

## ERGONOMICS AT DENTISTRY

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### ABSTRACT:

**AIM:**The aim of this study is to define work-related musculoskeletal disorders, risk factors and stressful individual behaviors in dentistry which lead to injures and implementing preventive strategies.

**MATERIAL AND METHOD:** Musculoskeletal disorders were attributed to numerous risk factors including prolonged static posture, repetitive movements, suboptimal lighting, poor positioning, genetic predisposition, mental stress, physical conditioning and age.(1) Researchers have found symptoms of discomfort for dental workers occurred in the wrists/hands (69.5%), neck (68.5%), upper back (67.4%), low back (56.8%) and shoulders (60.0%). (2)

**RESULTS:** Musculoskeletal pain, particularly back pain, has been found to be a major health problem for dental practitioners. Early symptoms of MSDs include pain, swelling, tenderness, numbness and loss of strength.

**CONCLUSNS:** Ergonomics along with regular exercises, relaxation techniques (meditation, pilates, biofeedback & yoga), proper nutrition helps dentists combat stress, thus conserving the productive energy, thereby increasing comfort, improving the quality of life, ultimately leading to extended careers.

**Key words:** *musculoskeletal disorders, risk factors, symptoms*

**INTRODUCTION:** Dental professionals are commonly exposed to a variety of occupational hazards such as chemical, biological and ergonomic which create musculoskeletal disorders. Dentists often have to limit or even abandon their professional activities and as a result, MSD has negative impact on either their finance and their healthy life.

A healthy dentist is one of the most important component in a successful dental practice. Despite the fact, that though 88% of dentists report good or excellent health (Kupcinskis & Petrauskas, 2003)(1), some studies show that one out of ten dentists reports having poor general health and three out of ten dentists report having poor physical state (Gorter et al, 2000). (2)

The musculoskeletal health of dental professionals has been the subject of numerous studies worldwide, and their focus has been on the pain experienced by the practitioner. Because their work area is narrow, dental treatment is performed, in a very inflexible work posture. Studies indicate that back, neck and shoulder or arm pain is present in up to 81% of dental operators (Bramson et al, 1998).(3) Back pain is the most common complaint followed by neck pain and shoulder pain, though they all are usually mild. Most dentists today work in the sitting position and treat the patient in the supine position. When operators sit, pain occurs not only in their back, but also in their neck, shoulders and arms. While the occasional backache or neck ache is not a cause for alarm, if regularly occurring pain or discomfort is ignored, the cumulative physiological damage can lead to an injury or a career ending disability (Valachi & Valachi, 2003). (4)

These problems can be avoided by increasing awareness of the postures used during the work, redesigning the work station to promote neutral positions, examining the impact of instrument use on upper extremity pain, and following healthy work practices to reduce the stress of dental work on the practitioner's body. (Jabbar, 2008).(5)

The aim of this study is to define work-related musculoskeletal disorders, risk factors and stressful individual behaviors in dentistry which lead to injures and implementing preventive strategies.

### **MATERIAL AND METHOD:**

Musculoskeletal disorders were attributed to numerous risk factors including prolonged static posture, repetitive movements, suboptimal lighting, poor positioning, forceful exertions, vibration, poorly designed equipment workstation, improper work habits, medical conditions, poor fitness level, lack of rest, poor nutrition, genetic predisposition, mental stress and environmental factors.

In this study we have done a review evaluation of most common musculoskeletal disorders represented in literature.

### **RESULTS & DISCUSSION**

Researchers have found symptoms of discomfort for dental workers occurred in the wrists/hands (69.5%), neck (68.5%), upper back (67.4%), low back (56.8%) and shoulders (60.0%). (6,7)

Musculoskeletal pain, particularly back pain, has been found to be a major health problem for dental practitioners. Early symptoms of MSDs include pain, swelling, tenderness, numbness and loss of strength. Others symptoms are excessive fatigue in the shoulders and neck, tingling, burning, or other pain in arms, weak grip, cramping of hands, numbness in fingers and hands, clumsiness and dropping of objects, hypersensitivity in hands and fingers. (8)



**Figure 1**



**Figure 2**



**Figure 3**

**Mechanisms of MSDs in Dentistry: Prolonged Static Postures (PSPs):** When the human body is subjected repeatedly to PSPs, it can initiate a series of events that may result in pain, injury or a career-ending.

**Muscle Ischemia/Necrosis and Imbalances:** During treatment, operators strive to maintain a neutral, balanced posture and find themselves in sustained awkward postures. These postures often lead to stressed and shortened muscles which can become ischemic and painful, exerting asymmetrical forces that can cause misalignment of the spinal column.

**Hypomobile Joints:** During periods of PSPs or when joints are restricted due to muscle contractions, synovial fluid production is reduced and joint hypomobility may result.

**Spinal Disc Herniation and Degeneration:** In unsupported sitting, pressure in the lumbar spinal discs increases. During forward flexion and rotation, the pressure increases further and makes the spine & disc vulnerable to injury.

**Neck and Shoulder Injury:** Repetitive neck movements and continuous arm and hand movements affecting the neck and shoulder demonstrate significant associations with neck MSDs.(9)

**Carpal-Tunnel Syndrome (CTS):** It has been associated with both repetitive work and forceful work. Symptoms can appear from any activity causing prolonged and increased pressure (passive or active) in the carpal canal.

**Low Back Pain:** Low back discomfort has been associated with dental work in numerous studies.

**Psychosocial Factors:** Dentists with work related

MSDs show a significant tendency to be more dissatisfied at work. They are burdened by anxiety, poor psychosomatic health and thus feel less confident.(10)

Elements of an Improper Workstation Setup: dentist's or patient's chair is too high/low, dentist's chair has no lumbar, thoracic or arm support, Instrument table is not positioned properly, lighting is inadequate for the task, edges of tables/work surfaces are uncomfortable, ventilation makes workspace cold, work environment is damp and cold. The elements of an improper workstation setup force the dental practitioner to assume many harmful postures when performing various procedures on the patient. These positions put pressure on nerves and blood vessels, cause excessive strain on muscles, decrease circulation and cause wear and tear on the joint structures.

Some Improper Postures That Dentists Take: Working with the neck in flexion and tilted to one side, shoulders elevated, side bending to left or right, excessive twisting, forward bending/overreaching at waist, shoulders flexed and abducted, elbows flexed greater than 90°, wrists flexed/deviated in grasping, thumb hyperextension, position maintained for 40 minutes per patient. (11,12)



Figure 4



Figure 5

Knowing the risk factors and MSD symptoms dentists will increase prevention, change their habits, select proper ergonomic equipment and posture and have a break after each operation with stretching exercise. In doing so, exercise plays an important role in their career to be healthy, safe and have a longer career.

Some tips for working with good posture: maintain an erect posture, use an adjustable chair with lumbar, thoracic and arm support, work close to your body, minimize excessive wrist movements, avoid excessive finger movements, alternate work positions between sitting, standing and side of patient, adjust the height of your chair and the patient's chair to a comfortable level, consider horizontal patient positioning, position the adjustable light to avoid strain on the neck, temperature of workspace should not be too cold because this will decrease the circulation and blood flow of extremities.

Body strengthening exercises: stretching and strengthening the muscles that support the back and neck and those used in the forearm, wrist, and hand will help them remain strong and healthy. Periodic stretching throughout the workday. Resting hands frequently is believed to be one of the most important factors in preventing. To relieve eyestrain caused by focusing intensely at one depth of vision for long periods, look up from the task and focus eyes at a distance for approximately 20 seconds. Move the head down slowly and allow the arms and head to fall between the knees; hold for a few seconds; raise slowly by contracting the stomach muscles and rolling up, bringing the head up last. Try head rotation for neck stiffness. Shoulder shrugging can be used to stretch the shoulder muscles that may be stressed from holding oral evacuator, instruments and telephone handset. Pull the shoulders up toward the ears, roll them backward and then forward in a circular motion. (13)

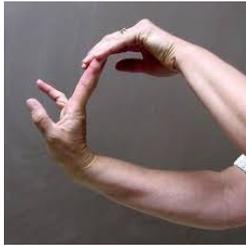


Figure 6



Figure 7



Figure 8



Figure 9

**CONCLUSION:** Ergonomics along with regular exercises, relaxation techniques (meditation, biofeedback & yoga), proper nutrition helps dentists combat stress, thus conserving the productive energy, thereby increasing comfort, improving the quality of life, ultimately leading to extended careers.

#### REFERENCES:

1. Al Wazzan KA, Almas K, Al Shethri SE, Al-Qahtani MQ: Back & Neck Problems Among Dentists and Dental Auxiliaries. *The Journal of Contemporary Dental Practice*, 2001;2(3):17-30.
2. Bramson JB, Smith S, Romagnoli G: Evaluating Dental Office Ergonomic Risk Factors And Hazards. *Journal of American Dental Association*, 1998;129(2):174-183.
3. Gorter RC, Eijkman MAJ, Hoogstraten J: Burnout and Health among Deutch Dentist. *European Journal Oral Sciences*, 2000;108(4):261-267.
4. Jabbar TAA: Musculoskeletal disorders among dentist in Saudi Arabia. *Pakistan Oral and Dental Journal*, 2008;28(1):135-144.
5. Kahri P: Ergonomics and teamwork in dental treatment. Planmeca, 2005: available from: [http://www.planmeca.it/pdf/downloads/PLANMECA\\_ARTICLE\\_Ergonomics\\_and\\_teamwork\\_web.pdf](http://www.planmeca.it/pdf/downloads/PLANMECA_ARTICLE_Ergonomics_and_teamwork_web.pdf)
6. Kupcinskas L, Petrauskas D: Hepatitis-Mediku Profesine liga. *Journal of Stomatologija* , 2003;Suppl1: 1:22.
7. Prevention of Work related MSDs in dental clinics, *ASSTSAS* 2009. available from: <http://www.asstsas.qc.ca/documents/Publications>.
8. Puriene A, Janulyte V, Musteikyte M, Bendinskaite R: General health of dentists Literature reviews. *Stomatologija, Baltic Dental and Maxillofacial Journal*, 2007;9(1):10-20.
9. Russell JG: Ergonomics in the Dental Surgery, *Occupational Medicine*, 1973;23(4):128-131.
10. Sadig W: Ergonomics in dental practice. *Pakistan Oral & Dental Journal*, 2000;20(2):205-213.
11. Shugars D, Miller D, Williams D, Fishburne C, Srickland D: Musculoskeletal pain among general dentists. *General Dentistry*, 1987;35(4):272-276.
12. Valachi B, Valachi K: Mechanisms leading to musculoskeletal disorders in dentistry. *Journal of American Dental Association*, 2003;134(10):1344-1350.
13. Yamalik NA: Musculoskeletal Disorders (MSDS) and Dental Practice part 2. Risk Faitors for dentistry Magnitage of the problem, prevetion, and gental