

Effects Of Ergonomic Advice And Posture Correction Exercises On Musculoskeletal Disorders Of Neck, Shoulder And Hand In Dental Professionals

Dr. Irish Jain

(Pt) Mpt (Ortho) Assistant Professor,
Ln Paramedical, College, Indore

Abstract

Introduction: The main reason of MSDs in dental professionals is incorrect posture and poor ergonomics as dentists stay in a static position for a prolonged period. Muscular inactivity results in MSDs. Poor ergonomics also play a role in causing poor posture which in turns result in MSDs. Exercises are very effective in preventing any type or WRMP.

Method: In this study, an online questionnaire was conducted to know the prevalence of MSDs in dental professionals. 100 dentists participated in the questionnaire. After inclusion & exclusion criteria and on the basis of RULA score, 30 dentists were selected for further studies. Considerable changes were done in ergonomics and posture correction exercises were taught.

Results: After doing considerable changes in ergonomics in dental work place and teaching some posture correction exercises, it was found that posture correction exercises along with ergonomic changes is helpful in preventing MSDs in dental professionals. It also increased their work life balance.

Conclusion: Study concluded that proper ergonomics and good posture are of great value in a dentist's life. It is needed to prevent musculoskeletal disorders and also to decrease the chances of early retirement.

Keywords: Dental professionals, Ergonomics, Posture correction exercises, musculoskeletal disorders.

Date of Submission: 16-07-2024

Date of Acceptance: 26-07-2024

I. Introduction-

Dentistry is a profession which demands lot of concentration and precision. Most of the dentists work in one static position, resulting in dyscomfort and pain[1].

Dental professionals often experience musculoskeletal pain in their entire career span. And this musculoskeletal pain is the reason for so many studies regarding work related musculoskeletal pain (WRMP) in dental professionals across the world[2].

One study shows, in India prevalence of Musculoskeletal disorders (MSDs) in different age groups. They found there is high prevalence of MSDs in above 40 years i.e., **70.8%**. It also reveals, MSDs are more common in female dental professionals with **59.5%** than in males **54.5%**. Sunisa et.al. found in their study that there is high risk of neck, shoulder and back pain from scaling (**78.8%**), filling (**77.7%**), and also in tooth extraction task. They found that back pain has highest prevalence with (**42.1%**) followed by shoulder pain. Most workers also show pain at all three sites (Neck, shoulder and back) with (**36.3%**) prevalence [3].

Dentists work with patients for a longest time, which in turn results in sitting or standing for longer duration causing trouble [2]. Dental practitioners have to work in static position for longer duration which cannot be avoided. Even in static position muscles have to work resulting in a lot of stress and strain [4]. The area of work i.e., oral cavity is dark and narrow which forces the dental professionals to adopt abnormal, poor posture causing serious physical impact and strain injuries [5]. Dental workers work in static & awkward postures, repetitive & forceful procedures, poor lighting, improper positioning of both patients and themselves, and stress. Specific dental tasks causing risks are constrained posture resulting in isometric muscle contraction, difficulties in direct visualization causing awkward postures, repetitive tasks for long durations including scaling, root planning & endodontic procedures, long surgical procedures, forceful clinical tasks like scaling and high precision and flexion for instrumentation, bad working environment [6,7].

According to WHO, Musculoskeletal disorders are defined as, " a disorder of the muscles, tendons, peripheral nerves or vascular system not directly resulting from an acute or instantaneous event [e.g., fall or slips.] These disorders are considered to be work related when the work environment and the performance of work contribute significantly, but are only one of a number of factors contributing to the causation of a multi factorial disease"[8]. Dentists and other dental professionals are at high risk of such work

related disorders. Most frequent areas of injuries are spine, shoulder, elbows and hands[9].

The International Ergonomics Association (IEA) defines ergonomics as, "the scientific discipline concerned with the understanding of the interactions among humans and other elements of a system, and the profession that applies theoretical principles, of a system, data and methods to design, in order to optimize human well being and overall system performance". In dentistry, ergonomics means preventing MSDs by allowing dentists to adopt proper, comfortable and natural posture, gaining patient friendly care, upgrading treatment efficiency and achieving treatment accuracy [5].

Dentistry poses many ergonomic challenge as dental ergonomics is difficult. Ergonomics in dentistry need to increase productivity, decrease physical and cognitive stress, stop musculoskeletal pains, to provide comfort and good quality to both patients & the professional [10]. Ergonomics in dentistry is a huge challenge, as dental surgeons have to change their positions repeatedly like standing or sitting & sometimes they have to stay in one static position for a prolonged time. They also bend forward or to the side for different procedures & stay in that position for a long time. This results in awkward postures for prolonged time with no back support and limited ROM resulting in muscle imbalance and pain [7]

Application of ergonomics in dentistry works under 3 categories:-

Work Posture includes Dentist position, Patient position, Assistant position ; 2) **Posture & Vision** includes Direct and indirect, Lighting and magnification ; 3) **Instruments** includes Examination & control instruments and Working instruments [5]. Four handed dentistry is found appropriate and helpful & is defined as an ergonomic chairside work arrangement performed by a well trained dental team in an organized manner in order to reduce elbow and forearm discomfort [11].

The incorrect posture that is assumed by the dentists while working affects majorly the shoulder girdle that includes neck, shoulder and upper back and also the muscles of lower back.

Their shoulder and upper back contact to keep the arms stable and to allow greater precision for holding instruments.

The neck muscles are contracted to keep the head tilted one side.[7] The ideal posture that should be assumed by dental professionals:

1. The head should be in neutral position , slightly inclined forward, should be on shoulders. Interpupillary line should not exceed 15-20 degrees.
2. Back should be upright that assist all the natural curvatures of spine. Lumbar support can be used to support the lumbar spine.
3. Arm should be hanged by the side of the body wall, forearm in front of the body. Wrist should be neutral position.
4. Seating height should be slightly high at hip than at knee. Operator stool can be then tilted on that.
5. Feet should be flat at the floor.
6. Rheostat should be kept near the dentist so that no extra stress will be there on back or neck if kept out the reach.[5]

II. Methods & Methodology –

An online questionnaire was conducted which included 15 questions in which answerer responded by yes or no or written their answer in the given space below. The questionnaire included their general information along with prevalence of MSDs among dental workers. It also included questions related to the awareness among them regarding their posture and ergonomics. 100 dentists participated in that questionnaire. Out of 100 dentists , 75 dentists were having musculoskeletal problems. These dentists were selected for further study by their consent.

Inclusion criteria - Age between 25-35 years Presence of Musculoskeletal Disorder.

Exclusive criteria - Age less than 25 years and more than 35 years

Any recent surgery

Musculoskeletal pain in any other part of body than Neck, Shoulder and Hand

Those who were not from the same city Those who were not willing to be a part of the study On the basis of inclusive and exclusive criteria 45 dentists were selected for further RULA assessment.

RULA assessment method was used to assess the postural disturbances due to poor ergonomics in dental professionals. Selected dental professionals were assessed in their most acquired position and the posture in which highest force load occur. One side of the body was assessed at a time. While doing Group A analysis i.e., Arm and wrist analysis, first we have examined Upper Arm positions (upper arm position & upper arm adjustment) , it was scored between 1-6; then Wrist positions (wrist position & wrist adjustment) scored between 1-4. After group A analysis, Group B analysis i.e., Neck, Trunk and Leg Position was performed. In that, Neck position (neck position & neck adjustment) scored between 1-6 was done. It was followed by Trunk position (trunk position & trunk adjustment) scored 1-6 and Leg position scored 1 or 2 respectively.

Dentists who scored between 2-4 on RULA score board, were proceeded for further study. Out of 45 dentists , 30 dentists were selected for further study.

Procedure -

After assessing the postural faults caused by poor ergonomics, to see the effect of ergonomic changes and postural exercises in prevention of those faults, we have done few ergonomic changes in the workplace and we taught the dental professionals postural exercises. We have also considered taking breaks between treatment sessions.

Descriptive Data-

Sample Size-

□ 30 dentists were selected for the study after their consent.

Study variables-

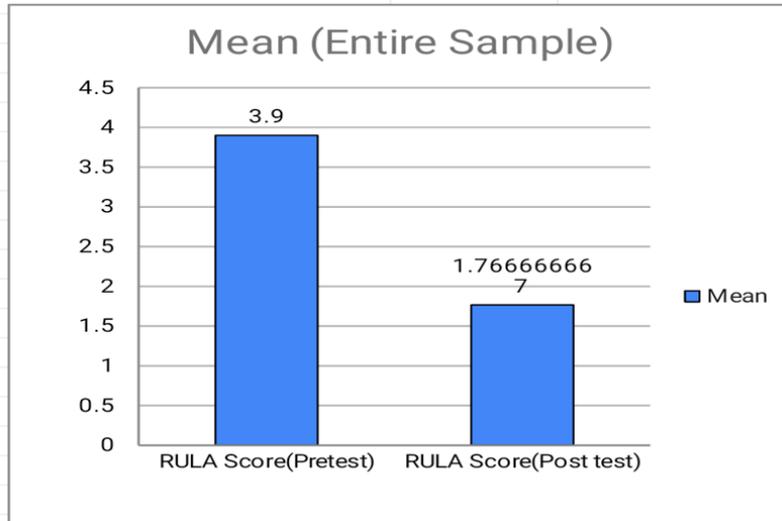
□ The independent variable of the study is dental professionals and their prolonged static position, whereas dependent variable is poor ergonomics and posture correction exercises.

Table No.1.1Pre & Post RULA SCORE

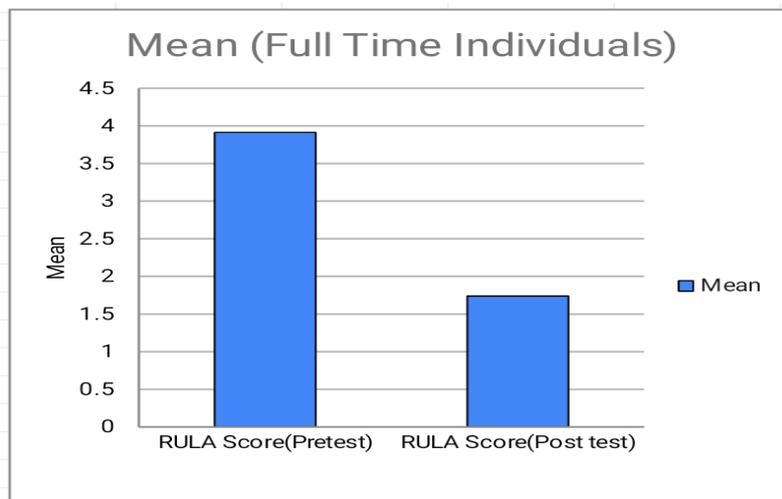
SubjectNo.	Age	RULA SCORE (Pre test)	RULA SCORE (Post test)
1.	26	3	2
2.	29	4	2
3.	32	5	3
4.	30	3	2
5.	31	5	3
6.	25	3	1
7.	26	5	2
8.	29	4	2
9.	32	4	2
10.	28	4	2
11.	31	4	2
12.	30	4	1
13.	26	3	1
14.	33	5	2
15.	30	4	1
16.	27	3	2
17.	29	4	2
18.	32	5	3
19.	30	3	2
20.	27	4	2
21.	34	4	1
22.	31	3	2
23.	26	4	2
24.	28	5	1
25.	28	3	1
26.	30	4	1
27.	32	4	1
28.	34	3	2
29.	34	5	1

III. Results –

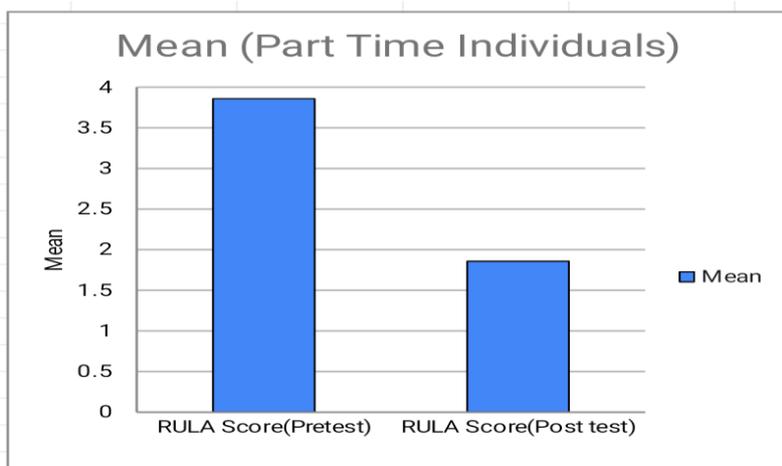
The 30 dentists which were selected for the study showed satisfactory results after application of proper ergonomics and posture correction exercises. We found posture correction exercises effective in relieving MSDs and further progression of pain in Shoulder, Neck and Hand was also decreased. Changes in ergonomics made their prolonged sitting comfortable for both the patients and for the dentists



Graph1.1 Comparison between Pre and Post RULA Score



Graph1.2 Comparison between Pre and Post RULA Score in Full timerDentists



Graph1.3 Comparison between Pre and Post RULA Score in Part timerdentists

IV. Discussion –

Dentist works in a static position for most of the time of their day. The static position causes muscle imbalance which in turns result in musculoskeletal disorder which is common in dental professionals. Among all

the areas of the body it is found that Neck, Shoulder and Hand are the regions which are under excessive stress due to poor posture and ergonomics. Prolonged awkward postures, improper positioning of patients and themselves, difficulty in direct visualization, repetitive & forceful procedures, use of heavy and vibrating instruments put lot of stress on hands, shoulder and neck. Poor ergonomics is still not considered to be a main reason behind musculoskeletal imbalances.

This study has promoted the importance of correct ergonomics and posture exercises. At the start of the study we have conducted an online questionnaire to know the prevalence of MSDs among dental professionals. We found 75% of dentists were suffering from MSDs whereas 90% dentists were aware about importance and correlation of ergonomics and posture in dentistry. The questionnaire also revealed that on an average dentists spend 7-8 hours working in which most of the time they are in sitting position. It also revealed that the most common procedures they perform is RCT and tooth extraction which results in excessive use of shoulder, neck and hand muscles. After questionnaire, on the basis of inclusion & exclusion criteria, 45 dentists were selected for further assessment via RULA method. On the basis of score between 2-4 on RULA scoreboard, 30 dentists were preceded for further study.

The study continued by making some considerable changes in ergonomics and teaching posture exercises. We found that posture exercises along with ergonomical changes put a great impact in preventing Musculoskeletal Disorders. Correct position of neck and hands prevented excessive strain on muscles.

Avoiding prolonged static posture and taking breaks in between the treatment session is beneficial. Less physical strain automatically results in increased quality of life in dental professionals. Avoiding repetitive motions, use of automatic and light weighted instruments resulted in prevention of many hand related problems. Taking breaks and reducing work time also helped in maintaining psychological health. The study also found to be effective in spreading awareness regarding good ergonomics and its importance in their profession.

Increasing scope of dentistry has its own advantages and disadvantages. Dentists are making profit but at the risk of their health. Good posture and ergonomics is necessary to prevent health related complications and for a better life. These posture correction exercises are aimed towards increasing muscle strength and to provide relaxation to the muscles which are under lot of stress due to static posture. The combination of correct ergonomics and posture correction exercise is proven to be helpful in better working abilities and quality of life.

V. Limitations -

This study only discussed the effect of poor posture and ergonomics on only 3 regions of the body i.e., neck, shoulder and hands. There are also other body regions which are affected due to poor ergonomics and posture in dental profession which this study hasn't discussed.

This study also doesn't clearly explain the changes related to hand dominance.

VI. Conclusion -

Increasing prevalence of MSDs in dentists demand immediate interventions. With the use of proper ergonomics and posture correction exercises, dental professionals can increase their quality of life and also provide quality treatment without any risk of MSDs. It will also improve comfort of them as well as to their patients.

Awareness for musculoskeletal diseases is also needed. There is much scope of improvement in ergonomics in dental workplace in order to decrease hazards related to poor workplace ergonomics.

References-

- [1] Lotte Finsen, Hanne Christensen, M Bakke. Musculoskeletal Disorders Among Dentists And Variation In Dental Work. *Appl Ergon.* 1998 Apr;29(2):119-25. Doi: 10.1016/S0003-6870(97)00017-3.
- [2] Bethany Valachi, Keith Valachi. Mechanisms Leading To Musculoskeletal Disorders In Dentistry. *Jada*, Vol. 134; 2003.
- [3] Sunisa Chaiklieng, Pornnapa Suggaravetisri. Ergonomics Risk And Neck Shoulder Back Pain Among Dental Professionals. *Procedia Manufacturing* 3(2015) 4900-4905.
- [4] Mahboobeh Abdolalizadeh, Fatemeh Jahanimoghadam. Musculoskeletal Disorders In Dental Practitioners And Ergonomic Strategies. *Anatomical Sciences*; 2015; 98(913)3431507.
- [5] Ergonomics And Posture Guidelines For Oral Health Professionals. *Fdi World Dental Federation* 2021.
- [6] Tim Morse, Heather Bruneau, Jeffrey Dusssetschleger. Musculoskeletal Disorders Of The Neck And Shoulder In The Dental Professions. *Ios Press*; Doi 10.3233/Wor-2010-0979.
- [7] Abdul Rahim Shaik. Dental Ergonomics : Basic Steps To Enhancee Work Efficiency. *Am&Hs* 2015; 2321-4848.
- [8] Amandeep Chopra. Musculoskeletal Disorders In Dentistry - A Review. *Jsm Dent* 2(3):1032. 2014; 333-7133.
- [9] Aasim Farooq Shah, Pradeep Tangade, Manu Batra, Soumik Kabasi. Ergonomics In Dental Practice. *Int J Dent Health Sci* 2014; 1(1): 68-78.
- [10] Arpit Gupta, Anil V. Ankola & Mamata Hebbal (2013). Dental Ergonomics To Combat Musculoskeletal Disorders: A Review, *International Journal Of Occupational Safety And Eronomics*. 19:4, 561-571, Doi: 10.1080/10803548.2013.11077005.
- [11] Saad A Khan, Kwai Yee Chew. Effect Of Working Characteristics And Taught Ergonomics On The Prevalence Of Musculoskeletal Disorders Amongst Dental Students. *Bmc Musculoskeletal Disorders* 2013,14:118.