

Site Predilection of Occupational Musculoskeletal Complaints among Dental Practitioners in Chennai City

A. S. Arthrisri¹, Ashish R. Jain^{2*}, Jacob Mathew Philip³, C. J. Venkata Krishnan⁴, Chitraa R. Chandran⁵¹Tagore Dental College and Hospital, Chennai, India²Ph.D Scholar, Assistant Professor, Department of Prosthodontics, Saveetha Dental College and Hospitals, Chennai, India³Department of Prosthodontics, Tagore Dental College and Hospitals, Chennai, India⁴Department of Prosthodontics, Tagore Dental College and Hospital, Chennai, India⁵Department of Periodontics, Tagore Dental College and Hospital, Chennai, India***Corresponding author:** Dr. Ashish R. Jain MDS, MD.ACU.VARMA Ph.D Scholar, Reader Department of Prosthodontics, Saveetha Dental College and Hospital, Poonamalle High Road, Chennai 600077, India, Ph:09884233423; Email:dr.ashishjain_r@yahoo.com**Received:** Sep 27, 2016; **Accepted:** Nov 21, 2016; **Published:** Dec 17, 2016**Copyright:** © 2016 Ashish Jain et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Dentists are at high risk for musculoskeletal disorders due to occupational health hazards. In India, even though the population is high, there is still a lack of awareness about the prevalence of work-related musculoskeletal disorders among dentists in this rapidly growing occupational sector. Identifying the common sites of ailment and comparing them with the contributing factors associated with these musculoskeletal symptoms can help to develop ergonomic recommendations for the dental profession in Chennai city. This study was aimed at investigating the common sites of ailment and comparing them with the contributing factors associated with musculoskeletal disorders among dentists in the city. Using stratified sampling method, 297 dentists were selected and given questionnaire based on the type of ailment, common sites of ailment, duration of ailments, treatment modalities, and effectiveness of therapy. The dentists reported that the most common sites of ailment were shoulder ($n = 106/297$) neck ($n = 78/297$), and lower back ($n = 67/297$). This study revealed the prevalence of musculoskeletal complaints among the various age groups of dentists is common in the shoulder and neck regions. Dentists should implement right ergonomic designing in their dental clinics along with regular exercise and relaxation techniques, which help them to combat stress, thus improving the quality of life, resulting in consistent long-lasting work efficiency.

Keywords: Musculoskeletal disorders; Ailment; Occupational hazards; Dentists

Introduction

Musculoskeletal disorders (MSDs) represent an important occupational health issue in dentistry. Musculoskeletal pain, particularly back pain, has been found to be a major health problem for dental practitioners [1,2]. Musculoskeletal disorders affect the physical, psychological, and social aspects of dentists. This, in turn, has an impact on their productivity and ultimately reduces their quality of life [3].

Musculoskeletal disorders are known to be of multifactorial etiology [4]. These disorders are due to excessive, long-term unilateral stress on muscles, tendons, joints, and nerves [5,6]. An article by Valachi and Valachi [7] cited a flowchart of muscle activity and pain leading to musculoskeletal disorders: Prolonged static posture → muscle fatigue and muscle imbalance → muscle ischemia/necrosis, trigger points, and muscle substitution → pain → protective muscle contraction → nerve compression, spinal disk degeneration → musculoskeletal disorder.

It has been suggested that injuries caused by work-related musculoskeletal disorders or similar cumulative trauma disorders can be reduced or prevented by applying ergonomic principles in dental equipment and instrument design [8]. Recommendations on how to decrease musculoskeletal disorders are often only partially implemented even by relatively motivated group of dentists [9,10]. Dentists require good visual acuity, hearing, depth perception, psychomotor skills, manual dexterity, and ability to maintain occupational postures over long periods [3].

Studies related to the musculoskeletal disorders among dental professionals have already been published in many countries. In a previous study (unpublished data) the various contributing factors for musculoskeletal disorders among the dentists in Chennai city were evaluated. Therefore the aim of this study is to reveal the common sites of ailment and to compare them with the contributing factors obtained from the previous study among the dentists in Chennai city by distributing questionnaires pertaining to it.

Aims

1. To evaluate site predilection of musculoskeletal disorders among the dentists in Chennai city.
2. To analyze the interrelationship between the contributing factors and different regions of ailment among the dentists surveyed.

Materials and Methods

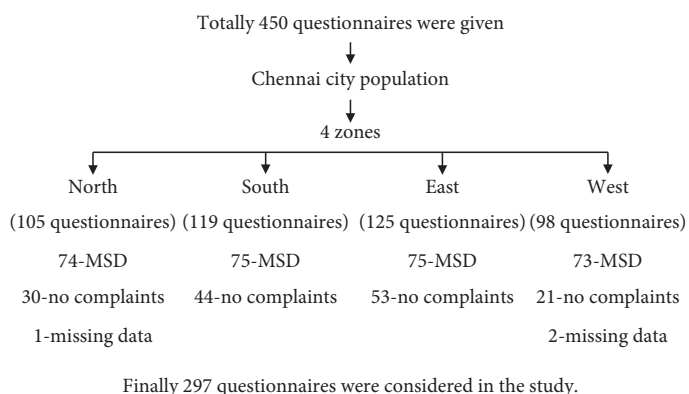
Using stratified sampling method, 297 dentists were selected and given questionnaire based on work-related musculoskeletal disorders as diagnosed in the previous study (unpublished data). In this study, questions related to the types of ailment, common sites of ailment, duration of ailments, treatment modalities, and effectiveness of therapy for musculoskeletal disorders were prepared and given to the same set of dentists so as to compare the contributing factors with the ailments experienced by the dentists.

Pretesting of questionnaire was performed prior to the survey. Similar to the previous study, this study was also approved by the ethical

committee of the institution and an informed consent was obtained from each dentist prior to the distribution of questionnaire.

Prevalence of musculoskeletal disorder complaints was analyzed using chi-square test (95% significance level [$p > 0.005$]). Statistical analysis was performed using SPSS software (16.0 version Windows XP).

Sampling Chart



Results

Among the dentists surveyed, 43.10% ($n = 128/297$) of dentists reported with pain as the musculoskeletal complaint; 31.65% ($n = 94/297$) of dentists had pain accompanied with stiffness and fatigue. The sites of ailment that the dentists experienced were shoulder (69.36%), neck (61.28%), wrist/hands (40.40%), lower back (28.28%), upper back (21.21%), knees (17.50%), elbows (13.47%), and foot (10.10%); 13.4% of dentists reported a musculoskeletal complaint after performing complete denture and impaction procedure; 12.12% ($n = 36/297$) of dentists reported a musculoskeletal complaint after performing scaling procedure; 11.78% ($n = 35/297$) of dentists reported a musculoskeletal complaint after performing root canal treatment procedure; and 11.41% ($n = 34/297$) of dentists reported a musculoskeletal complaint after performing orthodontic procedure (Table 1).

Male dentists reported that the most common sites of ailment were shoulder ($n = 106/297$), neck ($n = 78/297$), and lower back ($n = 67/297$), whereas in female dentists the regions were neck ($n = 104/297$), shoulder ($n = 100/297$), and wrist ($n = 70/297$)

(Figure 1). This study revealed that the shoulder and neck region is the most common site of musculoskeletal ailment among the dentists of various age groups in Chennai city (Figure 2). Dentists with a height ranging from 150 to 180 cm had more prevalence of musculoskeletal symptoms. Dentists with a height ranging from 151 to 160 cm had greater prevalence in shoulder (20.8% [$n = 62/297$]), neck (18.18% [$n = 54/297$]), and lower back (11.45% [$n = 34/297$]); dentists with a height ranging from 161 to 170 cm had greater prevalence in shoulder (21.88% [$n = 65/297$]), neck (19.87% [$n = 59/297$]), and wrist

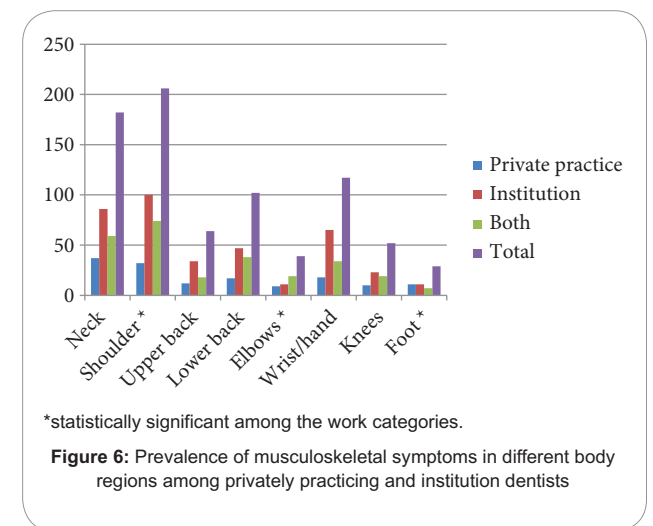
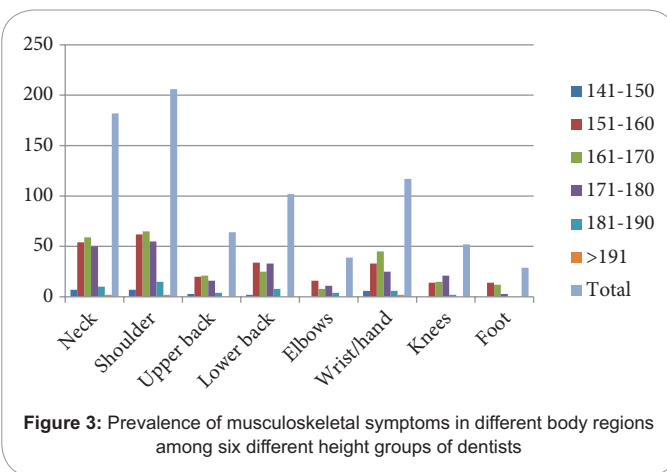
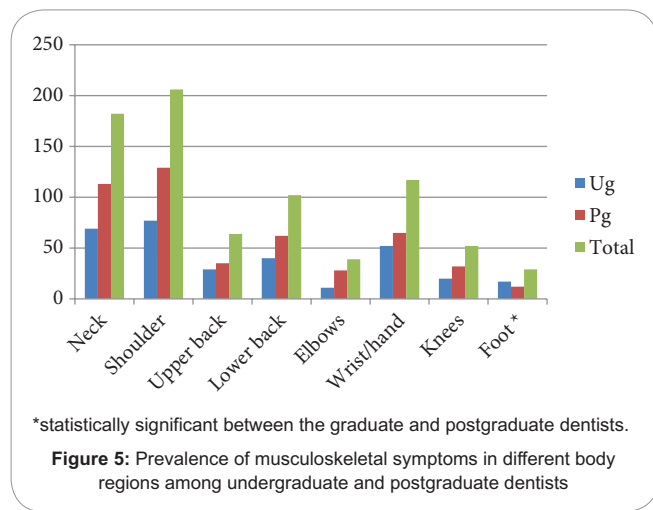
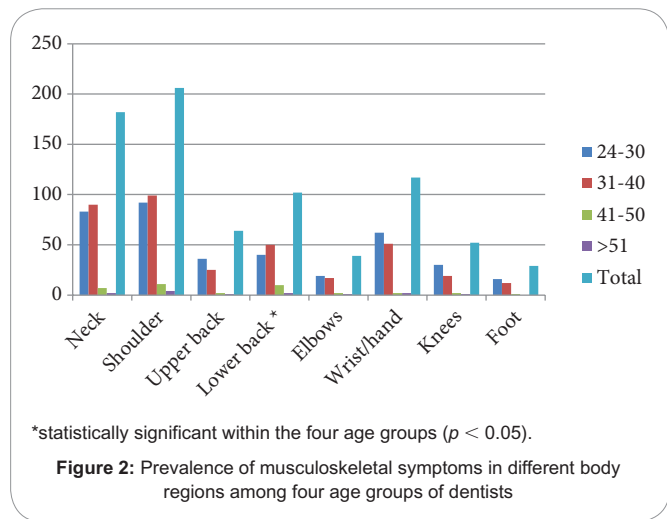
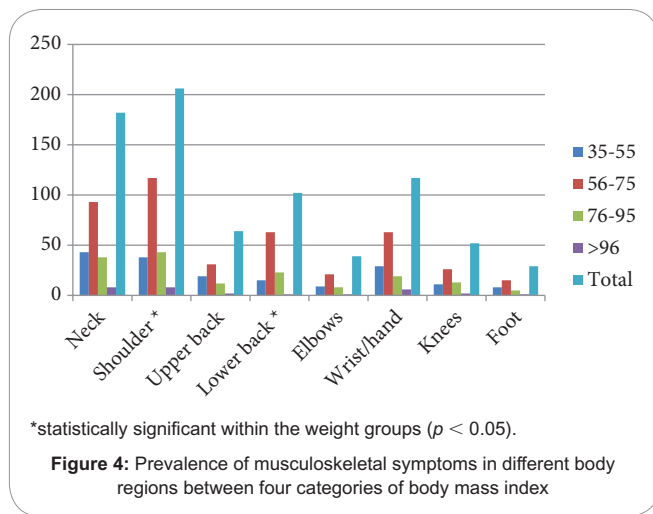
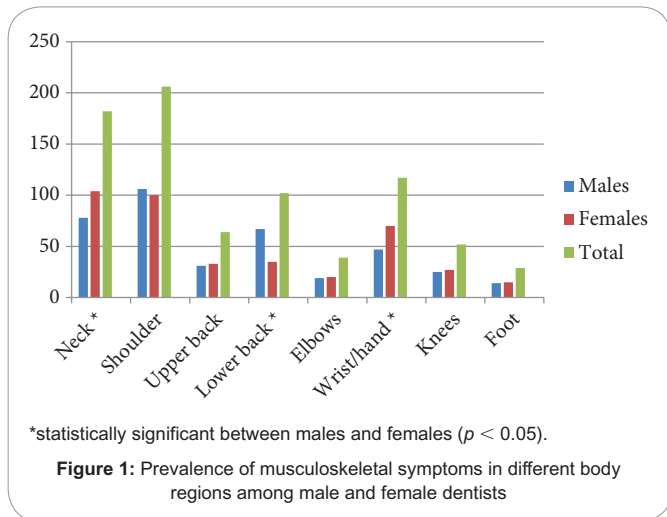
Musculoskeletal complaints	Subtype	Number
Type of ailments	Pain	128
	Stiffness	28
	Fatigue	29
	Mixed (pain, stiffness, fatigue)	94
	Others	18
Duration of ailments	Hours	89
	Days	124
	Months	38
	Years	46
	Region of symptoms	Neck
Shoulder		206
Upper back		64
Lower back		84
Elbows		39
Wrist/hands		117
Knees		52
Foot		29
Influence of work-related procedures		Scaling
	Extraction	32
	RCT	35
	FPD	26
	RPD	28
	CD	40
	Orthodontic treatment	34
	Impaction	40
	Implantation	20
	Maxillofacial surgeries	6

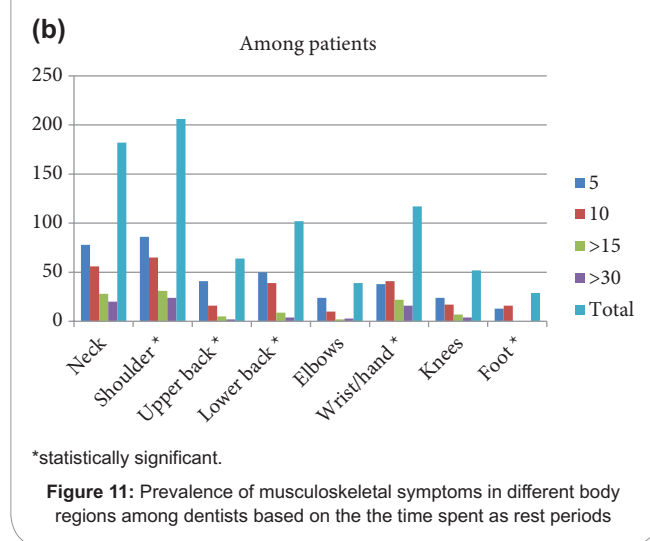
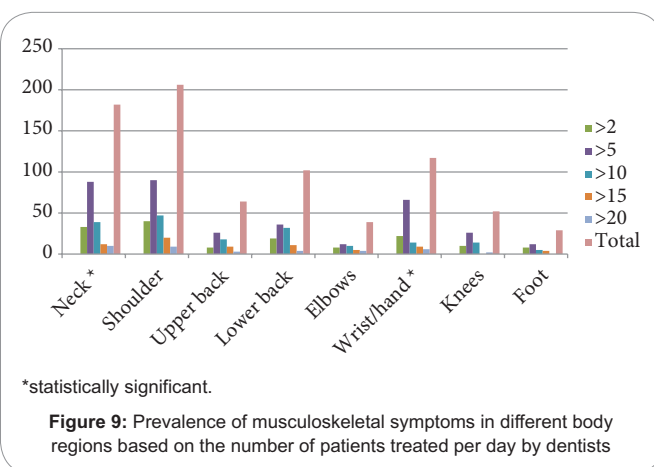
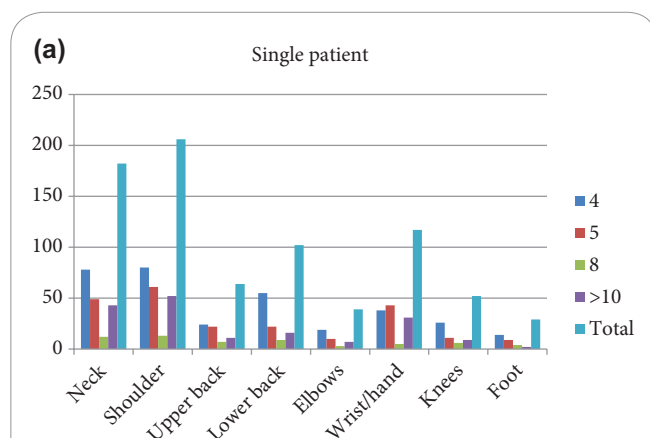
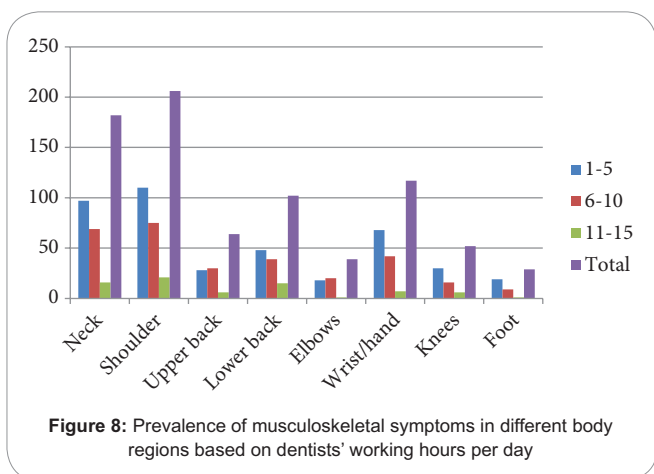
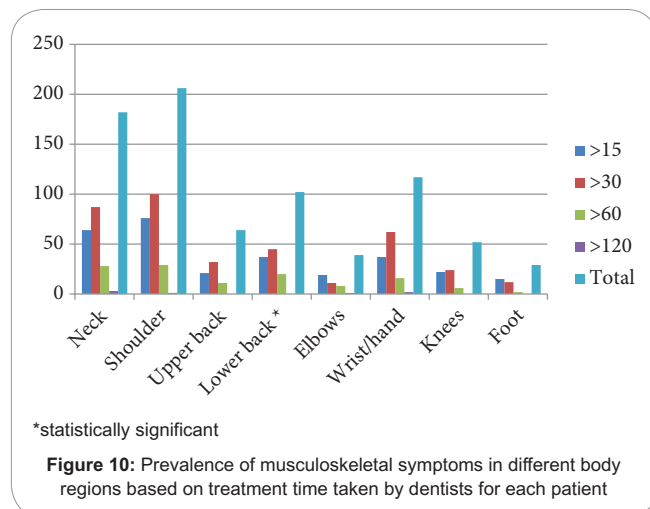
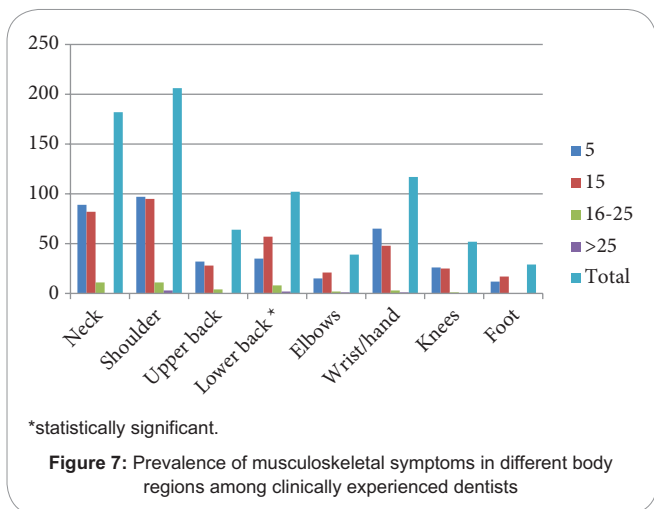
Table 1: Type (pain, stiffness, fatigue, and others), duration of ailments (hours, days, months, and years), region of symptoms, and influence of work-related procedures

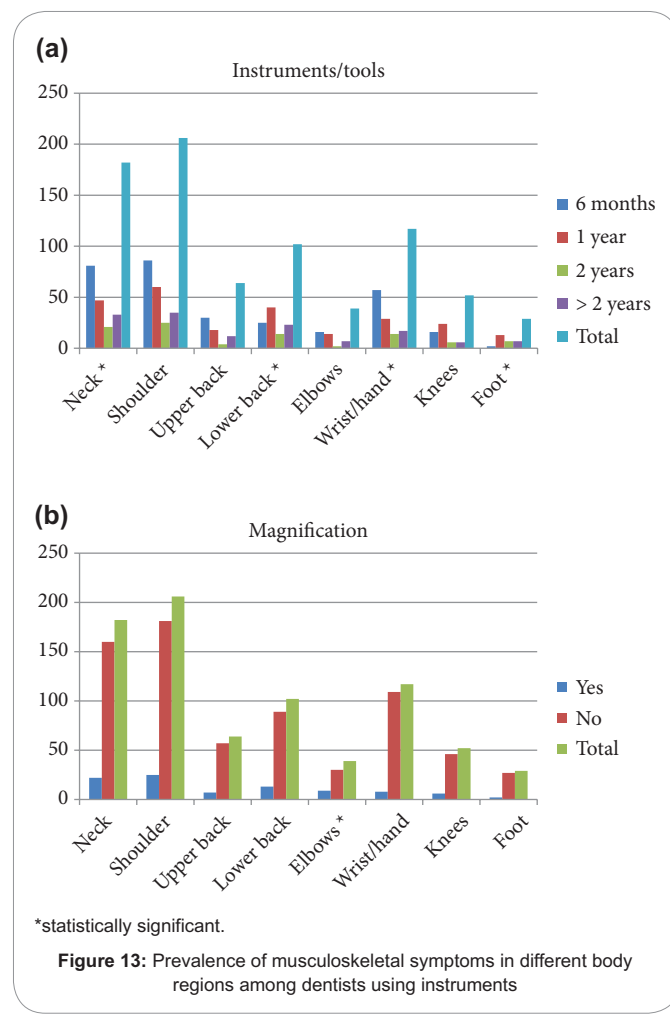
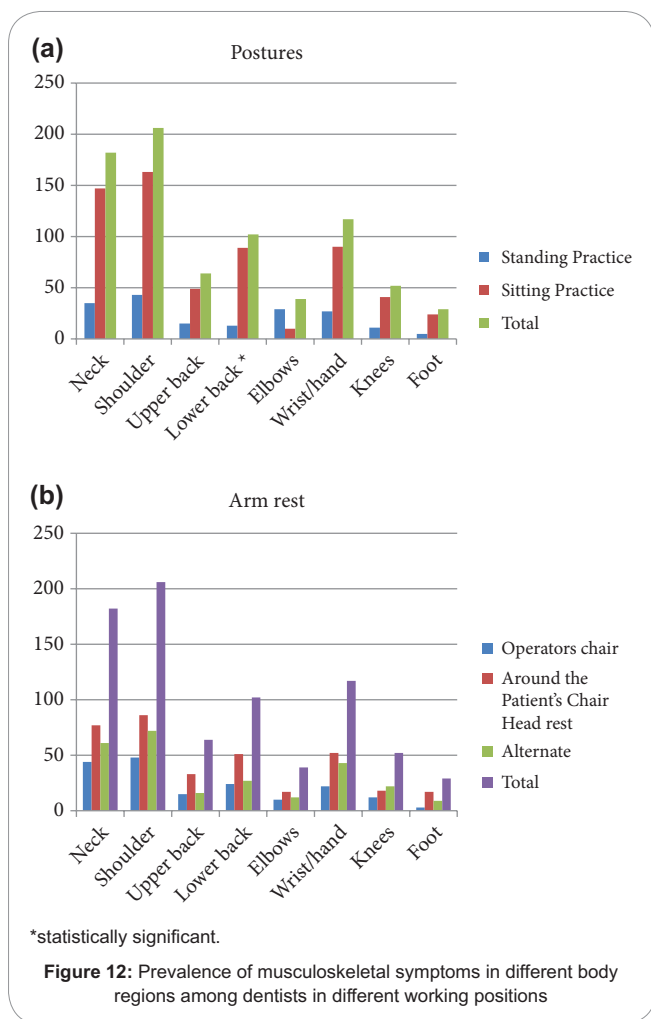
Procedures	Number	Neck	Shoulder	Upper back	Lower back	Elbows	Wrist/hand	Knees	Foot
Scaling	36	24	32	11	09	05	09	16	04
Extraction	32	11	37	09	11	04	10	03	01
RCT	35	37	32	08	12	04	17	08	05
FPD	26	32	31	05	11	05	13	09	06
RPD	28	9	5	03	07	05	11	01	00
CD	40	15	7	05	11	05	19	01	00
Ortho treatment	34	22	18	05	06	04	14	02	03
Impaction	40	13	33	14	06	06	15	03	04
Implantation	20	12	08	02	07	01	08	07	05
Maxillofacial surgeries	6	07	03	01	04	01	04	02	02
Total	297	182	206	63	84	40	120	52	30

Table 2: Prevalence of musculoskeletal symptoms in different body regions among dentists and work-related procedures

Comparative evaluation between anthropometric characteristics and prevalence of musculoskeletal complaints







(15.15% [$n = 45/297$]). And dentists with a height ranging from 171 to 180 cm had greater prevalence in shoulder (18.52% [$n = 55/297$]), neck (16.83% [$n = 50/297$]), and lower back (11.11% [$n = 33/297$]) (Figures 3 and 4). Postgraduate dentists reported with more prevalence of musculoskeletal symptoms in shoulder (43.43% [$n = 129/297$]), neck (30.05% [$n = 113/297$]), wrist (21.89% [$n = 65/297$]), and lower back (20.87% [$n = 62/297$]). Graduate dentists had greater prevalence of symptoms in shoulder (25.92% [$n = 77/297$]), neck (23.23% [$n = 69/297$]), wrist (17.51% [$n = 52/297$]), and lower back (13.47% [$n = 40/297$]) (Figure 5). Most of the dentists working in institutions had musculoskeletal symptoms in shoulder (33.67% [$n = 100/297$]), neck (28.95% [$n = 86/297$]), wrist (21.88% [$n = 65/297$]), and lower back (15.82% [$n = 47/297$]). Among the dentists doing private practice, the most common sites of musculoskeletal ailment were neck (12.46% [$n = 37/297$]), shoulder (10.77% [$n = 32/297$]), wrist (6.06% [$n = 18/297$]), and lower back (5.72% [$n = 17/297$]). Dentists with both private and institutional practice had musculoskeletal symptoms mostly in shoulder (24.92% [$n = 74/297$]), neck (19.86% [$n = 59/297$]), lower back (12.79% [$n = 38/297$]), and wrist (11.45% [$n = 34/297$]) (Figure 6). Dentists with 1 to 5 years of experience had more prevalence of musculoskeletal symptoms in shoulder (32.66% [$n = 97/297$]), neck (29.97% [$n = 89/297$]), and wrist (21.88% [$n = 65/297$]). Dentists with 6 to 15 years of experience also had more prevalence of musculoskeletal problems in regions like shoulder (31.99% [$n = 95/297$]), neck

(27.61% [$n = 82/297$]), lower back (19.19% [$n = 57/297$]), and wrist (16.16% [$n = 48/297$]). Dentists with a greater experience of more than 15 years also had a prevalence of musculoskeletal symptoms in regions like neck, shoulder, lower back, upper back, and wrist (Figure 7). Dentists working for a period of less than 5 h per day had more prevalence of musculoskeletal symptoms in regions like shoulder (37.04% [$n = 110/297$]), neck (32.66% [$n = 97/297$]), wrist (22.90% [$n = 68/297$]), and lower back (16.16% [$n = 48/297$]). Dentists working for about 6 to 10 h per day had more prevalence of musculoskeletal ailments in regions like shoulder ($n = [25.25\%] 75/297$), neck ($n = [23.23\%] 69/297$), wrist ($n = [14.14\%] 42/297$), and lower back ($n = [10.10\%] 30/297$). Dentists working for more than 11 h per day had more symptoms of ailment in regions like shoulder ($n = [7.07\%] 21/297$), neck ($n = [5.39\%] 16/297$), lower back ($n = [5.05\%] 15/297$), and wrist ($n = [2.36\%] 7/297$) (Figure 8). On analyzing the data from Figure 9 to 13, the comparative evaluation between work-related physical load and prevalence of musculoskeletal complaints revealed that the most common sites of ailment were shoulder, neck, wrist, and lower back.

Discussion

The prevalence of musculoskeletal symptoms among female dentists surveyed in this study was greater in regions like neck ($n = 104$), shoulder ($n = 100$), and wrist ($n = 70$). In male dentists the

common sites of ailment were shoulder ($n = 106$), neck ($n = 78$), and lower back ($n = 67$). In most of the studies back pain was the most commonly reported work-related musculoskeletal disorder with its prevalence ranging from 37 to 55% (14-16). A similar study conducted among Indian dentists population revealed that the sites of ailment were neck (75.74%), wrist/hand (73.13%), lower back (72.01%), and shoulder (69.40%) [11]. In our study, the most common sites of ailment were shoulder ($n = 206$), neck ($n = 182$), wrist/hand ($n = 117$), and lower back ($n = 102$) (Table 1).

Many dentists do not tilt their patients' head enough or adjust the sitting angle, which might result in awkward positioning thereby contributing to musculoskeletal symptoms. Several ergonomic investigations conclude that the least strained sitting position features an inclined backrest (130°), lumbar support, and arm rests. However, others claim a detrimental effect from arm support due to strain on the shoulder joint.

Hand and wrist disorders, which are less common, are getting more consideration by dental workers than the symptoms of neck and/or back disorders [12]. The uncomfortable working posture elevated the risk of neck pain, waist pain, and sleep disorders [13]. Long working hours without breaks can increase the operators' pain [14]. Scheduling of micro breaks regularly shows less discomfort among the operators as it replenishes and nourishes the stressed structures [15].

Prolonged use of small dental instruments is likely to be a special occupational hazard for work-related musculoskeletal disorders in dentists [16]. In clinical practice, dental scaling and endodontic treatment tasks require dentists to pull and/or rotate instrumental tools, which requires precision in hand/finger movement and a high level of pinch force [17]. Moreover, they have to hold the patient's wrist in an awkward position in order to get and maintain access to different areas within the mouth [17].

In this study, irrespective of the age, weight, and the various contributing factors, the common sites of ailment among dentists in Chennai city are shoulder, neck, wrist, and lower back. The authors attribute the high frequency of symptoms of neck, shoulder, and upper extremities among the dentists to be probably connected with their difficult work positions—cervical flexion and rotation, elevated arms, and repetitive precision demanding handgrips [7].

Study Limitation

The musculoskeletal symptoms mentioned by the dentists were self-reported measures (symptoms may not be associated with occupation). Therefore future studies should be based on objective measures for validating the musculoskeletal symptoms of the dentists.

Clinical Implication

Irrespective of the various contributing factors of musculoskeletal disorders like clinical experience, number of working hours per day, number of patients treated per day, and working procedures, majority of the dentists in Chennai city experienced ailments in shoulder, neck, and wrist. Therefore dentists must perform regular stretching exercises and concentrate on strengthening their upper body muscles.

Future Scope for Research

Further investigations are required to evaluate the risk levels of musculoskeletal disorders among the dentists in Chennai city.

Conclusion

This study highlights the fact that among the dentists surveyed in Chennai city, the common sites of ailment were shoulder, neck, and wrist. Further the prevalence of musculoskeletal disorders can be minimized among budding dentists by implementing ergonomic principles in their respective institutions, so as to lead an extended career in their profession.

References

1. Marshall ED, Duncombe LM, Robinson RQ, Kilbreath SL (1997) Musculoskeletal symptoms in New South Wales dentists. *Aust Dent J* 42: 240-246.
2. Milerad E, Ekenvall L (1990) Symptoms of the neck and upper extremities in dentists. *Scand J Work Environ Health* 16: 129-134.
3. Muralidharan D, Fareed N, Shanthi M (2013) Musculoskeletal disorders among dental practitioners: does it affect practice? *Epid Res Int* article ID 716897, 6 pages. <http://dx.doi.org/10.1155/2013/716897>.
4. Puriene A, Janulyte V, Musteikyte M, Bendinskaite R (2007) General health of dentists. Literature review. *Stomatologija* 9: 10-20.
5. Hayes M, Cockrell D, Smith DR (2009) A systematic review of musculoskeletal disorders among dental professionals. *Int J Dent Hyg* 7: 159-165.
6. Graham C (2002) Ergonomics in dentistry, Part 1. *Dent Today* 21: 98-103.
7. Valachi B, Valachi K (2003) Mechanisms leading to musculoskeletal disorders in dentistry. *JADA* 10: 1344-1350.
8. Morse T, Bruneau H, Dussetschleger J (2010) Musculoskeletal disorders of the neck and shoulder in the dental professions. *Work* 35(4): 419-429.
9. Gupta S (2011) Ergonomic applications to dental practice. *Indian J Dent Res* 22: 816-822.
10. Sustová Z, Hodacová L, Kapitán M (2013) The prevalence of musculoskeletal disorders among dentists in the Czech Republic. *Acta Med (Hradec Kralove)* 56: 150-156.
11. Kumar S, Baliga M, Kumar V (2013) Prevalence of work-related musculoskeletal complaints among dentists in India: a national cross-sectional survey. *Indian J Dent Res* 24(4): 428.
12. Guay AH (1998) Commentary: ergonomically related disorders in dental practice. *J Am Dent Assoc* 129: 184-186.
13. Puriene A, Aleksejuniene J, Petrauskiene J, Balciuniene I, Janulyte V (2008) Self-reported occupational health issues among Lithuanian dentists. *Ind Health* 46: 369-374.
14. Finsen L, Christensen H, Bakke M (1998) Musculoskeletal disorders among dentists and variation in dental work. *Appl Ergon* 29(2): 119-125.
15. Karwowski W, Marras WS (1999) *The Occupational Ergonomics Handbook*. Boca Raton, FL: CRC Press; p. 256, 835-925.
16. Feng B, Liang Q, Wang Y, Andersen LL, Szeto G (2014) Prevalence of work-related musculoskeletal symptoms of the neck and upper extremity among dentists in China. *BMJ Open* 4(12): e006451-e006451.
17. Dong H, Barr A, Loomer P, Laroche C, Young E, *et al.* (2008) The effects of periodontal instrument handle design on hand muscle load and pinch force. *J Am Dent Assoc* 137(8): 1123-1130; quiz 1170.