

Ergonomics in dentistry

¹Priyanka Khatri, ²Sonal Chhajed, ³Nayan Patel

¹Tutor, ²Professor, ³Lecturer
Department Of Public Health Dentistry,
Goenka Research Institute of Dental Science, Gandhinagar, India

Abstract: The incidence of work-related musculoskeletal disorders in dentists is growing day by day. Ergonomics is much border than avoiding work related musculoskeletal disorders. The effective submission of ergonomics declares high efficiency, escaping of disease and damages, ineffective submission on the other hand, can lead to work related musculoskeletal disorders (MSDs). The present article discusses various risk factors of musculoskeletal disorders and prevention of MSDs amongst dentists by applying ergonomics.

Keywords: Ergonomics, Dentistry, Musculoskeletal disorder (MSDs)

Introduction

The dental profession requires skillful dental preparations with great precision and control.¹ Ergo means work & nomies means laws, Ergonomics in dentistry means preventing musculoskeletal problems by enabling the dentist to adopt a more natural and comfortable posture, achieving, achieving patient-friendly treatment, improving treatment efficiency and achieving treatment accuracy. A good posture provides the dentists more working energy, a reduces stress level, increased comfort, lack of pain and muscular tension and a lower risk for therapeutical errors. Research had shown that most common injuries occur in wrists, elbows, shoulders, neck and back & spine.⁴ Literature suggests that the prevalence of skeletal or muscular pain in dentists, dental hygienists and dental students ranges from 93% to 64%. The most prevalent regions for pain in dentists have been shown to be the back (36.3% -60.1%) and neck (19.5% - 80%).⁵ Complex conditions like Carpel tunnel syndrome, sciatica, tendinitis & tension neck syndrome are now often associated with dental workers & dentists. The most common are musculoskeletal disorders, which can even lead to irreversible injuries. This article review about various musculoskeletal disorders and its management.

Goals of ergonomics include⁶

- Prevention of work related musculoskeletal disorders and conditions which might lead to it
- Increasing safety and productivity
- Enhanced performance by eliminating unnecessary effort
- Improving the standard of care to the patient

Musculoskeletal disorders

The World Health Organization defines an MSD as “a disorder of the muscles, tendons, peripheral nerves or vascular system not directly resulting from an acute or instantaneous event (e.g., slips or falls). 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 multifactorial disease.”⁸ Chowanadisai had studied occupational health problems of dentists in southern Thailand in 1997 and found that musculoskeletal (MS) pain was the most common problem.⁷ Musculoskeletal disorders (MSDs) are injuries and disorders of the musculoskeletal system. Documented studies in the literature across the world have shown a high prevalence of MSDs among the dentists^{11,12,13,14,15,16,17,18,19}

Prevalence of MSD

The prevalence of MSD among dental practitioners is not well documented in India.¹⁰ The survey was conducted in dental colleges and private clinics in major cities of Andhra Pradesh, where total 135 subjects with inclusion criteria about the trouble the dentists faced during the last 12 months that prevented them from regular work, the dentists opinion regarding effect of physical activity on MSD, which shows that the prevalence of general musculoskeletal pain ranges between 64% and 93%.²⁰ The most prevalent regions for pain in dentists have been shown to be the back (36.3-60.1%) and neck (19.8-85%), while the hand and wrist regions were the most prevalent regions for dental hygienists (60-69.5%), certain factors help the participants to relieve their pain which includes correct posture (46.9%), pause for few minutes (32.7%), muscle relaxing exercise (24.5%), analgesic drugs (10.2%), and complete rest for a day (4.1%), etc. Similar to this study, a study in Glasgow also found that improving or correcting posture can definitely help to relieve the pain.²⁰

MSDs classification⁶

1. Nerve Entrapment Disorders: carpal tunnel syndrome, ulnar neuropathy.
2. Occupational Disorders of the Neck and Brachial Plexus: tension neck syndrome, cervical spondylosis, cervical disc disease, brachial plexus compression.
3. Shoulder disorders: trapezius myalgia, rotator cuff tendonitis, rotator cuff tears, and adhesive capsulitis.
4. Tendonitis of the Elbow, Forearm and Wrist: deQuervain's disease, tendonitis, tenosynovitis, epicondylitis
5. Hand-Arm Vibration Syndrome: Raynaud's disease.
6. Low Back Disorders: chronic low back pain.

Risk factors for MSDs⁹

Based on various studies made, the following are the variety of risk factors for musculoskeletal disorders (MSDs) that are encountered in dental practice.

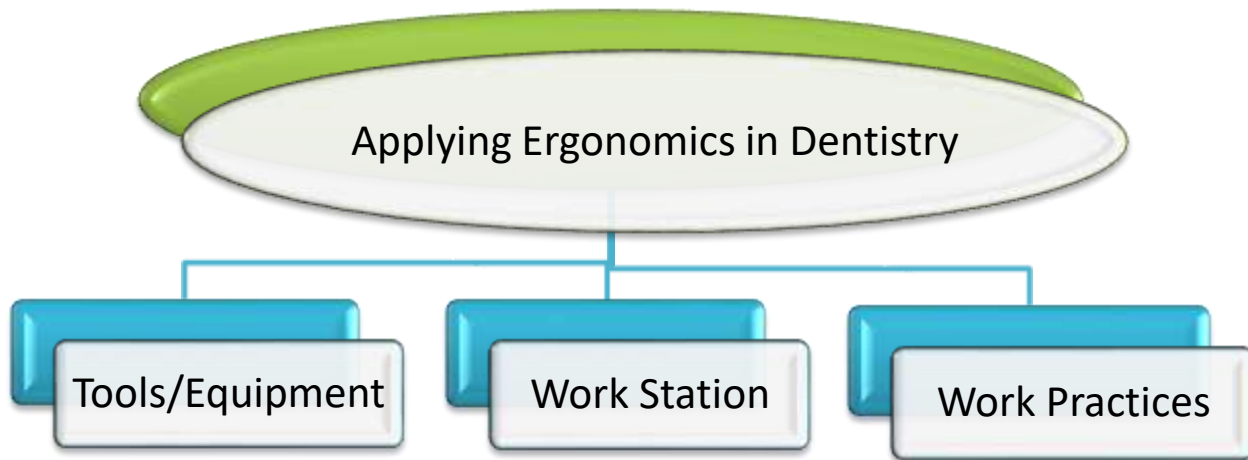
Risk Factors for MSDs	Dental Procedures
Repetitive motions	Scaling, polishing
Awkward postures	Handling of objects with the back bent/twisted than straight
Static posture	Static neck, back & shoulders
Forceful exertion	Tooth extraction
Duration	Grasping small instruments for prolonged periods
Contact stresses	Repeated contact with hard or sharp objects
Vibration	Prolonged use of vibrating hand tools

Other risk factors for MSDs are³

- Poorly designed equipment workstation eg -narrow
- working space improper work habits
- Genetics
- Medical conditions
- Poor fitness level
- Physical/mental stress
- Lack of rest/recovery
- Poor nutrition
- Poor lighting
- Environmental& psychosocial factors

MSDs Prevention Strategies

“Prevention is better than cure”. Prevention of any problem protects time, money & discomfort. The disease predominant among dentists is Musculoskeletal disorders (MSDs) and the solution to the problem is ergonomics.



Selection of Tools/Equipment^{21,22,23}

Tool instrument design should be such that it reduces forceful exertion and maintains hand wrist in neutral posture.

While using hand instruments look for:

1. Hollow or resin handles.
2. Round, Knurled or compressible handles.
3. Carbon steel construction (for instruments with sharp edges).

While using automated instruments look for:

1. Light weight, balanced models (cordless preferred).
2. Sufficient power.
3. Built in light sources.
4. Angled vs. straight shank.
5. Pliable, light weight hoses.
6. Easy activation.
7. Swivel mechanisms.

Work Station^{21,22,23}

Use Magnification: Magnification enables operators to maintain a greater working distance and position patients at the proper height, with the shoulders relaxed and the forearms approximately parallel with the floor. Operating telescopes or loupes are available with flip-up or through-the-lens designs. Working in postures with greater than 20 degrees of neck flexion have been associated with increased neck pain. The declination angle of the scopes should allow you to maintain less than 20 degrees of neck flexion

Work Practices³Patient positioning

Supine positioning of the patient in the chair is usually the most effective way to help to maintain neutral posture. The patient must lie comfortably without feeling pressure from the back.

Operator position

The clinician's access to the oral cavity should be truly unimpeded. The operator should be able to move freely the legs beneath the patient's head & headrest to avoid twisting or forward bending of the torso. 7 to 12:30 o'clock position is preferred for the right handed operator, & 12:30 to 5 o'clock for the left handed operator.

Conclusion

although the reasons for occupation related musculoskeletal disorders are frequent among dentists, the main causative factor is inappropriate posture. The booming implementation of ergonomics provides improved work competence. Ergonomics in dentistry starts with maintaining the body in a neutral position as much as possible. The dentist must optimize working surroundings to help to eradicate uncomfortable postures, physical wear and tear, and tiredness. By combining ergonomic exaggeration with postural amplification, positioning techniques, working practices, chair side stretching, the multifactorial problem of work-related pain in dentistry can most efficiently be addressed. Thus, successful appliance of ergonomics not only helps the dentists to get better their health, it also increases fulfillment as well as superiority of work.

References:

- (1) Sachdeva A, Bhateja S, Arora G. Ergonomics in dentistry: A comprehensive review. *Journal of Dental Research and Review*. 2020 Jan 1;7(1):32.
- (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) Das H, Motghare V, Singh M. Ergonomics in dentistry: Narrative review. *Int J Appl Dent Sci*. 2018;4(04):104-10.
- (4) Lindfors P, Von Thiele U, Lundberg U. Work characteristics and upper extremity disorders in female dental health workers. *Journal of occupational health*. 2006;48(3):192-7.
- (5) Biswas R, Sachdev V, Jindal V, Ralhan S. Musculoskeletal Disorders and Ergonomic Risk Factors in Dental Practice. *Indian Journal of Dental Sciences*. 2012 Mar 1;4(1).
- (6) Pendyala S, Karunakar P. Ergonomics in dentistry—Designing your work. *Journal of Academy of Dental Education*. 2014 Jun 30;1(1):45-50.
- (7) Chowanadisai S, Kukiattrakoon B, Yapong B, Kedjarune U, Leggat PA. Occupational health problems of dentists in southern Thailand. *International dental journal*. 2000 Feb 1;50(1):36-40.
- (8) Sudarshan R, Ganesan SV. Ergonomics in dentistry—a review. *J Environ Occup Sci*. 2012;1(2):125.
- (9) Dajpratham P, Ploypetch T, Kiattavorncharoen S, Boonsiriseth K. Prevalence and associated factors of musculoskeletal pain among the dental personnel in a dental school.
- (10) Muralidharan D, Fareed N, Shanthi M. Musculoskeletal disorders among dental practitioners: does it affect practice?. *Epidemiology Research International*. 2013;2013.
- (11) Puriene A, Janulyte V, Musteikyte M, Bendinskaite R. General health of dentists. Literature review. *Stomatologija*. 2007 Jan 1;9(1):10-20.
- (12) Gandavadi A, Ramsay JR, Burke FJ. Assessment of dental student posture in two seating conditions using RULA methodology—a pilot study. *British dental journal*. 2007 Nov;203(10):601-5.
- (13) Chaikumarn M. Differences in dentists' working postures when adopting proprioceptive derivation vs. conventional concept. *International Journal of Occupational safety and ergonomics*. 2005 Jan 1;11(4):441-9.
- (14) Leggat PA, Kedjarune U, Smith DR. Occupational health problems in modern dentistry: a review. *Industrial health*. 2007;45(5):611-21.
- (15) Garcia PP, Pinelli C, dos Reis Derceli J, Campos JÁ. Musculoskeletal disorders in upper limbs in dental students: exposure level to risk factors. *Brazilian Journal of Oral Sciences*. 2012;11(2):148-53.
- (16) Moosavi S, Desai R, Hallaj S, Sundaram KK, Hegde VS. Ergonomic analysis to study the intensity of MSDs among practicing Indian dentists. *Procedia Manufacturing*. 2015 Jan 1;3:5419-26.
- (17) Gupta S. Ergonomic applications to dental practice. *Indian journal of dental research*. 2011 Nov 1;22(6):816.
- (18) Theresa. M. Newell, Shrawan Kumar, Prevalence of musculoskeletal disorders among orthodontists in Alberta, J. *International Journal of Industrial Ergonomics* 33 (2004) 99–107
- (19) Pargali N, JOUKAR N. Prevalence of musculoskeletal pain among dentists in Shiraz, Southern Iran.
- (20) https://www.ijcmr.com/uploads/7/7/4/6/77464738/ijcmr_1926_v1.pdf
- (21) Finkbeiner BL. Selecting equipment for the ergonomic four-handed dental practice. *J Contemp Dent Pract*. 2001 Nov 1;2(4):44-52.

(22) Hagberg m, Silverstien B, Wells R, Smith R, hendrick II P et al, (Eds). Work related musculoskeletal disorders. In A handbook for prevention, London: Taylor and Francis; 1995.

(23) Desai V, Pratik P, Rajeev S. Ergonomics: a must for dentistry: a cross sectional study in various parts of Northern India. Journal of Dentofacial Sciences. 2012;1(2):1-5.

