

**EFFECT OF PREVENTIVE PHYSIOTHERAPY CARE ON WORK RELATED
MUSCULOSKELETAL DISORDERS AMONG DENTAL FRATERNITY**Yeddla Leelavathi^{1*}, Rayudu Geetha Mounika² and Patchava Apparao¹Post Graduate Student, Department of Physiotherapy, GSL College of Physiotherapy, Rajamahendravaram, Andhra Pradesh, India.²Associate Professor, Department of Physiotherapy, GSL College of Physiotherapy, Rajamahendravaram, Andhra Pradesh, India.³Principal, Swatantra Institute of Physiotherapy and Rehabilitation, Rajamahendravaram, Andhra Pradesh, India.***Corresponding Author: Yeddla Leelavathi**

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ABSTRACT

Background and Objective: Work related musculoskeletal disorders (WMSDs) are common in occupations with high risk for dentists due to repetitive movements, heavy lifting, and awkward postures, with a prevalence of 63-93% globally and higher frequency in the Neck region, lower back. The concept of ergonomics was introduced in dentistry to improve working conditions. There is evidence that preventive physiotherapy care as a rehabilitation protocol will be useful for work related MSDs among dentists. However, there is no research comparing the effect of preventive physiotherapy therapy within the pre test and post test. **Methods:** Survey Nordic musculoskeletal questionnaire was conducted among the Subjects through google form. The survey included 79 subjects with a mean age of over 22 years having musculoskeletal pain with prevalence in neck, upper & lower back, shoulders, wrist & hands. They received ergonomics, postural correction, self stretches and preventive care explained and illustrated to dentists with regular follow-up up to 6 months. The outcome measures of the intervention were measured in terms of Visual analogue scale for pain, Upper and Lower extremity functional scale for function. **Results:** Paired 't' test was used to assess the statistical significance of the pre and post test score for three parameters. Statistical analysis revealed that preventive physiotherapy care showed an improvement in pain and function among dental fraternity with work related MSDs. **Conclusion:** The present study concluded that preventive physiotherapy care is effective in decreasing pain and improvement of function in dentists with work related Musculoskeletal disorders.

KEYWORDS: Work related MSDs, Nordic musculoskeletal questionnaire, Upper extremity functional scale, Lower extremity functional scale, Ergonomics.

INTRODUCTION

Musculoskeletal disorders [MSDS] are the problems of musculoskeletal system, associated with wide range of occupations by affecting health productivity of working population due to repetitive, awkward, forceful or prolonged exertions of the hands, frequent or heavy lifting, pushing or pulling or carrying of heavy object and prolonged incorrect postures. The level of the risk depends upon the intensity, frequency and duration of the exposure to these conditions.^[1]

MSDS are the second most common cause of disability worldwide and is estimated to have 45% and is expected to continue to rise with an increasingly sedentary life and ageing population.^[2] Nearly 2 million Workers across the world suffer from MSDS each year, with dentists facing an increased risk.^[3]

Globally, the mean prevalence of MSDS and pain among

the dental fraternity is 63 to 90%, prolonged static posture and repetitive movements being listed as major factors and the most prevalent regions for complains are the neck (58.5%), back region (56.4%) followed by upper back (41.1%).^[4]

In INDIA, there are limited studies about the prevalence of general population is about 7.08%, a study evaluated the prevalence of musculoskeletal disorders among physicians, surgeons & dental surgeons and observed that dentists suffered from maximum musculoskeletal pain which is 61%.^[5]

The World health organization defines work related musculoskeletal disorders as disorders affecting muscles, tendons, joints, ligaments and bones which were caused due to mechanical overload of the biological structures and thereby potential overload of tissues results from high intensity forces or talks acting on and inside the

body.^[6]

Musculoskeletal disorder is one obvious hazard. Dentistry, particularly is a high risk profession for the development of MSDS as it is characterized by high visual demands which result in adaptation of fixed postures.^[7]

As their work area is narrow, dental treatment is performed in a very inflexible posture. Standing and sitting positions which are frequently adapted and twisting of spine, connected with excessive tightening of some tissues and straining of others which are the sources of painful disorders and diseases of the musculoskeletal system.^[8]

The reasons for early retirement among dentists due to work related musculoskeletal disorders results 29.5%.^[9] The types of MSDS in dentistry comes in variety of forms, this includes general information about the primary musculoskeletal disorders that dentists have to face. Postural muscles of upper and lower back, hand and wrist problems [due to repetitive motion], neck and shoulder problems [repeated rotation of head, neck and trunk].^[10]

Since dental work consists of precision tasks which involves highly visual and manipulative elements, and sometimes in combination with exertion of force. The concept of ergonomics [work place modifications] was introduced into dentistry in order to improve the dental Profession working conditions.^[11]

Ergonomics is an applied science concerned with designing procedures for maximum efficiency and safety.^[12] It modifies tasks to meet the needs of people rather than forcing people to accommodate the task. Proper ergonomic design is necessary to prevent repetitive strain injuries, which can develop overtime and can lead to long term disability. Ergonomics is concerned with the efficiency of the persons in their working environment.^[13]

While implementing in routine dental practice various ergonomic recommendation, Physical therapy by postural correction, ergonomics, stretching, relaxation techniques represents one of the key points in managing musculoskeletal issues in dentistry.^[14]

Dentists are among the increasingly group been referred for physical therapy and seeking ergonomic advice in the recent past. There is a scope of further decreasing the prevalence and severity of these work related MSDS by performing regular specific exercises.^[15]

To prevent the musculoskeletal disorders among dental students in hospital setting, it is necessary to conduct a questionnaire [NORDIC MUSCULOSKELETAL QUESTIONNAIRE] which is a musculoskeletal pain/discomfort form. To detect the prevalence among dental

fraternity need to design and implement a suitable intervention program. That addresses all the issues that may cause. In addition ergonomic awareness and application of ergonomic principle in work and achieve a balance between task demands and workers characteristics'. THE NATIONAL INSTITUTE OF OCCUPATION AND SAFETY HEALTH, published the documents & guidelines to prevent and to reduce work related MSDS can improve the working conditions of dental population and hence improvement of their performance for better outcome. This study aim is to estimate the prevalence of WMSDS and coping strategies among dental subjects through preventive physiotherapy care.

MATERIALS AND METHODS

Study Design: Prospective Study Design.

Ethical Clearance: The study protocol was approved by Ethical committee of GSL Medical College & General Hospital, the investigator explained the purpose of the study and given the patient information sheet. The participants were requested to provide their consent to participate in the study. All the participants signed the informed consent and the rights of the included participants been secured.

Study Population: Dental Professionals.

Study Setting: GSL Dental College, Rajamahendravaram, Andhra Pradesh, India.

Study Duration: The study was conducted during the period between October 2021 to September 2022.

Intervention Duration: After pre-test, Intervention explained and illustrated in 2 days and post-test conducted after 6 months.

Study Sampling Method: Convenient sampling method.

Sample Size: A total number of 79 subjects, both male & female dentists with musculoskeletal discomfort were participated in the study by convenient sampling method.

MATERIALS USED

1. Data collection form
2. Survey Google form
3. Nordic musculoskeletal Questionnaire
4. Visual analogue scale
5. Upper extremity functional scale
6. Lower extremity functional scale
7. Treatment couch
8. Band
9. Stress ball/ Pinch strengthener

CRITERIA FOR SAMPLE SELECTION INCLUSION CRITERIA

1. The study population were dental professionals
2. Subjects with above 22 years of age

- Subjects who works minimum of 3 hours per day
- Subjects with on & off musculoskeletal pain

EXCLUSION CRITERIA

- Work duration < 3 hrs per day
- Any degenerative changes in spine
- Arthrosis condition
- Any inflammatory changes in joints
- Spine deformities / abnormalities
- History of spinal fracture

STUDY TOOLS AND OUTCOME MEASURES

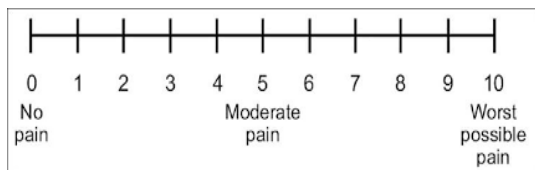
- The Nordic Musculoskeletal Questionnaire [NMQ] is a questionnaire. As it was performed through Google form survey.
- Visual Analogue Scale [VAS] was used to measure pain at baseline and at the end of 6 Months.
- Upper Extremity Functional Scale [UEFS] was used for functional measurement at baseline and at the end of 6 months.
- Lower Extremity Functional Scale [LEFS] was used for functional measurement at baseline and at the end of 6 months.

NORDIC MUSCULOSKELETAL QUESTIONNAIRE [NMQ]^[16]

The NMQ is a valid, reliable questionnaire, section 1: In this consists of 9 symptoms sites being neck, shoulders, upper back, elbows, lower back, wrist/hands, hips/thighs, knees and ankles/feet. Respondents are asked if they have had any musculoskeletal trouble in this last 12 months and last 7 days which has prevented normal activity. Section 2: In this, additional questions relating to the neck, shoulders, and lower back. Twenty five questions elicit any accidents affecting each area, functional impact at home and work, duration of the problem, assessment by a health professional and musculoskeletal problems in the last 7 days.

MEASUREMENT OF PAIN SEVERITY [VAS]^[17]

The Visual Analogue Scale (VAS) is a reliable, valid, responsive and frequently used pain outcome measure. The instrument used consists of horizontal lines, 10cm long with anchor points of 0 [no pain] and 10 [severe pain]. It located at either end of the line. Patients are instructed to draw a vertical mark on the line indicating their pain level. The severity of work related musculoskeletal disorders among dental fraternity was evaluated by VAS.



UPPER EXTREMITY FUNCTIONAL SCALE^[18]

The upper extremity functional index [UEFI] is a patient reported outcome measure used to assess the functional impairment in individuals with musculoskeletal upper

limb dysfunction. The original UEFI consists of 20 questions on a 5 point rating scale assessing level of difficulty in performing activities of daily living using the upper extremities including household and work activities. UEFI is easy to administer as it is a self-reported questionnaire. Patients respond to each item by circling a number that best describes their level of difficulty. Item scores range from 0 to 4, which indicates extreme difficulty to no difficulty. The UEFI 20 item score from 0 to 80 with 0 indicating lowest functional status and 80 indicating highest functional status.

LOWER EXTREMITY FUNCTIONAL SCALE^[19]

The lower extremity functional scale [LEFS] is a valid patient rated outcome measure for the measurement of lower extremity function. The LEFS is a self reported questionnaire. LEFS consists of 20 questions on a 5 point rating scale assessing level of difficulty in performing activities of daily living using the lower extremities. Patients respond to each item each item by circling a number that best describes their level of difficulty. Item scores range from 0 to 4, which indicates extreme difficulty to no difficulty. The LEFS 20 item score from 0 to 80 with 0 indicating lowest functional status and 80 indicating highest functional status.

INTERVENTION

This is 6 months prospective study, conducted a Survey among dental fraternity through Google form Standard Nordic Musculoskeletal Questionnaire (NMQ) was given to the subjects to identify the Pain and discomfort associated with work related musculoskeletal disorders.

Information on musculoskeletal disorders was given, to know the prevalence of work related musculoskeletal disorders which includes location of symptoms in the past 12 months, interference with daily activities, and having trouble in during last 7 days. The result showed high prevalence in neck, lower & upper back, shoulders, and wrist & hands. The outcomes were measured by VAS, UEFS, LEFS for pain and function respectively. All the subjects were eligible for criteria and performed preventive physiotherapy care.

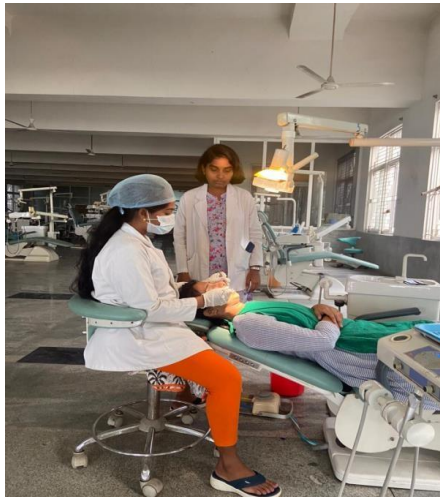
PREVENTIVE MANAGEMENT

Research indicates that over 80% of dental professionals complaints of pain in the upper body and back. This musculoskeletal pain is often the direct result of the body positioning and movements made by dental hygienists in their daily work.^[20] Neutral position is the ideal positioning of the body while performing work activities and is associated with decreased risk of musculoskeletal injury. It is generally believed that the more a joint deviates from neutral position, the greater the risk of injury.^[21]

Neutral seated position

Features are: Forearms parallel to the floor, weight evenly balanced, thighs parallel to the floor, hip angle of 90°, seat height positioned low enough so that you are

able to rest the heels of your feet on the floor.



Neutral back position

The goal of neutral back position is to lean forward slightly from the waist or hips and trunk flexion of 0 to 20°. Over flexion of the spine should be avoided.



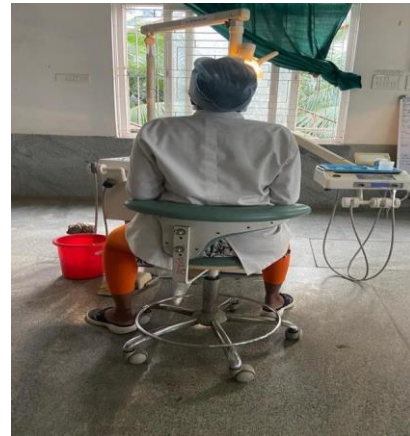
Neutral shoulder position

The aim of this position is to maintain the shoulders in a horizontal line and to evenly balance the weight when seated. Shoulders should not be lifted towards ears or hunched forward.



Neutral upper arm position

The goal is to maintain upper arms parallel to the long axis of torso and elbows at waist level. One should avoid greater than 20° abduction away from the body.



Neutral forearm position

Forearm should be kept parallel to the floor and can be raised or lowered accordingly by pivoting at the elbow joint. Angle between upper arm and forearm should be less than 60°.



Neutral hand position

Keep little finger side of palm slightly lower than thumb side of palm. The wrist should be aligned with the forearm. Avoid bending of hand up and down.



PERIODIC BREAKS AND STRETCHING^[22]

Studies suggest that the increase in operator pain since the 1960s may be due to longer work periods without breaks, due in part to the use of four handed dentistry techniques. Having operators take frequent breaks and reverse their positions is an integral in an effective injury prevention.

Directional Stretching can be done in or out of the operatory and can be incorporated in to a daily routine that facilitates balanced musculoskeletal health. Directional stretching involves a rotation, side bending or extension component that generally is in the opposite direction of that in which the operator frequently works. Stretching helps in increasing the blood flow to muscles,

production of joint synovial fluid, creates a relaxation response in the central nervous system, warms up the muscle before beginning to work.

STRETCHING DURING MICROBREAKS

To prevent injury to the muscles and the other tissues, the operator should allow for rest periods to replenish and nourish the stressed structures. 30 seconds of micro breaks should be practiced during working period.

STRETCHING EXERCISES FOR NECK

Grasp the back of your chair or hip with your left hand. Gently bring your left ear to your right underarm. Hold for 2 to 4 breaths and then repeat it on the opposite.

**STRETCHING EXERCISE FOR CHEST OPENER**

Clasp your hands together behind the nape of your neck. Slowly straighten your spine and look towards the Ceiling, pressing elbows outward to stretch the chest.

**STRETCHING EXERCISE FOR SHOULDERS**

Bend your elbow and lift to shoulder height, slowly pulling the arm across the chest. Turn the head in the direction of the shoulder being stretched. Hold the stretch for two to four breaths and then repeat it on opposite.

STRETCHING EXERCISE FOR BACK AND SHOULDERS

Ask the subject to put both the hands in front by making a fist, then tell the dentist to move the hands backwards until their shoulder blades came close with spine straight.



MAIN EXERCISES FOR WRIST AND HAND

This includes flexion and extension of wrist, make a fist, distal inter phalangeal joint & proximal interphalangeal

joint & metacarpophalangeal joint flexion, finger lift, thumb extension, Pinch strengthener.^[23]

WRIST FLEXION/ EXTENSION EXERCISES

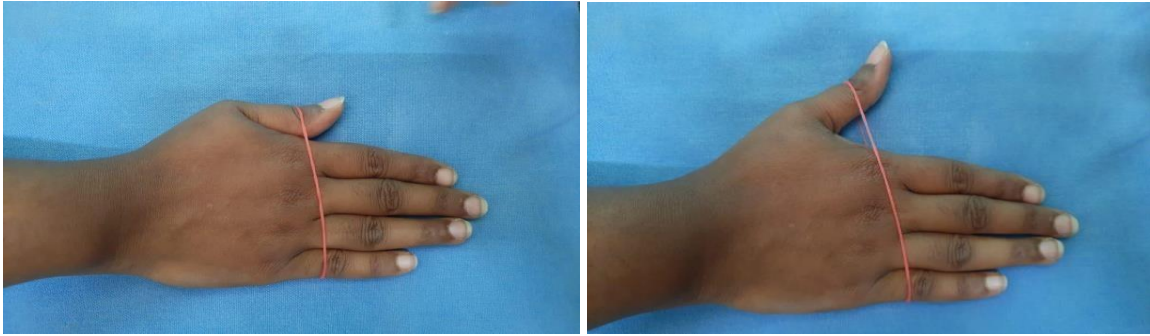


MAKE A FIST



FINGERS LIFT EXERCISES



THUMB EXTENSION EXERCISES**PINCH STRENGTHENER****STATISTICAL ANALYSIS**

All statistical analysis was done by using SPSS software version 21.0 and Microsoft excel - 2007. Descriptive data was presented in the form of mean \pm standard deviation and mean difference percentages were calculated and presented.

Within the group: paired “t” test was performed to assess the statistical significant difference in mean value within the group for Visual Analogue Scale for pain, Upper Extremity Functional Scale and Lower Extremity Functional Scale for function from pre- test and post- test values.

For all statistical analysis, $p < 0.05$ will be considered as statistically significant.

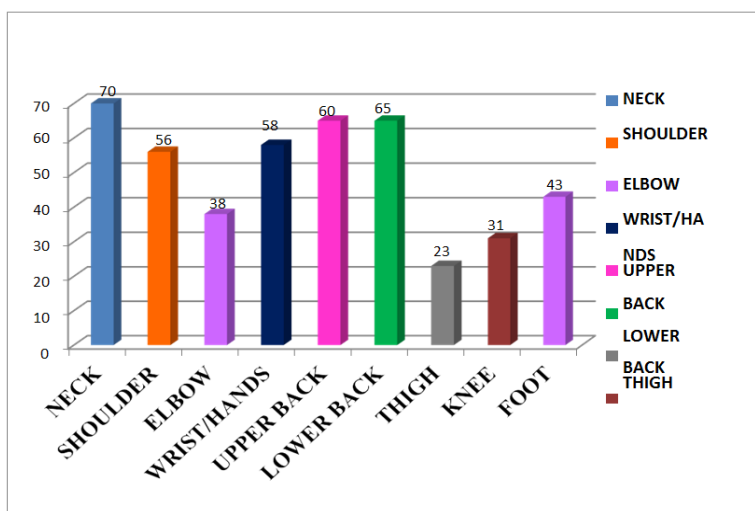
So as to evaluate the effectiveness of Preventive Physiotherapy care.

RESULTS

The subjects were participated in the survey through Google form which consists of Nordic Musculoskeletal Questionnaire, the result of survey analyzed the frequency of musculoskeletal pain. The results of this study were analyzed in terms of reduction of pain on Visual Analogue Scale and improved function on Upper Extremity Functional Scale and Lower Extremity Functional Scale.

Subjects with musculoskeletal pain / discomfort were screened for eligibility, amongst 79 subjects were included in the study trail. All the 79 subjects who met inclusion criteria have undergone baseline assessment.

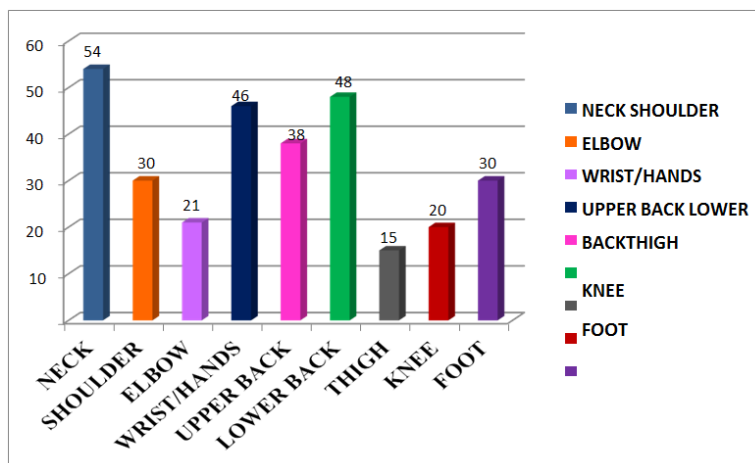
Comparison was done within the pre - test and post- test.



GRAPH- 1: Analysis of Prevalence of Musculoskeletal Pain/ Discomfort During The Last 12 Months.

RESULTS: The above graph shows that the prevalence of musculoskeletal pain during the last 12 months, shows

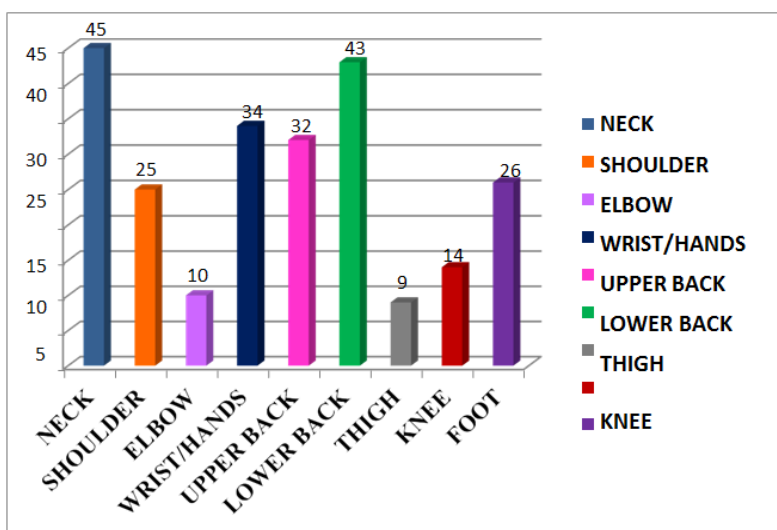
the frequency more in the neck region followed by lower back & upper back, shoulders, wrist & hands.



Graph 2: Analysis of Prevented Doing Activities Due ToThe Musculoskeletal Pain/ Discomfort.

RESULTS: The above graph shows that the prevented doing activities due to the musculoskeletal pain, shows

the frequency more in the neck region followed by lower back , wrist/ hands and shoulders.



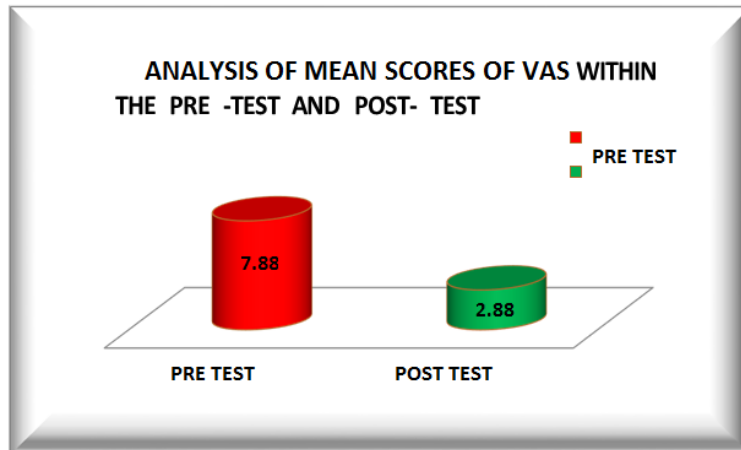
Graph 3: Analysis of Getting Trouble Due To Musculoskeletal Pain From Last 7 Days.

RESULTS: The above graph shows that the trouble due to musculoskeletal pain from the last 7 days, shows the

frequency more in the neck region followed by lower& upper back, wrist/ hands, shoulders.

Table 1:

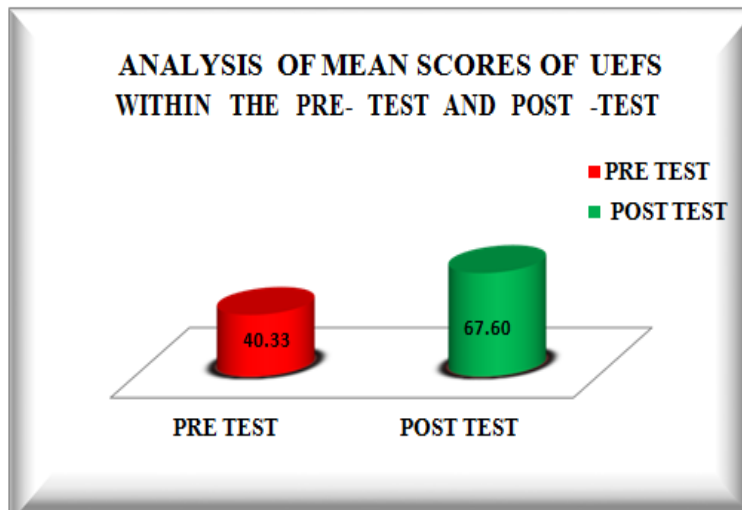
VAS	MEAN	SD	P- VALUE	INFERENCE
PRETEST	7.88	.993	0.0001	Significant
POST TEST	2.88	.789		



Graph 4: Analysis of Mean Scores of Vas Within The Pre- Test AndPost- Test.

Table 2:

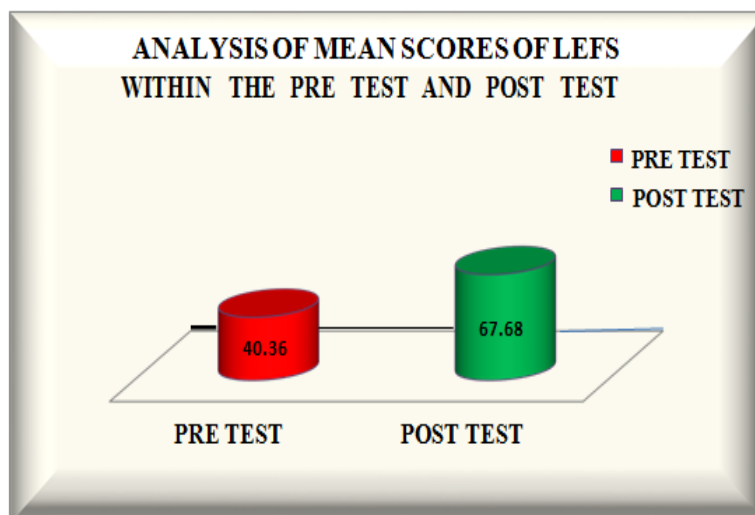
UEFS	MEAN	SD	P- VALUE	INFERENCE
PRE TEST	40.33	2.437	0.0001	Significant
POSTTEST	67.60	1.996		



Graph 5: Analysis of Mean Scores of Uefs Within The Pre- Test AndPost –Test.

Table 3.

LEFS	MEAN	SD	P-VALUE	INFERENCE
PRETEST	40.36	2.643	0.0001	Significant
POSTTEST	67.68	2.092		



Graph- 1: Analysis of Mean Scores of Lefs Within The Pre- Test And Post- Test.

DISCUSSION

The aim of our present study was to know the effect of preventive physiotherapy care as a management on pain and function in subjects with work related musculoskeletal disorders among dental fraternity. The survey was done through Google form among dentists to know the frequency of musculoskeletal disorders by Nordic Musculoskeletal Questionnaire (NMQ). The NMQ measures the frequency of pain in different regions of the body. The following outcome measures Visual Analogue Scale (VAS), Upper Extremity Functional scale (UEFS), Lower Extremity Functional Scale (LEFS) were used to measure the intensity of pain and function and the result showed effective in decreasing pain and improving function by giving Preventive Physiotherapy care.

The survey results showed that all the 79 subjects were suffered from Musculoskeletal problems at least in one region. We found that neck, upper & lower back, wrist & hands followed by shoulders were the most common painful regions effected in dentists. Preventive Physiotherapy care which includes ergonomic correction and preventive management showed statistically significant, and clinically effective within the pre-test & post-test (VAS mean - 2.88, UEFS mean – 67.60, LEFS mean - 67.68).

Dentistry is a high-risk profession for musculoskeletal disorders. Most dental professionals constantly complain of pain in some region in their professional life span. They need to visualize the exact field of work and this adds lot of strain on their muscles, as they need to be in the same position for a prolonged period of time. Several repetitive small ranges of motions are involved in dental practice.

Shaik, Szymanska, Finsen et al., compared their findings with those of other investigators in similar studies all around the world with specific pain results (back, neck, shoulders, wrist & hands). It was found that

WMSDs among dental professionals were present worldwide and our findings were related in agreement with the findings of most researchers.^[24-28]

Many researchers have determined that the mechanisms leading to work related musculoskeletal pain/ discomfort are multi factorial.^[29,30] The pain can be related with several risk factors like extended static posture, incorrect position of the patient on the dental chair, work pressure, stress, sedentary life style and age.

Dentists are often in particular still positions, which require more than half the body's muscles to contract and hold the body's muscles to contract and hold the body motionless, while resting gravity. The still forces resulting from these sustained positions have been shown to be much more troublesome than dynamic forces.^[30] When the human body repeatedly sustains extended periods of static postures, it can cause a series of events that can possibly lead up to pain and injury or a career-ending musculoskeletal disorders, muscle imbalances, trigger points, joint hypo mobility and spinal disk degeneration.^[31]

Prevention of chronic pain in dentistry may require proper use of ergonomic dental tools, good postural habits, regular stretch breaks and regular exercise are the areas that can be addressed to reduce strain on the musculoskeletal system of the dental professional. By combining ergonomics with positioning techniques, periodic breaks and self stretches, Then successful application of ergonomics not only helps the dentists to improve their health, it also increases satisfaction as well as quality of work. One of the main goals of ergonomics in dentistry is to minimize the amount of physical & mental stress that sometimes occur day- day in a dental practice.

Although most intervention studies showed decreased in musculoskeletal pain after receiving ergonomic training, most of these studies had small sample sizes.^[32-35]

Despite limitations, when participants of ergonomic training studies followed ergonomic recommendations, researchers found there is greatest decrease in pain, which suggests potential positive effects for ergonomic training.

There is currently insufficient literature available to conclusively suggest that physical activity benefits dentists in alleviating musculoskeletal pain. Since most studies implemented physical exercise after musculoskeletal symptoms were present, but there is little data on the preventive effects of physical activity. Most studies concerning physical activity, cross-sectional and prospective, focused on exercise that involved the whole body. Many cross-sectional studies did not differentiate specific types or intensity of exercise. Compared to medication alone, a combination of rehabilitation and medication seemed to work better.^[36] One case study implemented both postural re-education and physical activity and found improvement measuring change using the Visual Analogue Scale^[37] Another study implemented finger exercises and stretches before the dental hygienists performed scaling and root planning, this study only looked at the drop in pinch strength before and after performing scaling and root planning, and provides only suggestive evidence about musculoskeletal pain.^[38]

According to the findings of the current study, 6 months of preventive physiotherapy care intervention significantly improved function and pain reduction. However, there is a lack of data regarding effectiveness of preventive physiotherapy care and ergonomics among dentists related to work related MSDs. The current study's findings point to the preventive physiotherapy care as a potential therapy for the dentists with work related musculoskeletal disorders, as it helped the dentists with work related MSDs feel less pain and perform better.

LIMITATIONS

- No blinding of evaluators
- Most of the participants participated were young dentists
- This study has less sample size
- Done only on normal subjects

RECOMMENDATIONS FOR FURTHER RESEARCH

- Further research is necessary, not only related to dental equipment and ergonomics but also focused on those dentists who suffered from MSDs versus with the ones do not.
- It was recommended that more conclusive remedial measure be incorporated by addressing the posture related habits and exercise right from the undergraduate training of a dental student so that the incidence of work-related musculoskeletal disorders can be greatly reduced in the future.

CONCLUSION

The present study concluded that there is a greater prevalence of WMSDs among Dentists with most common pain sites were {neck, upper & lower back, shoulders followed by wrist & hand} Preventive Physiotherapy Care is need of an hour, and it shows effective in decreasing pain and improving function. The analysis between pre test and post test suggests that the intervention is effective.

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