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Investigating the Causes of Musculoskeletal Disorders among Dental Professionals and Designing Solutions to Mitigate their Impact on Social and Professional Well-being

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Abstract

Introduction: Work-related musculoskeletal disorders are a major concern among different professionals, including dentists. A study was conducted to determine the causative factors related to the prevalence of musculoskeletal disorders and to assess whether their social and professional life is hampered, and to design an intervention to be done.

Methods: For the study, 185 dentists, both male and female, were selected randomly from Kolkata city of West Bengal and Garhwa city of Jharkhand, India. Modified Nordic musculoskeletal questionnaire with posture analysis was performed. Then Oswestry Low Back Disability Questionnaire (OLBDQ) and Neck Pain Disability Questionnaire (NPDQ) were performed to evaluate the extent to which social and professional life is restricted by lower back and neck pain. A detailed existing dentist chair was study based on the ergonomics and design concepts. The design process has been followed by creating multiple ideation and evaluation based on the support it will provide to the user while working. Dimensional CAD model created in the Fusion 360 software package.

Results: From the analysis of the questionnaire, it was revealed that dentists mainly suffer from Lower Back and neck Pain/shoulder pain. The results of QLBPDQ and NPDQ analysis also support that LBP and neck pain restricted their social and professional life. Further posture analysis supports this finding. Statistical analysis strongly points to the association between job autonomy, workstation factors, and work stress factors. Thus, it was evident that dentists work in stressful conditions and awkward postures with repetitiveness of the work throughout the day, which further amplifies their discomfort. The existing poor design of the chair also acts as a supportive role.

Conclusion: It can be concluded that the dental professional are highly stressed due to their working postures, using poorly designed tools and workstation conditions, and it harms their finance and health. An ergonomically designed chair provides

different range settings and adjustability to the user, so each user can adjust according to their need and comfort.

Keywords: Dentist; Musculoskeletal disorders; posture; repetitiveness; Social life; Professional life

Introduction

Musculoskeletal disorders (MSDs) have become increasingly prevalent worldwide in recent years and are strongly associated with a wide range of occupational settings [1,2]. Dental professionals, in particular, are frequently exposed to uncomfortable, awkward, and asymmetric working postures—such as extending and rotating the head, and maintaining the arms in outstretched positions away from the body—which significantly contribute to MSD risk [3,4]. In addition to occupational factors, other contributors to MSDs include genetic predisposition, aging, and both physical and psychological stress [5,6].

Similar to many other healthcare professions, dentistry is associated with a specific set of musculoskeletal challenges. Dentists are particularly vulnerable due to the nature of their work, which demands sustained concentration, prolonged static postures, and repetitive hand and arm movements. The need for precise visual access, combined with frequent upper limb activity, poor ergonomic practices, and extended working hours, further exacerbates the risk of developing musculoskeletal conditions—particularly in the neck, shoulders, lower back, and waist. These conditions not only reduce professional efficiency but may also lead to early disability within the profession [7,8].

Among these issues, low back pain (LBP) is especially prevalent, highlighting the occupational hazards linked to prolonged sitting during clinical procedures. Numerous studies have reported that MSDs commonly affect the lumbar spine and may also involve the cervical and shoulder regions. Despite advancements in dental equipment design and ergonomic interventions since the 1980s, the prevalence of neck and shoulder pain and dysfunction remains notably high [9].

The present study aims to investigate the prevalence of musculoskeletal disorders— specifically low back and neck pain—among dental professionals, and to assess the extent to which these conditions affect their clinical performance and overall quality of life.

Material and Methods

Selection of Subjects

In the present investigation, a structured questionnaire was administered to 185 registered dental practitioners from various clinics, hospitals, and educational institutions across Kolkata and Jharkhand. In addition to the questionnaire, interviews and direct observations were conducted to gather comprehensive information on participants' demographic profiles, occupational history, income levels, and medical history related to musculoskeletal disorders. All interviews were conducted individually to ensure privacy and accurate data collection.

Ethical approval for the study was obtained from the Institutional Ethical Committee of Vananchal Dental College and Hospital (Ref No. VDCH/IEC/03/2024). The data collection was carried out over a six-month period, from April to September 2024.

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) [10] and Body Mass Index (BMI) [11,12] of all the subjects were also computed.

Questionnaire Study

A detailed assessment of low back pain (LBP) was conducted on the experimental group using the Modified Nordic Questionnaire, which evaluates both current pain (within the past 7 days) and previous pain (within the last 12 months) [13].

The questionnaire included the following key components:

1.Frequency of Symptoms: Participants were asked, "How often have you had, at any time during the last 7 days, 1 month, and 12 months, pains or discomfort in the following body regions?" Frequency was rated on a six-point scale from '0 = Never' to '5 = Very often'.

2.Intensity of Symptoms: Participants rated the intensity of pain or discomfort experienced during the same time periods on a six-point scale ranging from '0 = Zero' to '5 = Very high'.

3.Work Restrictions: Participants were asked, "Have you been restricted from doing your normal work (at home or clinic) because of pains or discomfort in any of the following regions at any time during the last 12 months?" with 'yes' or 'no' response options.

4.Recent Discomfort: Participants responded 'yes' or 'no' to whether they had experienced discomfort or pain in any body region during the last 30 days.

The questionnaire was divided into three sections: the first covered demographic details such as gender, age, work duration, and type of clinic; the second addressed work conditions, including working posture, use of an assistant, and work organization (e.g., number and purpose of breaks); the third section focused on musculoskeletal disorders (MSDs) and the types of discomfort or problems experienced during and after work. Pain intensity and discomfort were further quantified using the Body Parts Discomfort (BPD) scale, which rates discomfort on a scale from 1 to 10 [14]. The questionnaire comprised objective multiple-choice questions to facilitate standardized data collection.

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 of 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 [15].

Oswestry Low Back Pain Disability Questionnaire

This is a self-report questionnaire [16]. The questionnaire is divides into 10-sections (Pain Intensity, Personal Care, Lifting, Walking, Sitting, Standing, Sleeping, Sex Life, Social Life and Traveling) and each section has 6 possible answers. Statement 1 is graded as 0 points; statement 6 is graded as 5 points. After you have finished the Questionnaire, add up your points, divide that number by 50, and multiply by 100 to get your percent disability. If one section is missed or not applicable, the score is calculated by the total possible score.

- 0% to 20%: Minimal disability
  20%-40%: Moderate disability
  40%-60%: Severe disability
  60%-80%: Crippled
  80%-100% : Bed Bound

Neck Pain Disability Questionnaire

The Neck Disability Index (NDI) is a self-report questionnaire [17]. The questionnaire is divides into 10-sections (Pain Intensity, Personal Care, Lifting, Reading, Headache, Concentration, Work, Driving, Sleeping, and Recreation) and each section has 6 possible answers. Statement 1 is graded as 0 points; statement 6 is graded as 5 points. After you have finished the Questionnaire, add up your points, divide that number by 50, and multiply by 100 to get your percent disability. If one section is missed or not applicable, the score is calculated by the total possible score.

Points are interpreted as:

- 0 - 4 points = no disability
  5 - 14 points = minimal disability
  15 - 24 points = moderate disability
  25 - 34 points = severe disability
  > 34 points = complete disability

Observational Study

Dentists were observed in their assigned duty, while observing and performed 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 χ^2 test, and the associations were described by the odds ratio with a 95% confidence interval. Statistical analysis was performed using the Statistical Analysis System v9.1 (SAS) software program (2002–2003).

Design process

A detailed design process has been followed by creating multiple ideation and evaluation on the bases of support it will provide to user during working. Dimensional CAD model created in Fusion 360 software package.

Results and Discussion

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 a 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 hours a day for 6 days, and private practitioners 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%), paediatric dentists (13.2%), periodontists (17%), and orthodontists (14.6%). Forty-seven (25.4%) of them were working in governmental institutions, seventy-one (38.4%) are involved in dental college, and the remaining sixty-seven (36.2%) as private practitioners. All of them were right-handed. (Table 1)

Variable	Range	Mean	±SD
Stature (cms)	143-172.5	162.86	5.16
Weight (kgs)	42-73	52.98	6.8
BMI (kg/m^2)	16.22-24.03	19.95	2.23
BSA (m^2)	1.44-1.92	1.61	0.11
Year of Experience	1-27	11.1	6.9
Duration of Work	6-8	6.0	1.9
	N(%)		
Gender	Male	107	57.8
	Female	78	42.2
Age (years)	20-30	69	37.3
	31-40	52	28.1
	41-50	45	24.3
	50-60	19	10.3
Clinical Professional	Intern	19	10.2
	GP	78	42.2
	Specialist	88	47.6
Working Institutions	Government Hospital	47	25.4
	Dental College	71	38.4
	Private Practitioner	67	36.2
Years of Practice	≤ 5	31	16.7
	6-10	47	25.4
	11-15	49	26.5
	16-20	41	22.2
	≥20	17	9.2

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

Questionnaire Study

Musculoskeletal Disorder

Participants were asked to identify areas of the body where they had experienced discomfort over the past 12 months using the Modified Nordic Questionnaire. Analysis of the responses revealed that the lower back was the most commonly affected region, followed by the neck/shoulders and wrists/hands. These findings were further supported by results from the BPD (Body

Part Discomfort) scale, which also indicated that low back pain was the most prevalent, followed by discomfort in the neck and wrist/hand regions.

Approximately 50% or more of participants reported discomfort in the lower back, neck, and wrist/hand regions over the past seven days (Table 2). The one-year prevalence of functionally limiting musculoskeletal symptoms ranged from 1.1% for the ankle/foot to 41% for the lower back. These prevalence rates were calculated using responses to question 3 of the survey, where "0" indicated "No" and "1" indicated "Yes." Severe musculoskeletal symptoms (MSS) over the past year were defined as a score of ≥4 on questions 1 and/or 2. Notably, severe lower back symptoms were the most frequently reported, affecting 41% of participants (Table 2).

The results of the comparison between dentists with and without lower back pain (LBP), neck/shoulder pain, and wrist/hand pain—based on job autonomy, workstation factors, and work stress factors—are presented in Table 3. These responses were participatory in nature, gathered through interviews using the Nordic Musculoskeletal Questionnaire. Among the job autonomy factors, rigidity in work methods and prolonged working hours emerged as significant predictors of musculoskeletal symptoms in the lower back, neck/shoulder, and wrist/forearm regions.

In terms of workstation factors, uncomfortable seat back support showed a tendency toward significance in relation to lower back symptoms. Additionally, constraints in body movement were identified as significant predictors of symptom development in the lower back, neck/shoulder, and wrist/hand areas.

Among the work stress factors, a monotonous job pattern and awkward body movements during dental procedures were significantly associated with the development of symptoms in all three regions: lower back, neck/shoulder, and wrist/hand. Lower back pain typically lasted from a few minutes to several hours and, in some cases, persisted for 1–2 days. This discomfort was generally attributed to muscle pain, stiffness, and sprain. Dentists reported experiencing the most severe pain during rest periods, followed by during active working hours.

Table 2: Prevalence rates for 7 days, 1-month, 1-year severe musculoskeletal

Body Regions	7 days symptoms N (%)	1 month symptoms N (%)	1 year symptoms N (%)
Neck	109 (59)	63 (34.1)	49 (26.5)
Shoulders	30 (16.2)	24 (12.9)	14 (7.6)
Elbows/Forearms	38 (20.5)	25 (13.5)	19 (10.3)
Hands/Wrists	93 (50)	49 (26.5)	25 (15.5)
Fingers	21 (11.3)	11 (5.9)	05 (2.7)
Upper Back	15 (8.1)	10 (5.4)	03 (1.6)
Lower Back	132 (71.3)	93 (50.2)	76 (41)
Hips/Thighs	36 (19.5)	30 (16.2)	14 (7.6)
Knees/Lower Legs	22 (11.9)	15 (8.1)	11 (5.9)
Ankles/Foot	17 (9.2)	05 (2.7)	02 (1.1)

Table 3: 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	3.7	1.4-9.9	0.01	3.9	1.3-11.6	0.02
Prolong working time	4.5	1.1-11.0	0.02	2.9	1.1-7.4	0.03	3.5	1.3-9.6	0.02
Inadequate rest period during the working day	2.2	0.8-5.9	0.16	1.6	0.5-3.1	0.73	3.5	0.5-3.3	0.08
Workstation Factors									
Uncomfortable seat back support	3.8	1.1-12.1	0.04	1.3	0.5-3.3	0.07	0.7	0.3-1.9	0.68
Constrain in body movement	4.7	6.1-13.8	0	5	1.5-16.6	0.01	3.4	1.3-8.8	0.01
Clinical Environment	2.2	0.9-5.3	0.12	2.2	0.7-6.1	0.23	1.6	0.5-4.8	0.54
Work stressing factors									
Monotonous Job	3.1	1.3-7.8	0.02	4.1	1.3-12.1	0.01	3.2	1.2-8.5	0.03
Awkward body movement	4.5	1.7-12.2	0	4	1.5-10.9	0.01	3.1	1.3-9.5	0.04
Dissatisfaction regarding earning	4.8	1.2-19.6	0.05	4.7	1.3-16.2	0.03	2.4	1.0-11.1	0.04
Difficulty in falling asleep	2.4	0.8-6.9	0.17	1.9	0.7-5.2	0.14	1.7	0.5-4.9	0.73

($P < 0.05$) p value based on the χ^2. OR = odds ratio; 95% CI = 95% confidence interval for the OR.

Oswestry Low Back and Neck Pain Disability Questionnaire

Out of the 185 subjects interviewed, 133 were selected for the Oswestry low back pain questionnaire because of a complaint of low back pain. From the questionnaire analysis,

59 of them had minimal disability (48.7%), followed by 100 with moderate disability (54.1%), and the remaining 26 dentists had severe disability (14%). On the other hand, out of the 185, 97 were interviewed for a neck pain questionnaire because they were suffering from neck pain. From the questionnaire analysis, it was observed that 94 of them had minimal disability (50.8%), followed by 80 with moderate disability (43.3%), and the remaining 11 dentists had severe disability (5.9%) (Figure 1).

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 a long period (40.5%), and travelling (37.8%) (Figure 2a). This result is an absolute reflection of the alarming situations of dental professionals.

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.

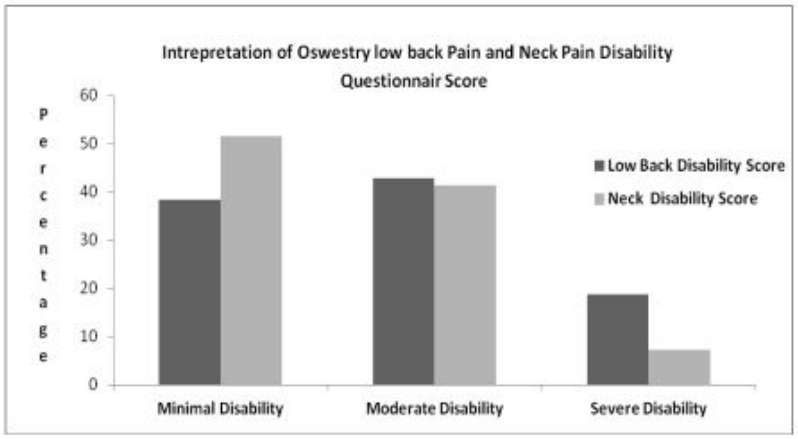

Figure 1: Interpretation of Oswestry Low Back and Neck Pain Disability Questionnaire scores

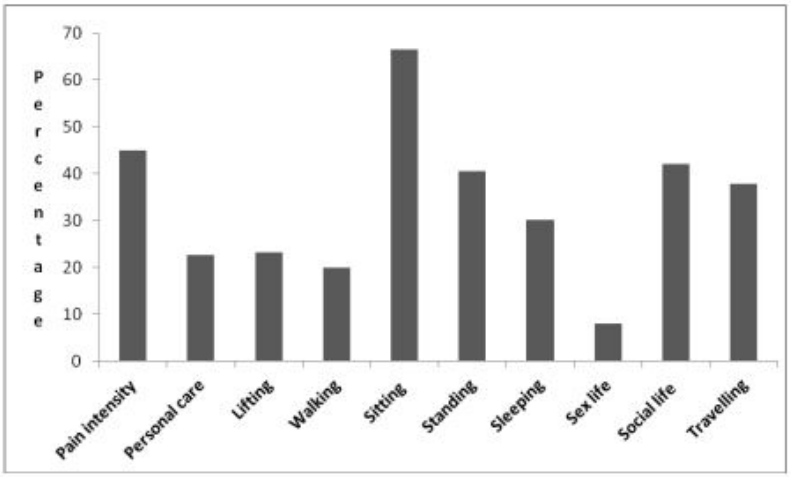

Figure 2a: Interpretation of Oswestry Low Back Pain Disability Questionnaire each sections scores

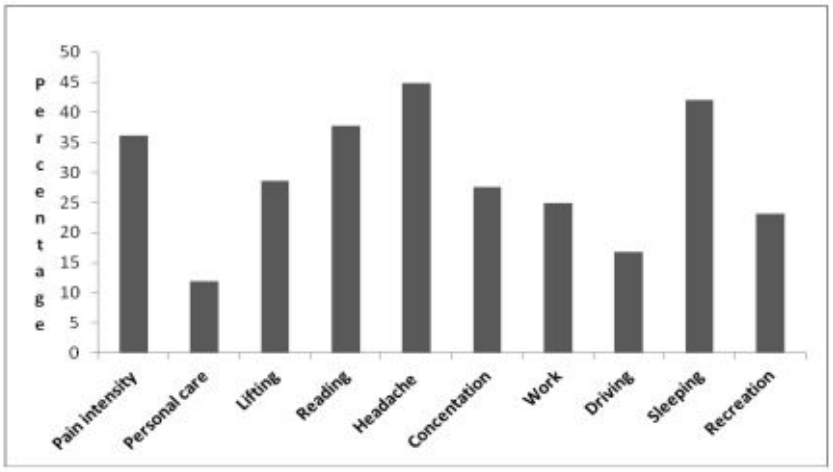

Figure 2b: Interpretation of Neck Pain Disability Questionnaire each section scores

Dynamic Posture Analysis

Out of 133 participants, 42 dentists who reported experiencing low back pain were selected for further assessment. All of them experienced discomfort while sitting during various dental procedures, and a few required the use of additional back support.

Questionnaire analysis revealed that 24 dentists (57.1%) reported adopting the 'torso against backrest' posture, 27 (64.3%) indicated the 'torso straight' posture, and 14 (33.3%) reported frequently adopting the 'torso bent' posture during dental procedures. Additionally, 9 dentists (21.4%) reported often using the 'torso twisted' posture, while 7 (16.7%) indicated the use of the 'torso twisted and bent simultaneously' posture (Figure 3a).

Observational data during dental procedures supported these findings: the 'torso straight' posture was most commonly observed, followed by 'torso bent' and 'torso against backrest'. The 'torso bent with twisted' posture was the least frequently observed, though some dentists occasionally adopted it during treatment (Figure 3b).

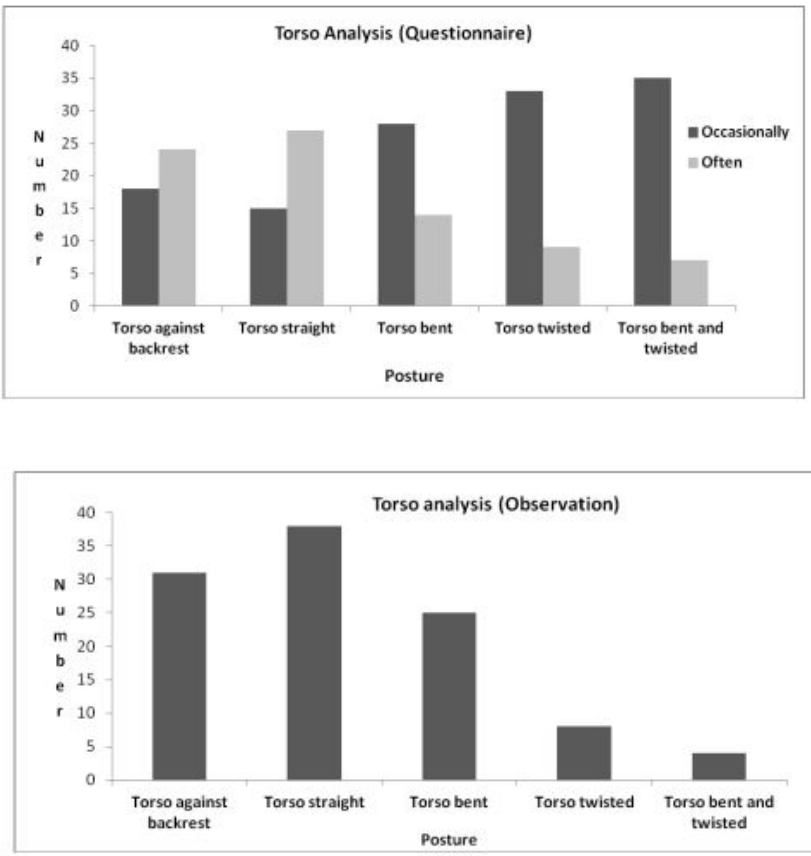

Figure 3: The summarized data for dentistry procedure posture

(a) Questionnaire assessment (n=42) and (b) Observation study (n=42)

Posture Analysis

Posture analysis revealed that the majority of postures adopted by dentists during clinical procedures were awkward and potentially hazardous, underscoring the urgent need for ergonomic interventions (Figure 4). These postures were frequently assumed throughout the workday and often maintained for durations ranging from several seconds to over a minute. A total of 150 postures were recorded and analyzed using video-based observation. Of these, the largest proportion (36.7%) fell within the RULA (Rapid Upper Limb Assessment) score range of 5–6, indicating a medium level of risk, where further investigation and corrective measures are recommended soon. This was followed by 27.3% of postures in the 3–4 score range (low risk, change may be required) and 23.3% in the 6+ category, which reflects a very high level of risk, necessitating immediate intervention. Only 12.7% of postures were classified as 1–2, suggesting negligible risk where no action is required.

Figure 4: Working postures of dentists during different dental treatments

The high prevalence of postures falling within medium to very high-risk categories suggests a significant ergonomic burden, likely contributing to the elevated incidence of musculoskeletal disorders (MSDs) observed among dental professionals. The present study was conducted to assess the prevalence of musculoskeletal disorders (MSDs) among dental professionals and students in Kolkata and Garhwa city, as well as to evaluate the impact of these disorders on their social and professional lives. The findings indicate that dentists are exposed to several significant risk factors contributing to the development of occupational MSDs. The competitive nature of the job market often compels them to work multiple shifts across hospitals and private clinics in an effort to increase their income. This extended workload further exacerbates their physical strain and increases the likelihood of developing musculoskeletal issues.

Prevalence and nature of musculoskeletal disorders in dental professionals

Data from this study revealed that a significant proportion of dentists reported experiencing musculoskeletal disorders (MSDs) in the past 12 months, primarily in the lower back (69.5%), neck/shoulders (60.5%), wrists/hands (53.8%), and knees (45.0%). These issues were generally attributed to muscle pain, stiffness, and sprains. Sarkar et al. [18] highlighted that awkward and prolonged working postures are key contributors to the development of MSDs. The onset of these disorders is also closely linked to factors such as an individual's physical condition, overall health status, psychosocial stressors, and physical workload.

Despite experiencing discomfort, most affected dentists continued to perform their duties. However, poorly designed workstations often force dental professionals into harmful postures during treatment, placing pressure on nerves and blood vessels, straining muscles, reducing circulation, and accelerating joint degeneration. Previous research also supports these findings: work-related stress and inadequate workstation ergonomics have been shown to increase MSD risk [19]. Frequently cited risk factors include rigid work routines, job dissatisfaction, limited control over tasks, repetitive movements, and monotonous work [20,21]. The results of the BPD scale showed that the severity of low back pain was higher compared to other body parts. Forty--four people with low back pain symptoms reported a BPD scale rating between 8 and 10, while the same BPD scale rating (8–10) was reported by 35 and 14 people for neck/shoulder and wrist/hand, respectively. Results also reflected that the mean BPD scale score increased as the subject group increased, supporting the hypothesis that MSD symptoms are aggravated over time, as they remain untreated.

The analysis of working postures revealed that most require immediate corrective measures, as indicated by the RULA action categories. Dentists were frequently observed working with their back and neck in flexion or tilted to one side, shoulders elevated, and engaging in side bending, forward bending, or excessive twisting of the spine. Other common postures included working without back support, overreaching at the waist, flexion and abduction of the shoulders, and wrist flexion or deviation during grasping tasks. These positions were consistently adopted throughout the day during various patient treatments and are

consistent with findings from previous studies [22-24]. It is therefore evident that dentists commonly work in awkward postures for prolonged periods, contributing significantly to the development of musculoskeletal disorders. This can be attributed to extended working hours and the repetitive nature of dental tasks. The necessity to maintain constrained and static postures for long durations further amplifies discomfort. These findings are in agreement with the work of Gangopadhyay et al. [25], who reported that maintaining awkward postures for prolonged periods leads to pain and discomfort in various body regions, ultimately resulting in musculoskeletal disorders.

From both the questionnaire evaluation and direct observation, it is indicated that the dentists are exposed to postural stress and frequently adopt different types of postures according to their convenience. Firstly, while the questionnaire data indicated more frequent adoption of the 'torso against back rest' posture during driving than the 'torso straight' posture but the observation data, showed that the 'torso straight' posture was more frequently adopted than the 'torso against back rest' posture and sometime "torso bent" and "torso twisted" (Figure 3).

The Oswestry Low Back Pain Disability and Neck Pain Disability Questionnaire results revealed that dentists suffer significantly from both low back and neck pain. These conditions have greatly affected not only their ability to work but also their social and domestic lives. In several cases, acute pain has intensified discomfort during work, but more importantly, it has created substantial hindrances in their personal lives. Many dentists find it extremely difficult to perform tasks that involve constrained postures, making it challenging to attend to personal needs. As a result, they often avoid social gatherings and outdoor recreational activities, such as going to the movies with their families, due to the discomfort associated with travel and prolonged sitting. According to the questionnaire findings, the majority of participants experienced moderate disability, followed by minimal and severe levels of disability.

Conceptualization of an Ergonomic Dentist Chair

A study revealed that awkward working postures commonly adopted by dental professionals put significant pressure on nerves and blood vessels, cause excessive muscle strain, reduce blood circulation, and lead to wear and tear of joint structures. To address these issues, an ergonomically designed dental chair was conceptualized and used the design process method. This chair offers comprehensive support to the back, chest/neck, arms, and wrists. Designed based on human anthropometric data, it accommodates users within the 5th to 95th percentile range by providing adjustable settings to meet individual comfort and ergonomic needs.

Description of the Dentist Chair Concept

The chair is designed to support the spine during standard dental working postures, particularly since dental surgeries often require the dentist to lean forward repeatedly or for extended periods. The absence of adequate front or back support in such scenarios can lead to chronic back and neck pain. To counter this, the chair is equipped with a 360-degree rotatable back support. This adjustable support can function both as a traditional backrest and, when rotated to the front, as a chest or neck support, depending on the dentist's posture during the procedure (Figure 5).

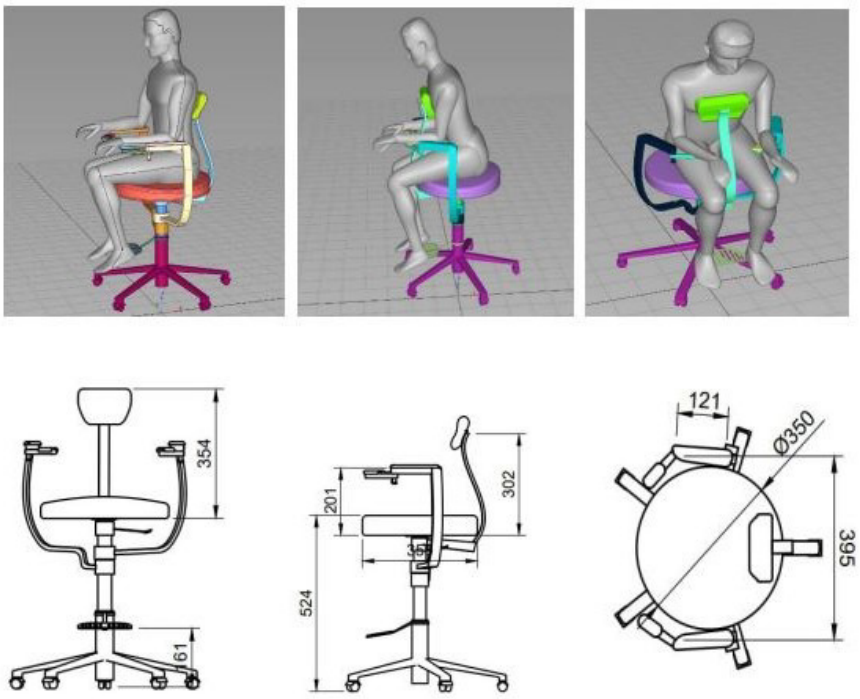

Figure 5: Concept of the ergonomically design chair for the dentists (the dimensions are in mm)

In addition, the chair includes multiple adjustable features such as seat height, footrest, and armrests. The user for maximum comfort can customize these. The armrests are particularly innovative — each can rotate 180 degrees and be angled as needed to support the arms during operations.

Each armrest consists of two segments, with the lower segment capable of rotation. This rotation allows for extended arm support, enabling the wrist to rest comfortably. This wrist support is especially beneficial during delicate procedures, enhancing precision and reducing strain on the wrist, arm, elbow, and shoulder joints.

Moreover, the chair's seat is 360-degree rotatable and mounted on a wheeled base. This mobility reduces the need for torso twisting or adopting awkward positions, further supporting ergonomic posture throughout the workday.

Conclusion

The results conclude that dentists experience significant occupational stress due to their working postures and behaviors, which contribute to a high prevalence of musculoskeletal disorders—particularly in the lower back, neck, shoulders, and wrists/hands. These pain-related disabilities have a substantial impact on their quality of life. The inability to perform both professional and domestic tasks demonstrates that symptoms of musculoskeletal disorders considerably interfere with dentists' daily lives. Over time, this can adversely affect their overall health and work performance. Ergonomically designed furniture, particularly chairs, plays a crucial role in reducing the occurrence of musculoskeletal disorders (MSDs). For dental professionals, who often maintain static and awkward postures for extended periods, properly designed chairs can provide essential support to the spine, neck, and limbs. These chairs promote natural body alignment, improve comfort, and help distribute body weight evenly, thereby minimizing strain on muscles and joints. By incorporating adjustable features such as seat height, backrest angle, and lumbar support, ergonomic chairs can be customized to fit individual needs, reducing fatigue and the risk of developing MSDs. Ultimately, investing in ergonomically designed furniture not only enhances physical well-being but also improves productivity and overall job satisfaction among dental professionals.

Acknowledgement

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Limitation/Future Scope

The scope of the study was limited to the conceptual stage, and no intervention study was conducted. In the next phase, a prototype was developed, taking the study to the next level.

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