

Effects of Ergonomics Among Dentist Practitioners on Pain and Function - An Interventional Study

Dr. Muskan Shashikant Mahant¹, Dr. Yagna Unmesh Shukla²

¹M.P.T (Orthopaedics), ²M.P.T (Musculoskeletal), Ph.D., Principal, Government Spine Institute and Physiotherapy College, Civil Hospital, Asarwa, Ahmedabad

Corresponding Author: Dr. Muskan Shashikant Mahant

DOI: <https://doi.org/10.52403/ijrr.20221148>

ABSTRACT

Background and Objectives: The term ergonomics is derived from "Greek" words "ergon" and "nomos" in which "ergon" means work and "nomos" means natural laws. Thus, Ergonomics is a study of how the human body can be best used for maximum comfort, efficiency, safety, and productivity. The term work-related musculoskeletal disorders (MSDs) refer to musculoskeletal disorders to which the work environment contributes significantly or to musculoskeletal disorders that are made worse or longer lasting by work conditions or workplace risk factors. Hence, this study was done to know the effect of ergonomics among dentist practitioners on pain and function.

Method: This study included screening of the dentist practitioners followed by the intervention after selecting the dentist practitioners based on inclusion and exclusion criteria. Screening was done by Nordic musculoskeletal questionnaire (NMQ) and Workplace ergonomic risk assessment scale (WERA). 60 dentist practitioners were selected and divided randomly into two groups: Control group and intervention group. Pre and Post intervention data for pain and function were collected by using Numeric pain rating scale (NPRS) and Patient Specific Functional Scale (PSFS) respectively. Post-intervention data were collected after 6 weeks.

Result: Within group and between group analysis of intervention group suggested significant reduction in pain and progression in function statistically. While the same was not true for the control group.

Conclusion: There is significantly positive effects of ergonomics on reduction of pain and

improvement of functions among dentist practitioners.

Keywords: Dentist, Dentist practitioners, Ergonomics, Pain, Function, musculoskeletal disorders.

INTRODUCTION

The term ergonomics is derived from "Greek" words "ergon" and "nomos" in which "ergon" means work and "nomos" means natural laws. Thus, Ergonomics is a study of how the human body can be best used for maximum comfort, efficiency, safety, and productivity. Ergonomics could be described as 'an applied science concerned with designing and arranging things people use so that the people and things interact most Efficiently and safely'. Ergonomics is highly relevant to preventive and occupational medicine, management of musculoskeletal injuries and rehabilitation. It helps people understand their limitations within the working area and helps them to find out the way to perform safely, effectively, and comfortably within the working environment.^[1]

The term work-related musculoskeletal disorders (MSDs) refer to musculoskeletal disorders to which the work environment contributes significantly or to musculoskeletal disorders that are made worse or longer lasting by work conditions or workplace risk factors. Common examples of such workplace risk factors include jobs requiring repetitive, forceful or

prolonged exertions of the hands; frequent or heavy lifting, pushing or pulling, or carrying of heavy objects and prolonged awkward postures. The level of risk depends on the intensity, frequency and duration of the exposure to these conditions.^[2]

Dental Surgeons belong to a high-risk occupation of being aimed by the MSDs due to their prolong working hours and stressful working postures.^[3] When performing the procedure, dentists try to keep the neutrality of their posture by exerting an unnecessary force on their musculature leading shortening of muscles further progressing to the development of MSDs. Their prolonged static postures put expose them to an array of MSDs including dorsalgia, carpel tunnel syndrome, sciatica, spondylitis, etc. Numerous daily activities such as use of poorly designed instruments with poor grip and blunt edges, handling of slippery tools, manoeuvring complex armamentarium, and vibrating handpieces produce unnecessary pressure in the muscles. Stressful postures attempted while viewing the oral cavity or slouching the back can also result in long-term musculoskeletal illnesses.^[3]

Every dentist is of different built and has a different level of strength. Contrary to that most of the workstations, machines, tools, and equipment are designed without consideration of ergonomic principles. This is very important that dentists should know how to consider the ergonomics principles while designing and setting up the dental clinic.^[1]

The overall prevalence rate of MSDs in dentistry differs from 63-93 % worldwide with as high as 92.4 % in Gujarat.^[4]

MATERIALS AND METHODS: SELECTION CRITERIA

INCLUSION CRITERIA

- Dentist practitioners.
- Willingness to participate.
- NPRS score 4-6.
- Both male and female.
- Working hours per day: 4-8
- Age: < 65 Years.

EXCLUSION CRITERIA

- Any surgical, orthopedic or neurological disorders.
- Individuals taking pain killers.

WITHDRAWAL CRITERIA

- If pain aggravates.
- Participant wishes to discontinue the treatment.

STUDY DURATION: six weeks.

STUDY DESIGN: An Interventional study

SOURCE OF DATA COLLECTION:

Dentist practitioners in Ahmedabad.

SAMPLING TECHNIQUE: Simple Random Sampling

SAMPLE SIZE: Total 60, divided into two groups:

- Group A: Intervention Group – 30 participants
- Group B: Control Group – 30 participants

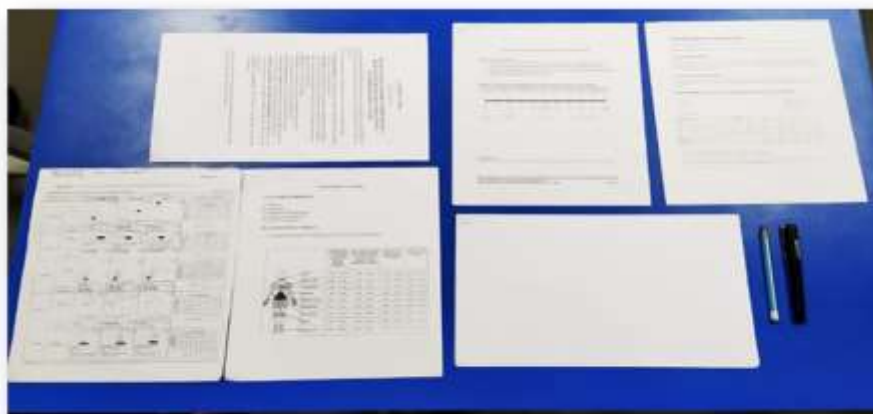


Figure 1: Materials

STUDY PROCEDURE:

As per inclusion and exclusion criteria, screening of dentist practitioners was done by Nordic musculoskeletal questionnaire^[5] and workplace ergonomic risk assessment (WERA)^[6].

After taking informed written consent from the subject, demographic data was collected.

Dentist practitioners were divided into intervention group and control group randomly. Dentist practitioners in the intervention group were advised on the application of ergonomics which was tailor made from the SOP of the ergonomic advices, while the control group was not given any advices.

Pre-intervention pain and function assessment was done by Numeric pain rating scale^[7] and Patient specific functional scale^[8] respectively.

The dentist practitioners in the intervention group were asked to maintain an exercise diary. Telephonic and in person follow ups were taken once a week.

After 6 weeks post intervention of pain and function was done and results were analysed.

CONSORT 2010 Flow Diagram

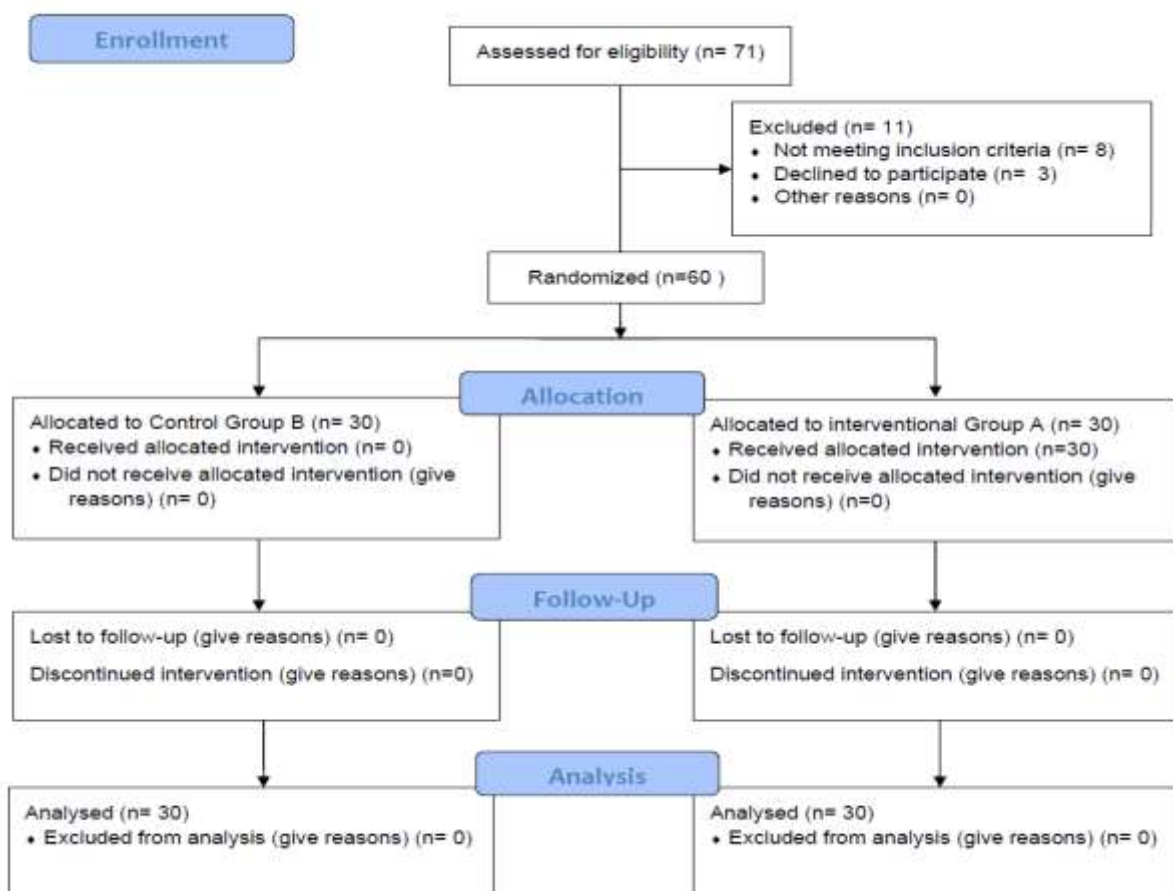




Figure 2: Pre-intervention Posture of a dentist practitioner



Figure 3: Post-intervention Posture of a dentist

STATISTICAL ANALYSIS

Statistical analysis was done by SPSS version 28. Kolmogorov-Smirnov test and Shapiro-walk test were applied to check whether the data follows normal distribution. Baseline data were calculated by MS excel 2019. Within-group analysis was done using baseline outcome measures taken before and after 6 weeks. The level of significance was 5% with a confidence interval of 95%.

WITHIN GROUP ANALYSIS

Paired t-test was applied to analyse the differences in NPRS and PSFS after 6 weeks for both the groups as the data were normally distributed.

OUTCOME MEASURES	GROUP A n = 30	GROUP B n = 30	Z VALUE	P VALUE
AGE	34 ± 9.02	30.9 ± 5.29	- 0.67	0.502
GENDER	15 ± 2.82	15 ± 5.65	0.27	0.59
NPRS	5.16 ± 0.77	5.16 ± 0.72	6.44	<.00001
PATIENT SPECIFIC FUNCTIONAL SCALE	7.06 ± 1.43	7.26 ± 0.80	-5.53	<.00001

Table 3: Baseline Characteristics

Within-group analysis:

Group A - Intervention group:

Analysis showed a significant statistical difference in NPRS and PSFS values within a group ($p < 0.05$).

Pre-Mean ± SD	Post Mean ± SD	t-value	Significant p value < 0.05
5.16 ± 0.77	2.63 ± 0.79	12.26	0.00001

Table 4: Paired t-test between pre and post NPRS in Group A.

BETWEEN GROUP ANALYSIS

Unpaired t-test was applied for between group analysis as the data were normally distributed. The p-value was < 0.05 for NPRS and PSFS.

RESULT

Groups	No. of participants	Age(years) Mean ± SD
Group A	30	34 ± 9.02
Group B	30	30.9 ± 5.29

Table 1: Mean age of participants in both the groups.

Group	No. of Male	No. of Female	Total
Group A	13	17	30
Group B	11	19	30

Table 2: Gender distribution of participants in both the groups.

Pre-Mean ± SD	Post Mean ± SD	t-value	Significant p value < 0.05
7.06 ± 1.43	8.9 ± 0.83	-5.95	0.00001

Table 5: Paired t-test between pre and post PSFS in group A.

Group B - Control group:

Analysis showed no significant statistical difference in NPRS and PSFS values within a group ($p < 0.05$).

Pre-Mean ± SD	Post Mean ± SD	t-value	Significant p value< 0.05
5.16 ± 0.72	5.09 ± 0.73	0.34	0.73(NOT SIGNIFICANT)

Table 6: Paired t-test between pre and post NPRS in group B.

Pre-Mean ± SD	Post Mean ± SD	t-value	Significant p value
7.26 ± 0.80	7.23 ± 0.83	0.15	0.87(NOT SIGNIFICANT)

Table 7: Paired t-test between pre and post PSFS in group B.

BETWEEN GROUP ANALYSIS:

Table 8: PRE-POST MEAN DIFFERENCE OF NPRS BETWEEN GROUPS.

Variable	Group A (pre-post difference) Mean ± SD	Group B (pre-post difference) Mean ± SD	t value	Significance (p value < 0.05)
NPRS	2.53 ± 0.02	0.07 ± 0.01	-12.37	<0.00001

Variable	Group A (pre-post difference) Mean ± SD	Group B (pre-post difference) Mean ± SD	t value	Significance (p value < 0.05)
PSFS	1.84 ± 0.60	0.03 ± 0.03	7.74	<0.00001

Table 8: PRE-POST MEAN DIFFERENCE OF PSFS BETWEEN GROUPS.

DISCUSSION

Ergonomics is a study of how the human build can be best used for supreme comfort, efficiency, safety, and productivity. Ergonomics is highly suitable to preventive and occupational medicine, management of musculoskeletal injuries and rehabilitation. It helps people understand their limitations within the working area and helps them to find out the way to perform safely, effectively, and comfortably within the working environment.^[1] Every dentist is of different built and has a different level of strength. Contrary to that most of the workstations, machines, tools, and equipment are designed without consideration of ergonomic principles. This is very important that dentists should know how to consider the ergonomics principles while designing and setting up the dental clinic.^[1]

The present study was conducted to see the effects of ergonomics on pain and function among dentist practitioners. Total 60 participants were divided into 2 groups A and B with 30 participants in each group. Group A participants were given ergonomic

advices for their respective pain and functional limitation. While, group B participants did not receive any advices for the correction of the ergonomics. The pre data was taken of all the participants from both the groups. Group A participants followed the ergonomic advices for 6 weeks. After 6 weeks, post data were taken of all the participants from both the groups. There was no significant difference between the age and gender among the two groups. Results showed statistically significant improvement in pain and function in Group A after 6 weeks while, no significant differences were noted in Group B. The current study shows that the ergonomic advices including workplace modification and postural correction improves function among dentist practitioners and reduces pain.

In a study conducted by Rajani Dable et al, similar results were found which concluded that the use of ergonomic saddle stool could assist the lumber region and preserve the natural curvature of the lumber spine at the same time magnification might produce the clearer view near to the operator instead of operator hunching over to get the view. During the study, it was found that the students were unaware of the correct position of the operator and the chair. Efforts were taken to make the students understand the importance of right use of chair to get the maximum ergonomic effect.^[9]

MJ Hayes et al, conducted a study with twelve practising dental hygienists and seventeen final-year dental hygiene students on the effect of wearing loupes on upper extremity musculoskeletal disorders and found that after wearing loupes for 6 months, hygienists reported less pain in the shoulder, arm and hand. Changes in musculoskeletal function were minimal.^[10]

CONCLUSION

The findings of the current study suggested that there are significantly positive effects of ergonomics on reduction of pain and

improvement of functions among dentist practitioners.

Clinical Implication: Ergonomic advices should be considered for pain reduction and functional improvement in dentist practitioners.

Declaration by Authors

Ethical Approval: Approved

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Kumar S, Gupta VK, Mishra G. Ergonomics in Dentistry: Really A Practice or Just a Tactics. *Int J Contemp Med Res IJCMR* [Internet]. Julho de. 2019;6(7).
2. Gupta A, Bhat M, Mohammed T, Bansal N, Gupta G. Ergonomics in dentistry. *International journal of clinical pediatric dentistry*. 2014 Jan;7(1):30.
3. Rajvanshi H, Batra H, Singh S, Effendi H, Zaidi I. Ergonomics in dentistry: The absolute dent-ergonomics workout. *IJSS Case Rep Rev*. 2015 Sep;2:35-9.
4. Correlation between Work Experience and Musculoskeletal Disorders among the Dentists of Vadodara, Gujarat, India - Joshi Medhavi, Desai Devangi, Singh Lalli, Joshi Vaibhavi.
5. Chairani, Aulia. "Validity And Reliability Test Of The Nordic Musculoskeletal Questionnaire With Formal And Informal Sector Workers." 7th International Conference on Public Health 2020, Surakarta, Indonesia, November 2020.

Sebelas Maret University, 2020, pp. 100-106, doi:10.26911/the7thicph-FP.05.06.

6. Abd Rahman MN, RANI MR, Rohani JM. WERA: an observational tool develop to investigate the physical risk factor associated with WMSDs. *Journal of human ergology*. 2011;40(1_2):19-36.
7. Cristiana Kahl and Joshua A Cleland, Visual Analogue Scale, Numeric Pain Rating Scale and the McGill Pain Questionnaire: An Overview of Psychometric Properties, *Physical Therapy Reviews* 2005; 10: 123-128.
8. Stratford, P., Gill, C., Westaway, M., & Binkley, J. (1995). Assessing disability and change on individual patients: a report of a patient specific measure. *Physiotherapy Canada*, 47, 258-263.
9. Dable RA, Wasnik PB, Yeshwante BJ, Musani SI, Patil AK, Nagmode SN. Postural assessment of students evaluating the need of ergonomic seat and magnification in dentistry. *The Journal of Indian Prosthodontic Society*. 2014 Dec;14(1):51-8.
10. Hayes MJ, Osmotherly PG, Taylor JA, Smith DR, Ho A. The effect of wearing loupes on upper extremity musculoskeletal disorders among dental hygienists. *International journal of dental hygiene*. 2014 Aug;12(3):174-9.

How to cite this article: Muskan Shashikant Mahant, Yagna Unmesh Shukla. Effects of ergonomics among dentist practitioners on pain and function - an interventional study. *International Journal of Research and Review*. 2022; 9(11): 356-361. DOI: <https://doi.org/10.52403/ijrr.20221148>
