



VARIATIONS IN PREVALANCE AND INTENSITY OF WORK RELATED MUSCULOSKELETAL DISORDERS IN DIFFERENT DEPARTMENTS AMONG DENTAL PROFESSIONALS

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ABSTRACT

Work related musculoskeletal disorders (WMSDs) are becoming crucial and require the identification and modification of risk factors. Since the dentists work for around eight hours a day in the static awkward postures may lead to musculoskeletal discomfort. The objectives of this study are to evaluate the WMSD in dental professionals and compare the intensity and prevalence of musculo-skeletal dysfunction in various departments of dental specialties. 306 dentists with the mean age of 31.7, working experience of 7.2 years and 41.34 working hours in a week were considered for this study and evaluated with the self administered Nordic musculo skeletal evaluation chart and Postural Discomfort chart. The results shows that, dental professionals are at high risk to get WMSDs such as pain, ache, numbness and discomfort at anatomical areas like neck, low back, shoulder, wrist and hand because of their routine working posture. Orthodontists were found to be having a higher risk of neck, shoulder and wrist and hand, musculo skeletal symptoms whereas prosthodontists were having a higher ratio of musculo skeletal symptoms at Low back region. Majority of the musculoskeletal symptoms are seen one or more times in a week in dental professionals and female dentists are more prone to have musculo-skeletal disorders compared to male dentists.

KEYWORDS : Dentists, Musculoskeletal Disorders, Nordic Questionnaire, Postural Discomfort Chart.



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INTRODUCTION

The past two decades have witnessed a sharp rise in the incidence of work-related musculoskeletal disorders (WMSDs). Prevention of WMSD is becoming crucial and requires the identification and modification of risk factors. Individual characteristics of the worker such as gender, age, stature, physical condition and strength may contribute to the occurrence of these musculoskeletal disorders. Moreover, the specific occupation and work organization may be the source of ergonomic hazards. Awkward postures, prolonged repetitive movements, intense work schedules or fast work pace represent important risk factors for WMSD¹. There are many studies regarding musculoskeletal disorders experienced by persons working in the dental field that have used surveys to assess pain perception. Although they vary in scope and objective, a targeted look at the upper back, neck, shoulders and wrists is common in all of the studies². However, when the pain becomes a regular occurrence, cumulative damage could arise leading to debilitating injuries. Several studies have indicated that back, neck and shoulder pain are a major problem among dentists. Six studies, in particular, polled respondents over a period of 1 to 5 years and found that over half of the participating dentists experienced musculoskeletal pain. However, all of these studies focused primarily on the physiological effects of prolonged postures occurring in the neck and shoulder region³. In the dental profession, dentists and dental hygienists spend their work days in an awkward static position performing extremely precise procedures in a 2"x 2½" workspace- the patient's mouth. As there is no room for error, a steady hand and a steady awkward posture must be assumed and maintained. In dentists, overstrained and awkward back postures for back, repetitiveness for neck and shoulder and psychosocial stressors for back, neck and shoulder are the chief causative factors for the complaints. Occasional pains from irregular stances or positions are to be expected while they are performing static work. Maintaining the steady hand and posture comes at a cost to the back, neck and shoulder area of the person². A positive relationship between fixed postures and musculoskeletal disorders

(including pain, weakness and paraesthesia) have been documented for a number of occupations^{4,5,6}. Dentistry, particularly the practice of general dentistry, is a high risk profession for the development of musculoskeletal disorders as it is characterized by high visual demands which result in the adoption of fixed postures⁷. The posture adopted during the practice of operative dentistry throughout the world has changed over the past 30 years. Originally, dentists commonly stood to practice. Sitting, as the preferred position for the dentist to adopt, was introduced in the 1960s in an attempt to reduce the fatigue and musculoskeletal problems associated with dental practice^{8,9}. Dental professionals commonly experience musculoskeletal pain during the course of their careers. While the occasional backache or neck ache is not a cause for alarm, if regularly occurring pain or discomfort is ignored, the cumulative physiological damage can lead to an injury or a career-ending disability¹⁰. In unsupported sitting, pressure in the lumbar spinal discs increases by 40 percent over pressure from standing. During forward flexion and rotation—a position often assumed by dental operators—the pressure increases 400 percent, making the structure vulnerable to injury¹¹. When dentistry changed from a standing job to a sit down task, musculoskeletal pain in the neck and shoulder region became more prevalent. This may explain the eventual focus on these areas. However, musculoskeletal pain in the lower back, regardless of occupation, remains a constant cause of loss of work for dentists and should be equally examined. As dentists spend long hours hunched over their patients with their arms raised and their hands positioned relative to their patients' mouths, unsupported stress is placed on the muscles of the lower back. A study by McGill *et al*, explains how prolonged static contractions of the lumbar erector spinae decreases oxygenation levels in the muscle. When this happens, lactic acid and metabolites accumulate and causes the pain that one feels¹². Younger dentists had pain and discomfort in the neck, shoulders and headaches to a greater extent than older

dentists¹³. The position adopted by the student was significantly related to the intensity of pain¹⁴. There are studies stating that dental professional work for around eight hours a day in the static awkward postures may lead to some sort of musculoskeletal discomfort. This can be evaluated with the help of a postural stress questionnaire namely Nordics Musculo Skeletal Questionnaire^{15,16}.

The pain suffered by dentists may lead to reduced productivity in terms of missed time from work or reduced work hours and may also lead to inefficient movements while working, causing an increase in time spent per patient. Therefore, not only will those engaged in dentistry benefit from a reduction of the chronic trauma often associated with the profession, but society as a whole will reap benefits in terms of efficiency and reliability of dentists and their practices¹⁷. The availed data is expected to provide information for preventive measures of MSDs, modification of risk factors, individual characteristics of workers such as age, gender, experience, department, physical condition etc to correct unhealthy postures, prevent prolonged repetitive movements and intense work schedules. So the need of this current study is that, even though there are many studies stating and proving the involvement of various musculo-skeletal problems associated with the dental professionals, there are lack of studies done in field of specific musculo-skeletal involvement in dental professionals who specialize in the various departments of dentistry.

MATERIALS AND METHODS

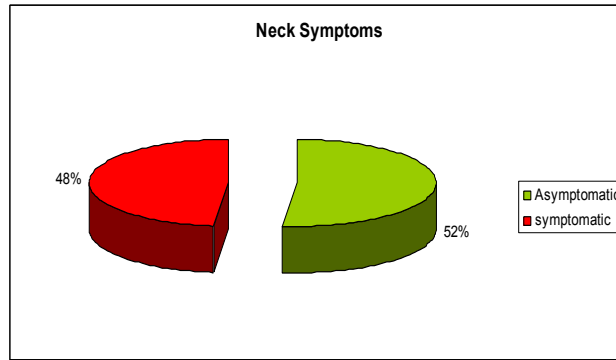
This was a cross sectional survey study which included 350 post graduate students and staff of different dental colleges in Mangalore. The inclusion criteria were; dental postgraduate students and working dentists with the age group not more than 40 years old whereas the exclusion criteria were; hyper mobile joints, cervical joint diseases, central and peripheral nervous diseases, trauma and fracture, sprains, any other musculoskeletal injuries and diseases, subjects undergoing regular flexibility exercise or any other physical work.

A self-administered Nordics questionnaire for musculoskeletal disorders comprised of 11 questions on each anatomical areas were distributed by the researcher along with the postural discomfort chart to the selected subjects/dental professionals. The questionnaire involved subjective information on the respondent's job history, individual characteristics, physical and psychosocial risk factors at work, general health status and the occurrence of musculoskeletal complaints¹⁸. The questionnaire was very user friendly and was designed to take approximately 10 minutes to complete. A variety of questions was used which involved yes or no response, rating the symptoms etc. In addition, the subjects were requested to mark the location of the symptoms suffered on the postural discomfort chart. The broad area investigated with the questionnaire included the presence, location and severity of pain, numbness, weakness and paraesthesia along with general health status like headache, fatigue and disturbed vision¹⁹. The filled questionnaire was collected on the third day and the data was taken for the statistical analysis.

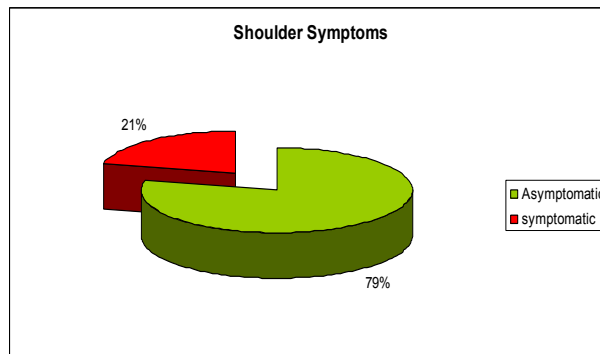
RESULTS

306 subjects completed the survey with an average age group of 27.7 years, mean working experience of 5.2 years and who used to work approximately 41.34 hours in a week. It included 177 males (57.8%) and 129 females (42.2%) from 7 different departments of dental profession. This included; Prosthodontics 60(19.6%), Periodontics 50(16.3%), Endodontics 39(12.7%), Pedodontics 35(11.4%), Oral medicine and Radiology 35(11.4%), Oral and Maxillo facial Surgery 37(12.1%), Orthodontics 50(16.3%). Chi Square test was used to calculate the statistical analysis. The results shows that, among the total subjects who completed the survey, 48% of them were complaining of neck symptoms, 21% of them were complaining of shoulder symptoms, 14% of them were complaining of wrist and hand symptoms, 34% of them were complaining of lower back symptoms.

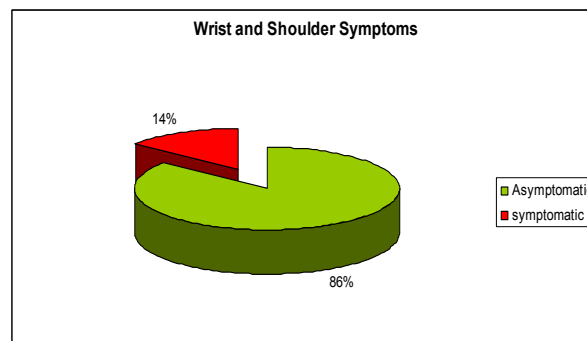
Graph 1
Neck Symptoms experienced by dentists



Graph 2
Shoulder Symptoms experienced by dentists



Graph 3
Wrist and hand Symptoms experienced by dentists



Graph 4
Low Back Symptoms experienced by dentists

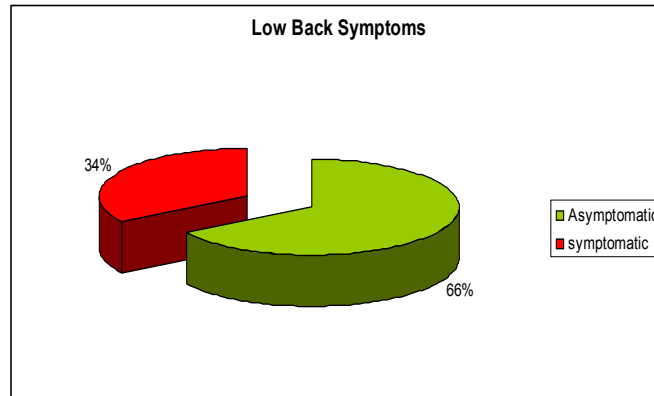


Table 1
Departmental Distribution of Neck Symptoms

Crosstab

Dept	Count	N1		Total
		.00	1.00	
1.00	Count	39	21	60
	%	65.0%	35.0%	100.0%
2.00	Count	30	20	50
	%	60.0%	40.0%	100.0%
3.00	Count	20	19	39
	%	51.3%	48.7%	100.0%
4.00	Count	18	17	35
	%	51.4%	48.6%	100.0%
5.00	Count	14	21	35
	%	40.0%	60.0%	100.0%
6.00	Count	17	20	37
	%	45.9%	54.1%	100.0%
7.00	Count	20	30	50
	%	40.0%	60.0%	100.0%
Total	Count	158	148	306
	%	51.6%	48.4%	100.0%

a. $\chi^2=10.782$ $p=.095$ ns

Out of 148 subjects who complained of neck trouble 21 subjects who were from department of Prosthodontics, 20 from Periodontics, 19 from Endodontics, 17 from Pedodontics, 21 from oral medicine and radiology, 20 from Oral and Maxillofacial and 30 from orthodontics.

Graph 5
Departmental Distribution of Neck Symptoms

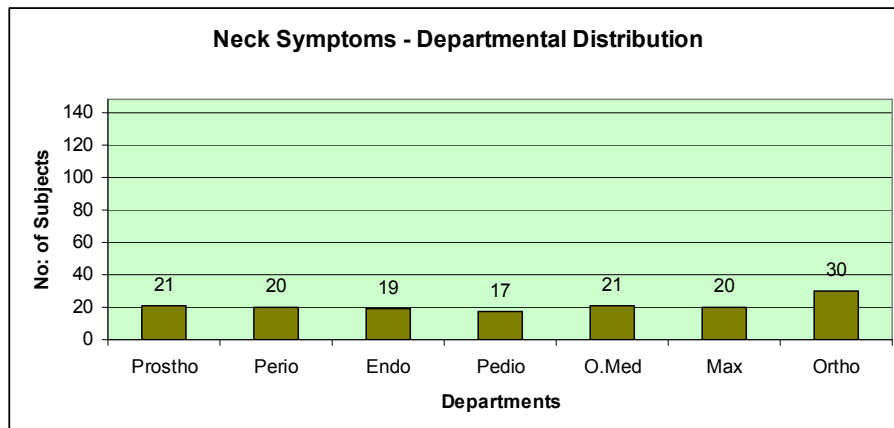


Table 2
Departmental Distribution of Shoulder Symptoms

Crosstab

			S1		Total
			.00	1.00	
Dept	1.00	Count	56	4	60
		%	93.3%	6.7%	100.0%
2.00	Count	40	10	50	
	%	80.0%	20.0%	100.0%	
3.00	Count	29	10	39	
	%	74.4%	25.6%	100.0%	
4.00	Count	30	5	35	
	%	85.7%	14.3%	100.0%	
5.00	Count	26	9	35	
	%	74.3%	25.7%	100.0%	
6.00	Count	30	7	37	
	%	81.1%	18.9%	100.0%	
7.00	Count	30	20	50	
	%	60.0%	40.0%	100.0%	
Total	Count	241	65	306	
	%	78.8%	21.2%	100.0%	

a. $\chi^2=20.183$ p=.003 hs

Out of 65 subjects who complained of shoulder trouble, 4 subjects who were from department of Prosthodontics, 10 from Periodontics, 10 from Endodontics, 5 from Pedodontics, 9 from oral medicine and radiology, 7 from Oral and Maxillofacial and 20 from orthodontics.

Graph 6
Departmental Distribution of Shoulder Symptoms

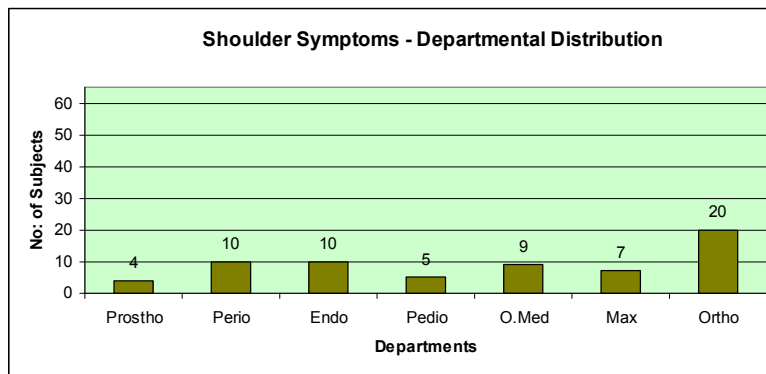


Table 3
Departmental Distribution of Wrist & Hand Symptoms

Crosstab

			W1		Total
			.00	1.00	
Dept	1.00	Count	58	2	60
		%	96.7%	3.3%	100.0%
2.00	Count	47	3	50	
	%	94.0%	6.0%	100.0%	
3.00	Count	34	5	39	
	%	87.2%	12.8%	100.0%	
4.00	Count	29	5	34	
	%	85.3%	14.7%	100.0%	
5.00	Count	29	6	35	
	%	82.9%	17.1%	100.0%	
6.00	Count	32	5	37	
	%	86.5%	13.5%	100.0%	
7.00	Count	34	16	50	
	%	68.0%	32.0%	100.0%	
Total	Count	263	42	305	
	%	86.2%	13.8%	100.0%	

a. $\chi^2=22.432$ p=.001 vhs

Out of 42 subjects who complained of wrist and hand trouble, 2 subjects who were from department of Prosthodontics, 3 from Periodontics, 5 from Endodontics, 5 from Pedodontics, 6 from oral medicine and radiology, 5 from Oral and Maxillofacial and 16 from orthodontics.

Graph 7
Departmental Distribution of Wrist and hand Symptoms

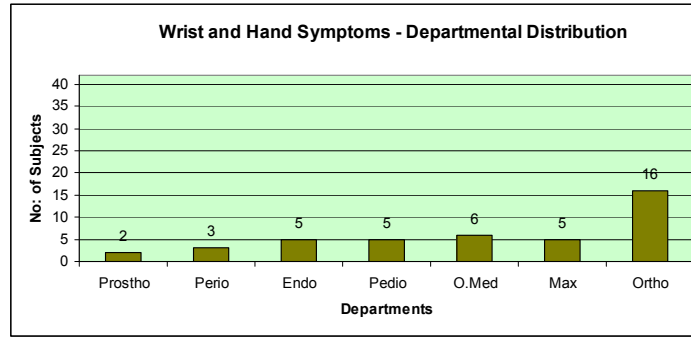


Table 4
Departmental Distribution of Low Back Symptoms

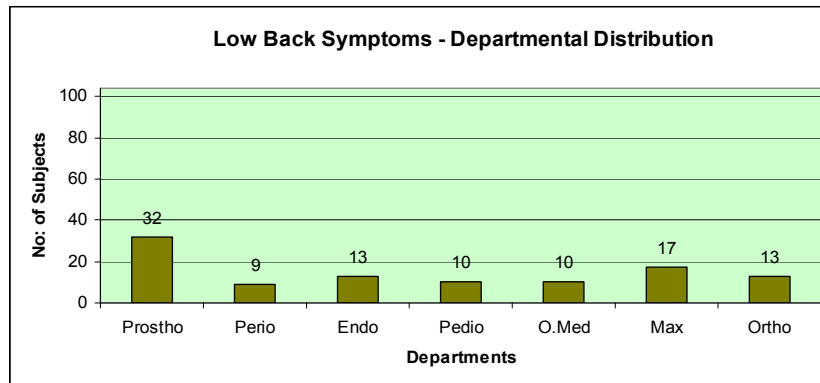
Crosstab

Dept		LB1		Total
		.00	1.00	
1.00	Count	28	32	60
	%	46.7%	53.3%	100.0%
2.00	Count	41	9	50
	%	82.0%	18.0%	100.0%
3.00	Count	26	13	39
	%	66.7%	33.3%	100.0%
4.00	Count	25	10	35
	%	71.4%	28.6%	100.0%
5.00	Count	25	10	35
	%	71.4%	28.6%	100.0%
6.00	Count	20	17	37
	%	54.1%	45.9%	100.0%
7.00	Count	37	13	50
	%	74.0%	26.0%	100.0%
Total	Count	202	104	306
	%	66.0%	34.0%	100.0%

a. $\chi^2=20.408$ p=.001 vhs

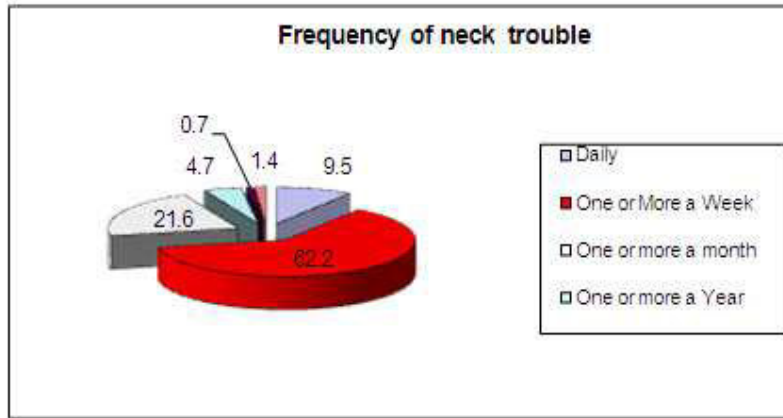
Out of 104 subjects who complained of neck trouble, 32 subjects who were from department of Prosthodontics, 9 from Periodontics, 13 from Endodontics, 10 from Pedodontics, 10 from oral medicine and radiology, 17 from Oral and Maxillofacial and 13 from orthodontics.

Graph 8
Departmental Distribution of Low Back Symptoms

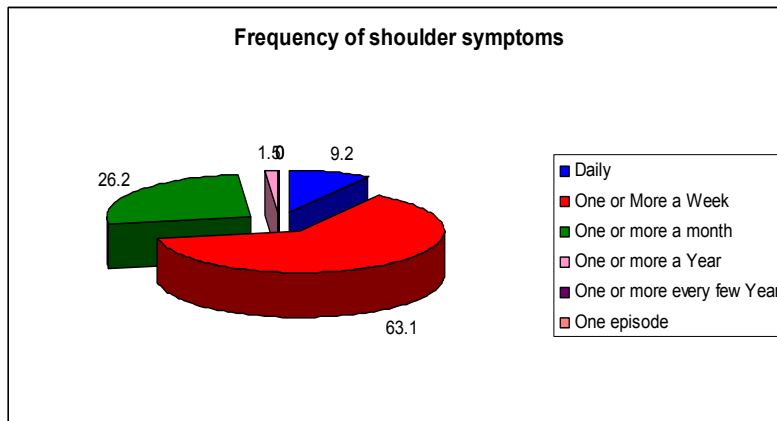


The results also shows that, 62.2% of the affected subjects experienced the neck trouble for one or more days in a week and 63.1% experienced shoulder trouble for one or more times a week. 65.1% of the subjects experienced wrist and hand discomfort for at least once or more times in a month whereas 65.4% of them experienced low back symptoms for one or more times in a week.

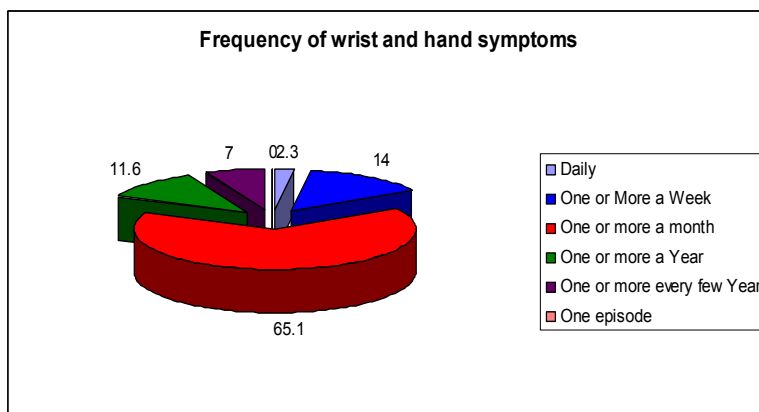
Graph 9
Frequency of Neck Musculoskeletal Disorders in dentists



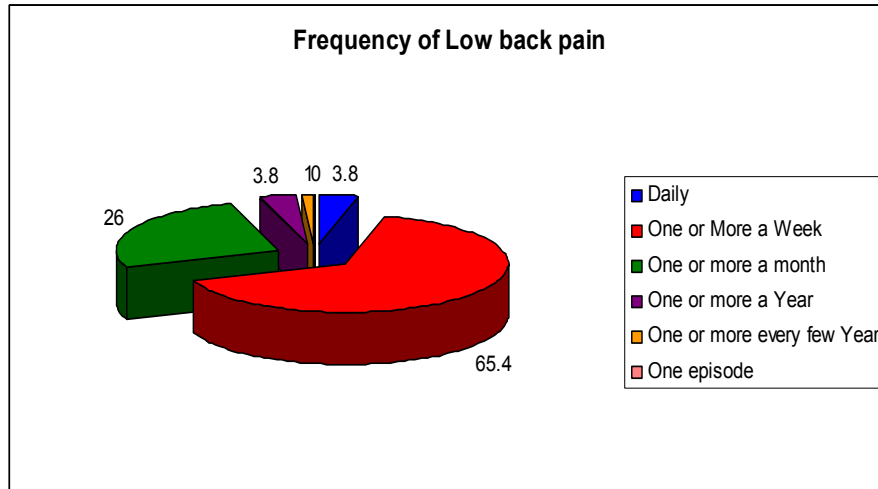
Graph 10
Frequency of Shoulder Musculoskeletal Disorders in dentists



Graph 11
Frequency of Wrist and hand Musculoskeletal Disorders in dentists

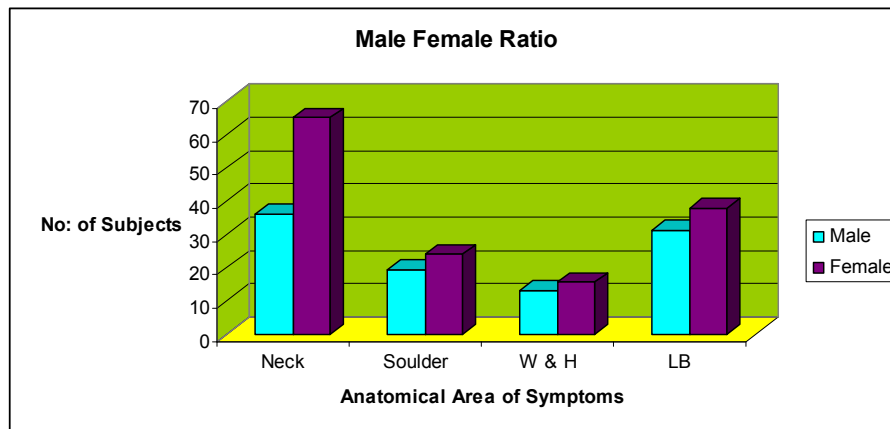


Graph 12
Frequency of Low Back pain Musculoskeletal Disorders in dentists



Among the subjects who experienced the musculoskeletal disorders, females were affected equally when compared to males for all the regions.

Graph 13
Male Female Ratio of Musculo Skeletal Symptoms in dentists



DISCUSSION

Statistical analysis has proven that dental professionals are at higher risk for having musculoskeletal discomfort in the neck, shoulder, wrist, hand and lower back regions. Out of the 306 subjects evaluated in this study, 177 were males and 129 were females. The subjects were selected from the different dental specialties like; Prosthodontics, Periodontics Endodontics, Pedodontics, Oral Medicine & Radiology, Oral & Maxillo Facial Surgery and Orthodontics. As the sedentary life style and physical activities are a growing public health concern, which is addressed by many professional organizations, including the American Medical Association (AMA), The

American College of Sports Medicine (ACSM) and The American Physical Therapy Association (APTA), the health promoting behavior that received the greatest attention from physical therapist was the promotion of physical activities to their patients²⁰. In this context the role of physical therapist is crucial in the identification and management of various WMSDs among the dental professionals. 148 subjects were recorded to have neck discomfort when dentistry changed from a standing job to a sit down task. It stands about 48% of the total subjects. This study thus, supports the findings of Rundcrantz *et al*, who cited that 72% of

dentists have neck and shoulder pain and these factors are considered as a major problem in his article 'Cervical pain and discomfort among Dentists'¹⁷. 65 cases of shoulder discomfort were noted in the selected subjects due to prolonged shoulder flexion and upper arm abduction as well as a high static muscle activity during common dentistry tasks. It correlates with the findings of Finsen *et al* who reported 65% of dentists having back, neck and shoulder pain²¹. 43 cases were found to have wrist and hand dysfunction resulting from forceful grip with higher risk for gripping small diameter objects and for an increased degree of precision leading to carpal tunnel syndrome. 104 cases were having low back problem because the dentist spends long hours hunched over the patients with their arms raised and their hands positioned relative to their patients mouth, unsupported stress is placed on the muscles of the lower back. These findings done in this study are supported by many others done earlier like Shugars *et al*, who reported in their article that, 60% of the back, neck and shoulder pain are a major problem among dentists²². The findings by Auguston and Morken reports 81% of subjects to be symptomatic in his article called 'Musculoskeletal problems among Dental Health personnel': a survey of the public dental health services in Holland²³. An interesting finding in this study was the diversity in the anatomical area of symptoms in various dental departments. This may be because of the adaptation of postures convenient to their specialized procedures and duration of procedures. Orthodontists were found to be having most of the symptoms in Wrist, Hand, Shoulder and Neck regions, whereas prosthodontists were found to have a higher risk of developing musculoskeletal symptoms in the Low back region. Musculoskeletal discomforts are least seen in department of Pedodontics. A detailed study is suggested to know the diversity in the location of the musculoskeletal symptoms in different dental departments. Among the subjects who experienced the musculoskeletal disorders, females were affected equally when compared to males. This finding has a positive correlation with the finding done by Barnekow-Bergkvist *et al*, who stated that female students were not significantly different from

males in musculoskeletal symptoms. Subjective reports of neck pain in the female working population have been estimated 61.1%²⁴. Another interesting finding of this study was that 62.2% of the affected subjects experienced the neck trouble for one or more days in a week, 63.1% experienced shoulder trouble for one or more times a week. The frequency of wrist & hand discomfort and low back symptoms were even higher with 65.1% and 65.4% respectively. Out of 148 subjects who had neck discomfort, 79.1% revealed that work activities are the main causative factor for the symptoms. 12.8% believed that the problem is because of activities at home. This has a positive correlation with the findings of Armstrong *et al*, who stated that MSDs may be occupational (work related MSDs) or non occupational²⁵. Out of 65 subjects who had shoulder discomfort, 76.9% of the Dentists believed that the occupation brought them the trouble. This was also supported by the studies done by Milerad & Ekenvall and Murtomaa, who stated that the descending parts of the right and left trapezius muscle and the latissimus dorsi are a common site of symptomatic pain in Dentists^{26,27}. 43 subjects suffered from wrist and hand trouble and among them 79.1% supposed that the discomfort is related to their occupation which has a positive correlation with the statement by David M R *et al*, who suggested that synovial tissue irritation and inflammation results from a high level of repetitive movement, subsequently placing pressure on the median nerve in the carpal tunnel sheath²⁸. Among the 104 dentists who lived with Low back pain, 81.7% thought that occupational stress caused the problem of discomfort. This study is also supported by the earlier findings by Valachi and Valachi's²⁹. 19.3% of the 104 subjects who had low back trouble stated that low back trouble had reduced their activities in the last 12 months. 63.5% of 104 subjects who suffered from low back ache had been seen by a doctor, physiotherapist or a chiro practitioner. General symptoms experienced by dental professionals like head ache, fatigue and disturbed vision were also assessed. Majority of the subjects experienced the symptoms like fatigue some times. Disturbed vision in dentists was found to be nearly nil (93%). This study found 46.4% of the subjects to be

experiencing headache rarely. These findings support those done by Ylipa *et al*, who stated that dental professionals experienced physical fatigue (18%), mental fatigue (15%), headache (16%) and anxiety (13%)³⁰. We further recommend conducting a large scale study to find out the variation of symptoms and the related risk factors in different specialties of the dental profession and it is also recommended to conduct future studies focusing on the prevention of these WMSDs among different dental specialties according to the risk factors. Further, we would like to recommend conducting studies on how to manage these symptoms if it occurs and it is advised to concentrate more on the areas like neck, shoulder and lower back problems. It is also recommended to try out new modes of treatment for the neck, shoulder and low back symptoms in the different fields of health

sciences and especially of physical therapy which is having no side effects.

CONCLUSION

Dental professionals pose a high risk of musculoskeletal disorders such as pain, ache, numbness and discomfort in the anatomical areas like neck, shoulder, wrist, hand and lower back. Orthodontists are at a higher risk of wrist, hand, shoulder and neck musculoskeletal symptoms whereas prosthodontists are found to have a higher risk of developing musculoskeletal symptoms in the lower back region. Majority of the musculoskeletal symptoms are seen one or more times in a week in dental professionals and female dentists are also equally prone to have musculoskeletal disorders when compared to their male counterparts.

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