



ISSN Print: 2394-7500  
ISSN Online: 2394-5869  
Impact Factor: 5.2  
IJAR 2016; 2(3): 61-64  
www.allresearchjournal.com  
Received: 02-01-2016  
Accepted: 04-02-2016

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## Effect of neck muscle training and ergonomic education in musculoskeletal neck pain among Chennai dentists

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### Abstract

**Background:** Dentist are at high risk of neck and back problems due to the limited work area, faulty ergonomic and impaired vision associated with the oral cavity. Increased risk of musculoskeletal disorders among dentist is associated with psychological stress, treating patients with high concentration and precision. Studied found back, neck shoulder, or arm pain present in up to 81% of dental professionals. The purpose of the study was to survey the health status among dentists in Chennai regarding the prevalence of pain and disability and effects of active muscle training and ergonomic education on pain and disability.

**Aim:** To find out prevalence of neck pain and the effectiveness of active neck muscle training and ergonomic education to relieve neck pain among dental professionals.

**Methodology:** Study was conducted in 2 phases. Phase 1 Survey study conducted on a sample of 100 Dentist in Chennai. A total of 100 dentist practicing in Chennai was given a validated questionnaire focused on MSDs. Subjects with musculoskeletal neck pain, who met the inclusion criteria based on phase 1 study were give active neck muscle training and ergonomic education in a group. A pre-test pain NPRS and NDI was taken from dentist. The participants were taught active neck muscle training and ergonomic education for 2 weeks under supervision. After two weeks of treatment assessment was taken to investigate the effect of active muscle training and ergonomic education on pain and disability among dentist. Post-test NPRS and functional outcome was taken and documented for statistical analysis.

**Outcome Measures:** Numerical pain rating scale (NPRS) for neck pain, The Neck Pain Disability Index (NDI) was used to measure the disability.

**Statistical Analysis:** Statistical analysis was done to identify the difference between pre and post-test measurements by paired t test analysis.

**Results:** For the outcome measures NPRS and NDI, paired t-test analysis showed significant statistical difference ( $p < 0.05$ ) between pre and post-test measurements.

**Conclusion:** It was recognized that limited ergonomics in the work environment of the dental professionals results in MSDs and the neck pain prevalence is high. Two week of active neck strength training and ergonomic education has seemed to enhance musculoskeletal neck pain and disability.

**Keywords:** Musculoskeletal disorders, Neck pain disability index, Numerical pain rating scale

### Introduction

The dental team is at high risk of neck and back problems due to the limited work area and impaired vision associated with the oral cavity. Furthermore dental procedures are usually long and require much more concentration during work. Biller<sup>[1]</sup> found that 65% of dentist complained of back pain. Further studies<sup>[2-6]</sup> found back, neck, shoulder or arm pain present up to 81% of dental professionals. Musculoskeletal disorders such as neck and low back pain have been widely reported as being of significant health and economic concern, due to increased work load and poor posture among dentist. The world health organization defines an MSD as "a disorder of muscles, tendons, peripheral vascular system not directly resulting from an acute or instantaneous event. These disorders are considered to be work related when the work environment and the performance of work contribute significantly to disease<sup>[11]</sup>."

The etiological factors leading to neck symptoms are largely occupational such as static work, poor ergonomics and bad posture. Studies found that the biggest risk factors are awkward, prolonged seated posture with no back support<sup>[8]</sup>. Due to these risk factors dentist

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are prone for neck and back problems due to limited work area and impaired vision when procedures are done on some regions in the oral cavity. These working postures force a clinician to assume stressful body position to achieve good accessibility and visibility in the oral cavity. Usually the dental procedures are usually carried out for a long period of time and demands more concentration during work. Dentist treat patients with their arms abducted and unsupported and the cervical spine flexed forward and rotated which make them more susceptible for pain in the neck, back and shoulder regions. Moreover the monotony of work, work noise, artificial light are disadvantage for dentist.

Increased risk of MSD among dentist is associated with psychological stress, treating patients with high concentration and precision. It is a well-known fact that stress can elicit muscular contraction and pain, especially in the trapezius muscle. Thus the purpose of the study was to survey the health status among dentist in Chennai regarding the prevalence of musculoskeletal pain and effect of active muscle training and ergonomic education on pain and disability.

### Objective

1. To evaluate the prevalence of neck pain among dental professionals in Chennai.
2. To evaluate the effect of active neck muscle training and ergonomic education to relieve neck pain and disability among dental professionals.

### Clinical significance

The origin and exact pathophysiologic mechanism of chronic neck pain often remains obscure because trauma or severe degenerative conditions at working age are found only in few cases. The origin of neck pain is thought to be multifactorial. Evidence for many of the standard treatment approaches to neck pain is lacking [20]. The aim of our study was to investigate the efficacy of active muscle training and ergonomic education. Active neck muscle training may be helpful in building up endurance of neck muscle. Ergonomic education helps to attain high productivity, avoidance of illness, injuries and work satisfaction.

### Methodology

The study was conducted in two phases. Phase one consist of a survey study conducted on a sample of 100 dentist in Chennai using stratified cluster sampling method. Here After the suggestions from the experts in the field, the questionnaire was checked, corrected and validated. Informed consent was obtained from all the dentists who participated in the study. A total of 100 dentist (63 males and 37 females) practicing in Chennai was given a validated questionnaire focused on MSDs. At least one year of work experience in the current position was the only criteria for eligibility to participate in the study. The data was analyzed using SPSS 15.0.

Phase two is a cross sectional study using quota sampling method. Dentist who participated in the survey having age

group 25-40 years, clinical practice more than 3 years, musculoskeletal pain more than one year, pain at beginning of work, continues throughout the work or immediately after the work are included in the study. Dentist having Spondylosis, tumors, fractures, recently undergone surgery, vertebro basilar insufficiency symptoms, acute inflammatory problems and using medications medication for neck pain are excluded from the study.

### Intervention

Forty dentist with musculoskeletal neck pain, who met the inclusion criteria based on the phase one study participated in the study. A pretest NPRS and NDI was taken before the intervention. The participants were taught active neck muscle training and ergonomic education for two weeks, 5 sessions per week having 30 minutes duration under supervision. Posttest NPRS and disability was taken at the end of the treatment session.

### Active Neck Muscle Training

**Strength Training:** The strength training group will be performing resisted cervical flexion and extension using theraband in sitting position. A single series of 15 repetition with 3 sec hold is given for flexion and extension movements.

**Endurance Training:** Two sets 10 repetitions of supine and prone lift to strengthen the deep cervical flexors and extensor muscles are taught. In supine and prone patients with the head supported in a comfortable resting position were instructed to lift there head so that cervical flexion and extension respectively was performed while maintaining a neutral upper cervical spine. Patients were instructed to slowly move there head and neck through as full a range of motion as possible without causing discomfort or reproduction of their symptoms.

### Ergonomic Education

The overall goal of the ergonomic education program is to enable dentist to identify aspects of job task that may increase risk of developing work related MSDs, recognize the signs and symptoms of the disorders, and participate in the development of strategies to control or prevent them.

### Evaluation

An 11-point Numerical Pain Rating Scale (NPRS) where 0 corresponded to "no pain" and 10 corresponded to "worst imaginable pain," was used to measure pain. The Neck Disability Index (NDI) is used to measure disability. The subjects were measured at baseline, end of second week treatment and at one month follow-up.

### Statistical Analysis

Pried t- test to find out the significant difference between the pre and posttest measurement for the parameters of NPRS and NDI after active neck muscle training and ergonomic education.

Table1

| Parameters                  | Pre test |                    | Post test |                    | 't' test | P Value |
|-----------------------------|----------|--------------------|-----------|--------------------|----------|---------|
|                             | Mean     | Standard deviation | Mean      | Standard deviation |          |         |
| Numerical Pain rating Scale | 7.12     | 0.68               | 1.32      | 1.78               | 3.043    | 0.003   |
| Neck Pain Disability Index  | 44.07    | 3.88               | 21.4      | 2.94               | 4.78     | 0.001   |

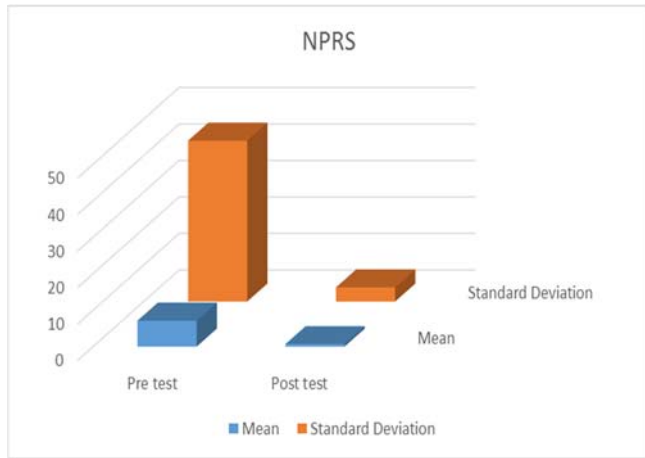


Fig 1: Pre test

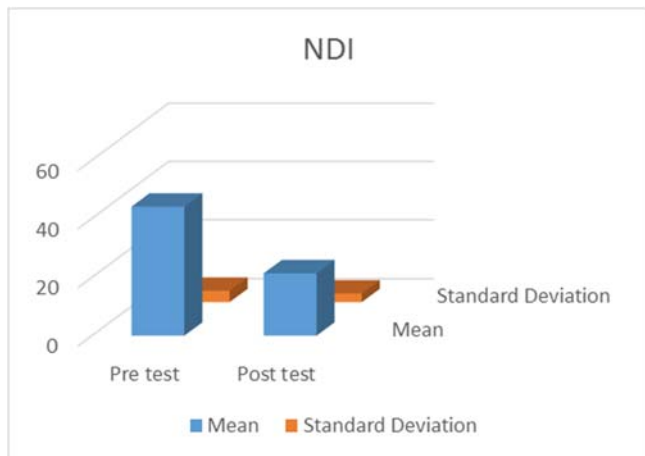


Fig 2: Post test

## Results

In the survey, 100 dentists practicing in Chennai were given a validated questionnaire focused on MSDs. From the survey it can be concluded that the 76% of dentists have experienced musculoskeletal pain, 24% reported no pain in their dental career. Out of 100, 94 questionnaires were returned, missing data was excluded from the analysis. The most prevalent musculoskeletal complaint among dentist during the previous 12 months were reported at the neck (42.5%), lower back (28.7%), shoulder (12.3%), upper back (8.9%), hand and wrist (7.6%). This proves our initial hypothesis is that musculoskeletal pain is highly prevalent in dentists.

From the outcome measures of NPRS and NDI of the phase two study, Paired t test analysis showed significant statistical difference ( $p < 0.05$ ) between the pre and post-test measurements.

## Discussion

A high frequency of MSDs among dentist was confirmed in numerous studies [11, 13, 16]. Musculoskeletal co morbidities was high and significant number of dentist reported chronic complaints and were seeking treatment for same. Dentist report more frequent and worse health problems than other high risk medical professionals. Dental professionals regardless of specialty should receive education about all the aspects of dental ergonomics. Physical exercise and regular rest breaks are recommended to prevent the continuous loading on the musculoskeletal structures.

There are large number of studies relating to musculoskeletal complaints among dental surgeons in the western literature but none has been conducted in Chennai, Tamil Nadu. This study has been conducted to assess the work related complaints among dentists in our region with specific objectives to find out the prevalence of neck, shoulder and back pain among the dental surgeons.

The results from studies on MSDs in Chennai dentist have generally been similar, though some have differed according to country. A Greek study showed that 62% of dentist reported at least one musculoskeletal pain, while 87.2% of Australian dentist reported having experienced at least one musculoskeletal pain. In INDIA, neck and back disorders have previously been reported among dentists at a higher frequency than hand and wrist complaints [9, 16]. In the present study the most prevalent musculoskeletal complaint among dentist in Chennai, reported at the neck, upper back, lower back, shoulder and hand and wrist. This study demonstrates the specific active neck muscles training and ergonomic training relieves neck pain and decreases disability in dentist.

Most dentist today work in a sitting position treating patients in supine position. Because their work area is narrow, performance of dental treatment results in a very inflexible work posture. In dentistry these muscles must maintain eccentric contractions which increases the susceptibility to tearing of muscle tissue. As posture deviates from neutral, their muscles must contract harder to maintain a working posture. As muscles become fatigued, this prolonged contraction can cause muscle ischemia [18]. Since neck pain is associated with a decrease in neck muscle strength, neck strength training has been one means in seeking cure for neck pain [21]. Endurance exercise increases the number of mitochondria in neck muscle fibers. Ergonomic training enables dentist to identify aspects of job tasks that may increase risk of developing work-related MSDs, recognize the signs and symptoms of the disorders, and participate in the development of strategies to control or prevent them. Active neck muscle training and ergonomic education for two weeks has decreased the neck pain and improves functional outcomes in dentist. Hence the study assess the effects only for two weeks, longer follow up assessment studies are necessary for understanding the long term effects.

## Limitations

Performing physical examination would provide more detailed information. Associated risk factors should have assessed with the work related complaints of neck pain. Active neck muscle training intervention should be extended for long duration.

## Conclusion

It was recognized that limited ergonomics in the work environment of the dental professional's results in MSDs and the neck pain prevalence is high. The symptoms of MSD increase with the number of years of practice. The dentists should be aware of the work related risk factors and educate themselves in dental ergonomics. Two week of active neck strength training and ergonomic education has seemed to enhance musculoskeletal neck pain and disability. Active neck muscle training can be recommended to improve musculoskeletal neck pain if given for longer duration.

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