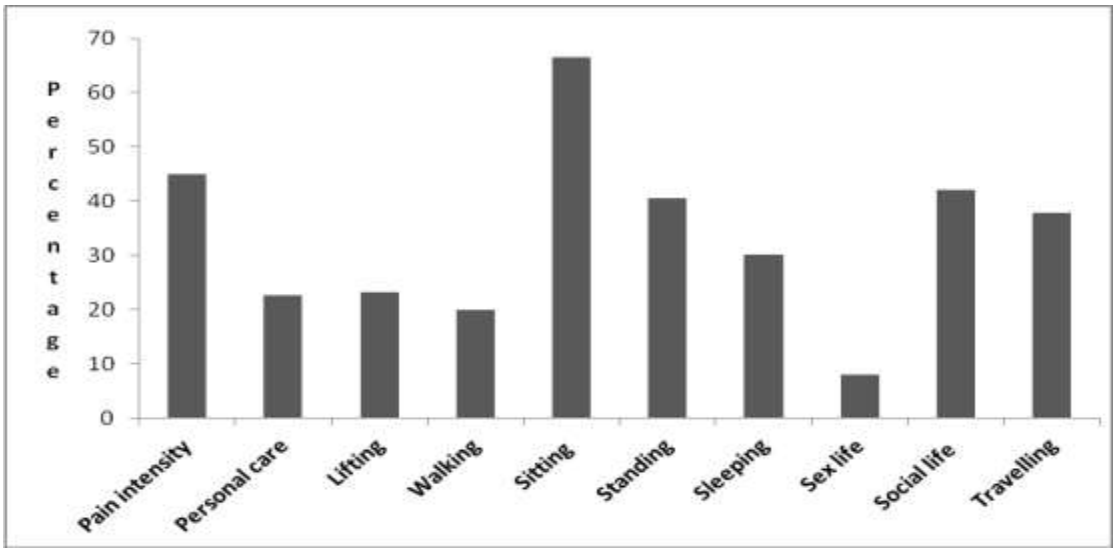


Figure 1. Interpretation of effect of MSD among different activities daily life

From the questionnaire analysis it was also found that due to neck pain their social and professional life was affected. The dentists suffered from headache (44.9%) followed by sleeping problems (42.1%) difficulties in reading (37.8 %) and pain intensity (36.2%) [Figure 2b]. These results clearly indicate that dentists suffer from pain to a greater extent.

Dynamic Posture Analysis

Forty-Two were selected who suffered from low back pain for further assessment. All of them experienced discomfort from sitting during different activities of dental procedures. Few of these dentists needed to use separate support. According to the questionnaire analysis of postures revealed that twenty-four (57.1 %) adapted 'torso against backrest', twenty-seven (64.3%) indicated the 'torso straight' posture and fourteen dentists (33.3%) indicated that the 'torso bent' was often adopted during dental procedures. Only nine (21.4%) and seven dentists (16.7%) respectively, indicated that the 'torso twisted' posture and the 'torso twisted and bent simultaneously' posture were often adopted.

From the observation of the dentists during medical procedures, it was noted that the 'torso straight' postures were most often adopted followed by 'torso bent' and 'torso on backrest' and the 'torso bent with twisted' postures were least adopted posture by the dentists. They sometime also adopted the 'torso bent with twisted' postures for medical treatment.

Posture Analysis

Postural assessment revealed that a substantial proportion of the working postures adopted by dentists during clinical procedures were ergonomically unfavorable and potentially hazardous, indicating the need for timely corrective interventions [Table 3]. The findings further demonstrated that dental professionals frequently maintained awkward and constrained postures throughout their working hours, often sustaining a particular position for several seconds to more than a minute. A total of 150 working postures were documented through video recording and subsequently evaluated using the Rapid Upper Limb Assessment (RULA) method.

The RULA assessment indicated that the highest proportion of observed postures (36.7%) fell within the score category of 5–6, representing a medium level of ergonomic risk and suggesting the need for further investigation and prompt postural modifications. This was followed by 27.3% of postures in the score category of 3–4, indicating a low level of risk for which ergonomic changes might be necessary. Furthermore, 23.3% of the observed postures were classified under the highest risk category (RULA score of 7), indicating a very high level of ergonomic risk and the urgent need for immediate corrective action. Only 12.7% of the recorded postures were categorized within the score range of 1–2, representing negligible ergonomic risk and requiring no immediate intervention.

Overall, the postural assessment demonstrated that a considerable proportion of dental professionals' working postures were associated with moderate to very high ergonomic risk. The frequent adoption of awkward, static, and constrained postures may contribute substantially to the increased occurrence of work-related musculoskeletal disorders among dental professionals. These findings emphasize the importance of ergonomic training, appropriate workstation modifications, and the adoption of neutral working postures to minimize occupational musculoskeletal risks.

Important statistical clarification: RULA scores are conventionally classified as:

- 1–2: Negligible risk.
- 3–4: Low risk; further investigation may be needed.
- 5–6: Medium risk; further investigation and changes soon.

- 7: Very high risk; immediate changes required.

Your reported category of **6+** should therefore be verified against the original RULA scoring records before publication.

Table 3: Postures by RULA action categories

RULA action category	RULA Score	No. of sampled postures
Negligible risk, no action required	1-2	19 (12.7%)
Low risk, change may be required	3-4	41 (27.3%)
Medium risk, further investigation, change soon	5-6	55 (36.7%)
Very high risk, implement change now	6+	35 (23.3%)

DISCUSSION

The present study was designed to find out the prevalence of musculoskeletal disorders among dental professionals and students in Kolkata and Garhwa Districts and find whether their social and professional life is affected or not due to musculoskeletal disorders. Dentists were exposed to numerous important risk factors for the development of occupational disorders as seen in the results of this study. To improve their income, they often performed multiple shifts at hospitals and private clinics due to the high competitiveness of the job market.

Prevalence and nature of musculoskeletal disorders in dental professionals

The findings of the present study revealed a high prevalence of work-related musculoskeletal disorders among dental professionals. During the preceding 12 months, the lower back was the most frequently affected anatomical region (69.5%), followed by the neck/shoulder (60.5%), wrist/hand (53.8%), and knee (45.0%). The reported symptoms were predominantly associated with muscular pain, stiffness, and sprain-like discomfort. These findings highlight the considerable occupational burden of musculoskeletal disorders among dental practitioners. In agreement with the present observations, Sarkar et al. [18] reported that prolonged exposure to awkward working postures was an important occupational factor associated with the development of musculoskeletal disorders.

The occurrence of musculoskeletal disorders is multifactorial and may be influenced by individual physical characteristics, general health status, psychosocial conditions, and occupational physical workload. Although a considerable proportion of dentists reported musculoskeletal discomfort, most continued to perform their professional responsibilities despite experiencing symptoms. This suggests that dental professionals may continue working while experiencing varying degrees of musculoskeletal pain, potentially affecting their longterm occupational health and work efficiency. An inadequately designed workstation may further compel dental practitioners to adopt ergonomically unfavorable postures during different clinical procedures. Such postures can increase mechanical stress on muscles, nerves, blood vessels, and joint structures, potentially resulting in muscle fatigue, restricted circulation, and cumulative musculoskeletal strain. Previous investigations have also highlighted the contribution of occupational stress and workstation-related factors to the development of musculoskeletal disorders [19]. Among the commonly reported occupational risk factors are rigid work methods, job dissatisfaction, limited control over work activities, repetitive movements, and monotonous work patterns [20],[21].

The present study also indicated that both male and female dentists belonging to different clinical specialties predominantly preferred a sitting posture while performing conservative dental procedures rather than working in a standing position. Although sitting may provide greater stability and precision during clinical procedures, maintaining a static sitting posture for prolonged periods can increase the biomechanical load on the lumbar spine. Supporting this observation, a previous study [22] reported that dentists who continuously worked in a sitting position experienced more severe lower back pain than those who alternated between sitting and standing. This suggests that prolonged static positioning, rather than sitting alone, may be an important contributor to lower back discomfort among dental professionals. Therefore, incorporating appropriate postural variations and regular movement during clinical practice may help minimize prolonged musculoskeletal loading.

The findings obtained from the Body Part Discomfort (BPD) scale further demonstrated that the severity of discomfort was greater in the lower back compared with other anatomical regions. Among participants reporting lower back pain, 44 individuals recorded BPD scores ranging from 8 to 10, indicating a high level of perceived discomfort. Similarly, 35 participants reported scores within the same range for the neck/shoulder region, whereas 14 participants reported comparable discomfort levels in the wrist/hand region. These observations reinforce the finding that the lower back represents the most vulnerable anatomical region among the dental professionals included in the study. Furthermore, the mean BPD scores showed an increasing trend across the participant groups, suggesting a possible relationship between prolonged exposure to occupational risk factors and greater symptom severity.

This pattern may indicate that persistent musculoskeletal symptoms, particularly when left unaddressed, can progressively affect the severity of discomfort. However, longitudinal investigations would be necessary to establish whether symptom severity increases over time.

Postural assessment using the Rapid Upper Limb Assessment (RULA) method revealed that a substantial proportion of the working postures adopted by dentists required ergonomic correction, as indicated by the corresponding RULA action categories. The commonly observed postural deviations included forward flexion and lateral inclination of the neck and trunk, elevated shoulders, lateral bending of the spine, unsupported sitting postures, excessive trunk rotation, forward bending and overreaching at the waist, shoulder flexion and abduction, and wrist flexion or deviation during instrument handling. These postural characteristics were frequently observed during different dental treatment procedures and were consistent with the findings of previous studies [23],[24].

The observed postural patterns suggest that dental professionals are frequently exposed to prolonged static, constrained, and asymmetrical working positions throughout their clinical practice. Such postural demands, combined with repetitive movements and extended working hours, may increase biomechanical stress on the musculoskeletal system and contribute to the development of occupational discomfort. Maintaining the trunk and neck in flexed or rotated positions, together with sustained upper-limb activity, may particularly increase the loading of the cervical, shoulder, and lumbar regions [25]. Consequently, repeated exposure to these unfavourable postures may contribute to the high prevalence of musculoskeletal symptoms observed in the present study.

These findings agree with the observations of Gangopadhyay et al. [26], who reported that prolonged work in awkward postures was associated with discomfort and pain in different anatomical regions, potentially contributing to the development of musculoskeletal disorders. Collectively, the findings emphasize that the occupational demands of dentistry, particularly prolonged static postures, repetitive clinical movements, inadequate workstation ergonomics, and restricted body movement, may play an important role in the development and aggravation of musculoskeletal disorders. Therefore, appropriate ergonomic interventions, including improved workstation design, posture correction, alternating working positions, and periodic rest breaks, are essential to reduce occupational musculoskeletal risks and promote the long-term health and professional well-being of dental practitioners.

The findings obtained from both the questionnaire-based assessment and direct postural observations indicated that dental professionals were frequently exposed to occupational postural stress and adopted various working postures depending on their individual comfort and clinical requirements. However, a difference was observed between the self-reported postural patterns and those documented through direct observation. The questionnaire responses indicated that the *torso-against-backrest* posture was more frequently adopted than the *torso-straight* posture. In contrast, observational findings revealed that the *torso-straight* posture was more commonly maintained, followed by the *torso-against-backrest* posture. Additionally, instances of *torso-bent* and *torso-twisted* postures were also observed during clinical activities. This variation between reported and observed postures highlights the importance of combining subjective assessments with direct observational methods to obtain a more comprehensive understanding of occupational postural exposure among dental professionals.

The impact of these conditions extended beyond their professional responsibilities, adversely influencing their social participation and routine domestic activities. In several instances, episodes of acute pain further intensified discomfort during clinical work, potentially affecting their ability to perform occupational tasks efficiently. More importantly, the findings highlighted the adverse effects of musculoskeletal pain on dentists' personal and social well-being. Many participants reported difficulties in performing routine activities that involved maintaining constrained or awkward postures, thereby limiting their ability to carry out certain personal care and household tasks independently. Furthermore, musculoskeletal discomfort appeared to restrict their participation in social gatherings and recreational activities. Some dentists reported avoiding outdoor activities, including travelling with family members and watching movies together, because prolonged sitting and travelling could aggravate their discomfort. Such limitations indicate that work-related musculoskeletal disorders affect not only occupational functioning but also the overall quality of life and social well-being of dental professionals.

The distribution of disability scores obtained from the questionnaires [Figure 1] revealed that the largest proportion of participants experienced moderate disability, followed by minimal and severe disability. These findings suggest that lower back and neck pain impose considerable functional limitations on dental professionals, affecting their professional efficiency, personal independence, domestic responsibilities, and social engagement. Therefore, early identification of musculoskeletal symptoms and appropriate ergonomic interventions are essential to minimize disability and improve the overall quality of life of dental practitioners.

CONCLUSION

The findings of the present study suggest that dental professionals experience considerable occupational stress associated with prolonged working hours, repetitive clinical activities, and the frequent adoption of awkward and constrained working postures. These occupational demands appear to be important factors associated with the high prevalence of musculoskeletal disorders, particularly in the lower back, neck, shoulders, and wrists/hands. Furthermore, the disability associated with musculoskeletal pain

has a substantial impact on the overall quality of life of dental practitioners. Difficulties in performing professional responsibilities, routine domestic activities, and personal tasks indicate that work-related musculoskeletal symptoms extend beyond the workplace and considerably restrict their daily functioning and social participation. Persistent musculoskeletal discomfort may also adversely affect their physical and psychological well-being, potentially reducing work efficiency, professional productivity, and long-term occupational sustainability. Therefore, the findings emphasize the need for appropriate ergonomic interventions, postural modifications, and preventive occupational health measures to minimize musculoskeletal risks and improve the overall well-being of dental professionals.

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INFORMED CONSENT: Before the study all the subjects', hospital and Institutional authorities was informed and take their consent.

CONFLICT OF INTEREST: The authors report no conflict of interest.

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