

OCCUPATIONAL HAZARDS

ERGONOMICS IN DENTAL PRACTICE

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SUMMARY

Dentistry particularly the practice of general dentistry is a high risk profession for the development of musculoskeletal disorders as it requires high visual demands which result in the adoption of fixed postures. The aims of this paper are; firstly, to highlight the extent of musculoskeletal problems related to the dental professionals in different parts of the world and secondly to describe the term ergonomics in dental practice and finally, to emphasize the management with specific and general recommendations.

It is hoped that the paper will help dental professionals to adopt correct postures, which will enhance their working capacity to work in a pain free environment to deliver quality dental care to their patients.

Key words: Occupational hazard, musculoskeletal pain, ergonomics dental practice.

INTRODUCTION

Modern dentistry is associated with and exposed to new dental materials and infectious diseases, such as Hepatitis B and C, and human immunodeficiency virus¹.

Previous studies suggest that a wide variety of workplace hazards are found in dental practice. A survey conducted in Norway found that public health dentists complained dermatoses (40 percent), eye, respiratory system complaints (13 percent) and musculoskeletal problems (3 percent).²

It also showed that a significant percentage of practicing dentists commonly experience substantial musculoskeletal pain associated with the daily performance of dental procedures. The discomfort described most often

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occurred in the lower back followed by the neck, upper back, shoulders and legs. The percentage of dentists experiencing lower back pain was reported to range from one-third to one-half of the dental population.^{3,9} Fixed prosthodontic procedures were cited as the dental activity most likely to produce musculoskeletal pain.⁵

Musculoskeletal pain can affect the dentists performance in several important ways, including limiting the number of patients seen per day decreasing fine motor dexterity and hampering dentists - patient rapport.¹⁰ It is proposed that modification in the dentist's stool design might reduce lower back, neck and shoulder pain and therefore improve several facets of dentistry.

The traditional approach for prevention and management of dental related musculoskeletal pain is to adopt a proper sitting posture, reduce large scale movements and engage in periodic stretching.¹¹ The recommended sitting position is one with feet flat on the floor, torso vertical and a 90° angle between the calf and the thigh. It is suggested that the patients mouth should be only slightly above the dentist's elbow height.¹² As evidenced by pain survey data, the concept of proper sitting posture (whether utilized or not) has not eliminated pain in the dental community. This most likely results from the preference of many dentists for direct viewing during certain portions of procedures because of increased speed and/or accuracy. The unwillingness of many dentists to tilt the patients head or adjust the patients sitting angle also may contribute to strained musculoskeletal positions for the dentist.¹³

Several ergonomic investigations conclude that the least strained sitting position features an inclined backrest (130°), lumbar support and arm rests.^{14,16} However, others claim a detrimental effect from arm support due to strain on the shoulder joint.¹¹ Although an inclined backrest results in minimal muscle activity and disc pressure, a significant problem arises when this position is used by the dentist. It is unlikely that adequate viewing of the oral cavity could be obtainable from the inclined position without excessive neck strain.¹³

The Prevalence of Back Pain Among Dentists

A study done by the British Dental Association in 1963, revealed that in a sample of 2,288 dentists, 49% suffered from low back pain as compared to 10% of the valuable control group (RAF educational officers), of those dentists in the study whose work was affected by low back pain. Thirty percent said that their working hours were reduced because of the symptoms, 62% said that their work was affected and 77% said that mental irritability was created.¹⁷ Morris also claims that one out of every two dentists has back pain.⁸

In a study by Bassett,¹⁸ dentists in Toronto area were surveyed to determine the lifetime incidence of back problem, it was found that 62.2% had suffered back and neck pain at sometime during their lives.

Hope-Ross and Corcoran⁹ investigated the incidence of pain and discomfort in 650 dentists of the Irish Dental Association. The incidence of symptoms experienced in various body locations was determined, it was found that the highest figure of incidence of symptoms was related to basic pain (in both upper and lower back), which 65% of respondent experienced.

In one particular study pain and discomfort among dentists in the Public Dental Service in Malmö District and the municipality of Malmö was followed prospectively. The number of dentists participated was 311. In the study, the prevalence of musculoskeletal pain and discomfort had increased. Excluding L.B.P. and headache. The only significant difference was found in respect to shoulders pain. In 1987 and 1990 female dentists have had a higher prevalence of pain in the neck and shoulders area than their male colleagues. In 1987, 49% were free of symptoms, while 24% of them reported symptoms in locomotor system later in 1990. In 1987 and 1990, 262 out of 311 dentists have had symptoms. In 1987, 24% were without symptoms at the follow up in 1990. Further in this study the influence of some ergonomic variables showed alone predictive value for recovery or for the development of pain and discomfort in the locomotor system.¹⁹

In another study of the 359 dentists, female dentists had a higher prevalence of pain and discomfort. Concerning headache, cervical and shoulder pain, possible correlations between these symptoms and various positions and different working actions were investigated. The results showed that out of the 359 dentists, 55% used the mirror to facilitate a direct view from patient's mouth. It was clear that those dentists who did not have symptoms in the upper locomotor system used the mirror more often than those who did suffer discomfort.

A study was conducted to determine the nature and prevalence of musculoskeletal pain into the dental hygienist, and its effect on clinical practice. Results revealed that 69% of 493 dental hygienist having musculoskeletal pain in eight body locations during the previous year. Thirty four percent stated that musculoskeletal pain had affected their clinical practice forcing them to practice fewer days, decreasing their endurance, reducing speed and quality and/or altering operating positions. Further research was indicated by the authors to clarify specific patient operator positions contributing to musculoskeletal pain so that prevention and early treatment become possible.²¹

After reviewing the prevalence of musculoskeletal problems in dental professionals, it is important to look into the details of working environmental and postural problem related with routine practice of dentistry.

Ergonomics

Ergonomic is defined as a systematic approach to study the relationship between the individuals, their tools and the environment at work.²²

1 *The Room (office, clinic)*

Room should have a suitable area to allow free movement of the dentist during work. Small dental area will minimize the movement of the dentist through out the treatment period.

2 *Instruments*

The instruments should be close enough to the dentist hand reachable. So it will minimize extreme flexion.

3 *The Dentist Chair*

Should be movable, with back support and hand support. The chair can go up and down.

4 *The Patient Chair*

Should be electronic, easy to be adjusted and comfortable to patient.

5 *Time Period of Seeing the Patient*

The time period should be suitably distributed between work and rest. Dentist should have resting period during treatment and between each patient.

6 *Assistant*

Dental assistant should be available if there is increase demand in the work and if there are a large number of patients to be seen in short period of time.

General Posture in Dental Practice

1 Patient chair

a) *Up right*



b) *Semi reclined*



c) *Fully reclined*



2 Relationship of the dentist knee to the patient chair

a) 90°



b) $>90^\circ$



c) $<90^\circ$



3 Dentist posture

a) *While standing*

Flexion posture

Either A - 0° or B - 35° (unfavourable).



b) *While sitting*

Flexion posture

Either A - 0° or B - 20° or C - 30°



4 Relationship of the dentist to the patient's chair;

a) *at sternal level*



b) *below sternal level*



c) *above the sternal level*



Faulty postures (extreme posture)

The following postures are related with musculoskeletal pain.

- 1 Kyphotic back
- 2 Hyper flexion
- 3 Hyper lateral flexion
- 4 Hyper rotation

Management

There are various approaches to treat musculoskeletal problems.²³ The following are general guidelines observed successful in treating the above-mentioned problems.

1 *Health Care Consultation*

If dentists have developed low back pain for the first time they should consult:

- A health care professional (family doctor)
- A specialist physiotherapist

You should also seek advice if there are complications to your back pain:

e.g.,

- a If you have constant pain, which is referred into your leg all the way to your feet.
- b If you have numbness or weak muscle.
- c If, in addition to the back pain, you feel unwell.

All these circumstances indicate the need to consult a health professional.

2 *Relief Exercises*

The exercises programme consists of seven exercisers:

The first four exercises are extension exercises; the last three are flexion exercises. Extension means bending backwards and flexion means bending forwards. Exercise No. (1) Lying face down; (2) Remain face down; (3) Extension in lying; (4) Extension in standing; (5) Flexion in lying; (6) Flexion in sitting; (7) Flexion in standing. The exercises manual can be seen with physiotherapist for practice.

The purpose of these exercises is to abolish pain and where appropriate to restore normal function that is to regain full mobility in the low back or as much movement as possible under the given circumstances. When you are exercising for pain relief, you should move to the edge of the pain or just into the pain, then release the pressure and return to the starting position; but when you are exercising to regain lost movement, and to achieve this you may have to move well into the pain.

In order to determine whether the exercise programmed is working effectively for you, it is very important that you observe closely any changes in the intensity or location of your pain. Centralization of pain that occurs as you exercise is a good sign.

Others

e.g., sport activity; (swimming, walking)

- Using back support during treatment
- Avoid excessive reaching

3 *Medicine and Drugs*

Most of the common back pains are mechanical in origin, drugs and medications are not capable of removing the causes of back pains. Therefore, medication should be taken when pains are severe. The most common medications used are nonsteroidal anti-inflammatory drugs (NSAIDS), e.g., aspirin has been recommended by the US Federal Government Agency for health care policy and research.

4 *Bed rest*

When back pain is so severe that bed rest is required, you should restrict this period of rest, to two or three days.

5 *Acupuncture*

Acupuncture is capable to relieve pain. You should be aware, that you can obtain relief from acupuncture but it does not correct the underlying mechanical problem.

6 *Electro therapy: e.g., diathermy, ultrasound*

These treatments provide no long term benefit and do nothing to threat the underlying problem.

All these approaches have different level of cure. It is better to observe preventive measures to avoid attracting musculoskeletal problem. The following recommendations are made to help dental professionals to avoid musculoskeletal occupational hazards:²⁴

General Recommendations

- 1 When sitting for prolonged periods you must sit correctly with the low back in moderate lordosis. Whenever the seat has back rest you must use a lumbar roll to support the low back.
- 2 When sitting for prolonged periods, regular interruption of the sitting posture is essential to prevent the onset of pain. This can be achieved by standing upright, bending backward five or six times and walking about for few minutes.
- 3 When working in a stooped position, regular interruption of the bent posture is essential to prevent the onset of pain, this can be achieved by upright and bending backward five or six times.
- 4 When lifting, you should apply the correct lifting technique. In addition, you should stand upright and bend backwards five or six times immediately before and after each heavy single lift and also at regular intervals repeated lifting.
- 5 After vigorous activity you should restore and accentuate the lordosis by standing upright and bending backward five or six times. When you sit down to rest, you should maintain the lordosis and use a lumbar roll to avoid slouching.
- 6 When standing for prolonged periods, you must stand correctly. Stand tall. Do not allow your back to sag into extreme lordosis. Frequently stand tall.

Specific Recommendations

- 1 Patient chair should be placed at mid-sternal level.
- 2 Sitting position can be more appropriate for dental practice provided that minimizes the time period.
- 3 The relationship between the knee to the patient chair should be at 90°.
- 4 Inclination angle should be minimized.
- 5 Using back support during treatment.

It is hoped that dental professionals, e.g., Dentists, DSA, dental hygienists, and technicians may get benefited from this paper. By practising with correct postures the working capacity and productivity of dental professionals will be enhanced. They can work in pain-free environment for quality dental care to their patients.

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