

'Mitigation of Musculoskeletal Disorders (MSDs) through Ergonomics'

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Abstract

Objectives: To investigate the prevalence of Musculoskeletal Disorders (MSDs) in practicing dentists and dental students in Karachi and to analyze what percentage of dental practitioners make use of ergonomics in their practices.

Methods: The study was cross-sectional observational study conducted over a period of one month (February to March, 2015) by self-administered questionnaires. The sample size was set at 250 individuals by using convenience sampling technique from different universities, hospitals and private clinics in Karachi.

Results: Of total 250 questionnaires distributed, 211 responses were registered. The percentage of response rate was 84.4%. The study population of respondents had females outnumbering males (Females=143, males=68). It comprised of 42.2% undergraduate students, 47.4% graduates and 10.4% post graduates on different designations as students, teachers, house officers, clinicians and PG trainees. Almost every dental college in Karachi was included in study sample. Amongst the dentists, 68% of them used both hand and vibratory instruments. 57.3% of the dental students used hand instruments. 60.7% of the dentists and dental students experienced backache due to faulty seating positions. Different therapeutic modalities such as muscle relaxants, physiotherapy, deep heat, oil massage and analgesics were used both orally and topically to deal with musculoskeletal problems. 64.8% dentists practise principles of ergonomics in dental practice. Amongst them, 7.4% strictly follow it and 57.4% follow it to some extent. 75.3% of undergraduate respondents were of the view that principles of ergonomics are not taught in their institutions.

Conclusion: The conclusion drawn was that half of the population was unaware of the principles of ergonomics in dentistry and more than half practised it to some extent but experienced backaches. These aches can be explained by inadequate body support, inappropriate posture and excessive dynamic motion caused by vibratory instruments as was evident through questionnaires. The general attitude was found to be pro health hazards and not towards following ergonomics principles strictly.

Key Words: Ergonomics, Musculoskeletal Disorders, Human Factors, Work Environment, Occupational Health hazard.

Introduction

The word ergonomics is derived from two Greek words, 'Ergo' means work and, 'Nomo' means natural laws or systems or simply 'Science of work'. It is defined as;^[1] "Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance."^[2]

It can be simply iterated as a fit between people and their work. When a person's capabilities do not match with the working requirements, it can give rise to numerous musculoskeletal disorders. Dentists are found to be more prone to these disorders owing to the nature of their work.^[3,4]

Practicing dentists and dental students have to work numerous hours around the same posture. The instruments they deal with are mostly vibratory in function and require extensive hours of static gripping.^[5]

During procedures, even the slightest undesired movement can result in the failure of a procedure; therefore such delicate procedures demand minimum dynamic motions and instead require repetitive movements in the same pattern which can result in

muscles, tendons and ligaments to fatigue. Chronic exposure to this may eventually give rise to a condition termed: multiple musculoskeletal disorders (MSDs) which includes carpal tunnel syndrome, trigger finger, tendonitis, hand-arm vibration syndrome, repetitive motion disorders etc. As a consequence, they experience a decline in the efficiency of their work and parallel harm to health as well. Ergonomics and its principles explain the optimum way to maximize stamina at the working seat and help to have a healthy professional life style. If these principles are not followed it can be hazardous to the health of the professionals and can lead to long lasting disabilities.^[6]

The purpose of this study was to evaluate the status of awareness of ergonomics among the dentists and dental students as there is a high risk for developing different disorders. These disorders can not only decrease their efficiency at work but can also affect their dental career. If they are aware of the principles of ergonomics and its application, then they can mitigate muscular stresses and problems and therefore, can lead a healthy life style.

Methods and Materials

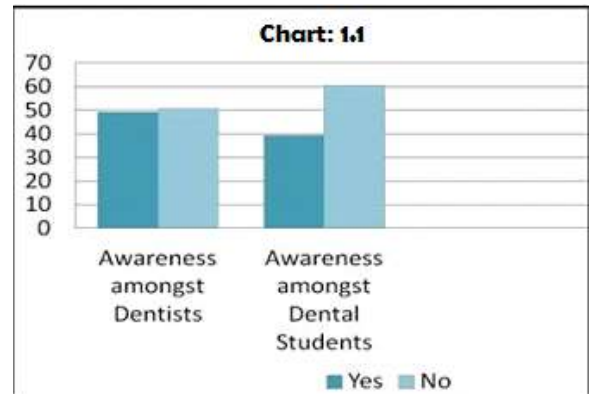
A cross-sectional observational study was conducted in Karachi over a period of one month (February to March, 2015) by self-administered

questionnaires. The study targeted all the Dental Colleges in Karachi along with different dental hospitals and private clinics. It was carried out in 12 dental colleges, 5 major hospitals and multiple private clinics from different areas of Karachi including BUMDC, AKU, LNH, CMH, ZU, FJDC, PNS-Shifa, PNS-Rahat, DIKIOHS, DUHS, LMDC, AIDM, KMDC, JMDC, Baqai Dental University, Sir Syed College of Medical Sciences and Hamdard University. The sample size was set at 250 individuals by using convenience sampling technique from different dental colleges, hospitals and private clinics in Karachi. The questionnaires were distributed both through online and hard copies. The questionnaire was designed into two strata; one for dentists (including house officers) and the other for dental students in clinical years. It comprised of 40 questions; 7 for demographic details, 17 for dentists and 16 for dental students. Most of the questions were close-ended while some were open-ended. The respondents were provided a complimentary information sheet attached with the questionnaire regarding the subject of Ergonomics and its importance for educational purposes. Questions were devised concerning working hours, type of instruments, change of postures, field of work and use of different modalities to tackle musculoskeletal disorders. The respondents were from different age groups and were on different designations as students, teachers, house officers, clinicians and PG trainees. The informed consent was obtained and confidentiality was ensured. Statistical analysis was done on Microsoft Excel. It was executed on the binomial distribution of data. Level of confidence was set at 95%. Hypothesis testing was performed by three ways on each variable; i. Critical value, ii. P-value, iii. Cumulative probability.

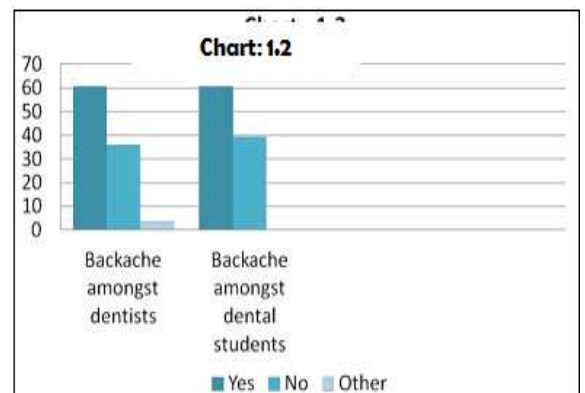
Results

Out of 250 questionnaires distributed, 211 responses were registered. The percentage of responderate was 84.4%. The study population of respondents had females outnumbering males (Females=143, males=68). It comprised of 42.2% undergraduate students, 47.4% graduates and 10.4% post graduates on different designations as students, teachers, house officers, clinicians and PG trainees. The study showed that 49.2% (60/122) of the total dentists and 39.3% (35/89) of the total dental students were aware of the ergonomics. (Chart: 1.1)

Amongst the dentists, 68% of them used both hand and vibratory instruments.



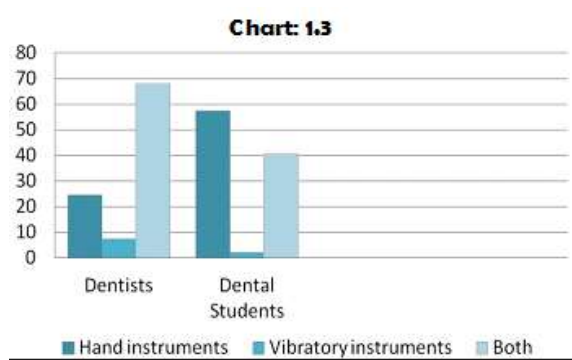
57.3% of the dental students used hand instruments. 60.7% of the dentists and dental students experienced backache due to improper seating positions. (Chart: 1.2)



64.8% dentists practice principles of ergonomics in dental practice. Out of which, 7.4% strictly follow it and 57.4% follow it to some extent. 75.3% of undergraduate respondents were of the view that principles of ergonomics are not taught in their institutions. Same results were deduced through all three ways of hypothesis testing. P-value < 0.05 was considered to be statistically significant. Table 1 shows one variable where it was done.

Table 1: Are you aware of Ergonomics and its importance in Dentistry?

Critical binomial value	70
Cumulative Probability	60.6971071553070%
P-value	0.393028928446930000
Level of significance	0.05



Objectives

To investigate the prevalence of Musculoskeletal Disorders (MSDs) in practicing dentists and dental students in Karachi and to analyze what percentage of dental practitioners make use of ergonomics in their practice.

Discussion

Dental professionals require meticulous use of ergonomic principles for optimizing their work. They should have an awareness regarding its principles before heading towards the pragmatic approach in the working field. If they would not practically apply these principles, they can end up in having fatigue, discomfort, illness, absenteeism, errors, lower productivity and customer dissatisfaction.^[7]

60.7% of dentists (74/122) and 60.7% of dental students (54/89) experienced back ache due to long working hours and complex dental procedures. (Chart: 1.3) Dental professionals experience musculoskeletal disorders due to different stressors they face including sustained uneasy postures, repetitive tasks, forceful hand exertions, vibrating operational devices, time pressure from a fixed schedule, coping with patient anxieties, precision required with work and restricted access to oral cavity. 68% dentists used both hand and vibratory instruments while 57.3% dental students used hand instruments. (Chart:1.3)

Musculoskeletal disorders can be classified as hand and wrist disorders (e.g. carpal tunnel syndrome, hand-arm vibration syndrome), neck and shoulder disorders (e.g. cervical spondylolysis) and back disorders (e.g. lower back pain).^[8] 63.1% of the respondents from dentists group had to maintain an upright posture for long periods without adequate body support and 48.9% were of the view that they have to work in a 'bent over'

position. It was found that they have to change their postures repeatedly to adjust themselves in a single procedure.^[9]

Dentists did not use any aiding device for their cervical pain (Only 15.6% of dentists used Loupes or any similar device) and also were reluctant when it came to buying ergonomically designed dental units. 39.3% of the dentists never considered it while 34.4% considered it while purchasing. There was a lack of knowledge as interpreted from the data concerning optimum ways of incorporating ergonomic principles in practice.

It was extracted from the data that 64.8% dentists practice principles of ergonomics in dental practice. Amongst them, 7.4% strictly follow it and 57.4% follow it to some extent. It can be seen that the attitude towards practicing ergonomics strictly was not very appreciating. (Table 2)

The respondents used different therapeutic modalities such as muscle relaxants (e.g. Nuberol Forte) physiotherapy, deep heat, oil massage and analgesics were used both orally (e.g. Panadol) and topically (e.g. Xobix, Voltral emulgel) to deal with musculoskeletal problems. They also took breaks in between their procedures to give body some rest and performed 'stretching exercises' (69% students, 60.7% dentists).

75.3% of undergraduate respondents were of the view that principles of ergonomics are not taught in their institutions. Ergonomics principles should be taught in different universities and different seminars should be conducted to spread its awareness.

There are different measures to prevent ergonomic injuries such as modifying human attitude, identifying risk factors, considering ergonomic features for dental equipment's, changing working conditions, achieving better access.^[10] We can incorporate different workplace interventions including neutral position of wrist, joints held at midpoint of range of motions, placing equipment's in a comfortable range and position of appendages should not be away from midline or towards midline. The operator position should be such that thighs and forearms parallel to floor, weight evenly balanced, 90 degree hip angle and feet flat on floor. If these measures are well practiced then there can be a decline in musculoskeletal disorders associated with dental practice.^[11,12,13]

Dentists				Dental Students			
Questions Asked	Dentists Total = 122 Number of responses (%)	Questions Asked	Dentists Total = 122 Number of responses (%)	Questions Asked	Dental Students Total =89 Number of responses (%)	Questions Asked	Dental Students Total = 89 Number of responses (%)
Are you aware of Ergonomics and its importance in Dentistry?	Yes = 60 (49.2%) No = 62 (50.8%)	Do you experience Back ache or other musculoskeletal problem?	Yes = 74 (60.7%) No = 44 (36%) Other = 4 (3.3%)	Have you been treating patients lately?	Yes = 79 (88.8%) No = 10 (11.2%)	Do you practice Ergonomics and it's principles to make work efficient and to optimize the overall performance?	Strictly = 10 (11.2%) To some extent = 36 (40.5%) Never bothered = 43 (48.3%)
What type of instruments you mostly use?	Hand instruments = 30 (24.6%) Vibratory instruments = 9 (7.4%) Both = 83 (68%)	Do you have to maintain an upright posture for long periods without adequate body support?	Yes = 77 (63.1%) No = 45 (36.9%)	Are you changing your position for working in different quadrants or remaining static?	Yes = 76 (85.4%) No = 13 (14.6%)	Do you experience Back ache or other musculoskeletal problem?	Yes = 54 (60.7%) No = 35 (39.3%)
Do you work in a "bent over" position or in a position on your stomachs or backs?	Yes = 59 (48.9%) No = 60 (49.2%) Other = 3 (2.5%)	Do you use Loupes or other aiding devices to avoid cervical pain?	Yes = 19 (15.6%) No = 103 (84.4%)	Have you been taught principles of Ergonomics in university?	Yes = 22 (24.7%) No = 67 (75.3%)	Do you take Muscle relaxants to relieve your muscle ache? Or any other drug that you use?	Yes = 20 (22.5%) No = 69 (77.5%)
Do you respite in between the procedure? And stretch yourself up? (Any specific manoeuvres)	Yes = 74 (60.7%) No = 46(37.7%) Other = 2 (1.6%)	Do you practice Ergonomics and its principles?	Strictly = 9 (7.4%) To some extent = 70 (57.4%) Never bothered = 43 (35.2%)	What type of instruments you mostly use?	Hand instruments =51 (57.3%) Vibratory instruments = 2 (2.2%) Both = 36 (40.5%)	Are you aware of Ergonomics and its importance in Dentistry?	Yes = 35 (39.3%) No = 54 (60.7%)
Do you consider the principles of Ergonomics while purchasing a Dental Unit?	Yes = 42 (34.4%) No = 32 (26.2%) Never considered it = 48 (39.3%)	Do you take Muscle relaxants to relieve your muscle ache? Or any other drug that you use?	Yes = 28 (23%) No = 94(77%)	Do you work in a "bent over" position or in a position on your stomachs or backs?	Yes = 50 (56.2%) No = 39 (43.8%)	Do you respite in between the procedure? And stretch yourself up? (Any specific manoeuvres)	Yes = 62 (69.7%) No = 27 (30.3%)

Conclusion

The conclusion drawn was that half of the population was unaware of the principles of ergonomics in dentistry and more than half practiced it to some extent but experienced backaches. This was also observed that efficiency at work was decreased and dental professionals used different modalities to tackle with it. The general attitude was found to be pro health hazards and not towards following ergonomics principles strictly.

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