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Research Article

ERGONOMIC CONSIDERATIONS AND PREVALENCE OF MUSCULOSKELETAL DISORDERS AMONG DENTAL PRACTITIONERS OF UTTAR PRADESH, INDIA

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ABSTRACT

Introduction: Work-related musculoskeletal disorders (WMSDs) are responsible for morbidity in many professions. Dentists as the health-care professionals are prone to develop WMSDs. **Objectives:** To analyse the prevalence of WMSDs and access factors affecting them among dental practitioners of Uttar Pradesh. **Material and methods:** A self-administered questionnaire, formulated using Google online survey tool was sent to dentists, through E-mail, and social networking. **Results:** 1) Overall prevalence of WMSDs for last 12 months was 75.5%. 2) 43.1% of practitioners reported WMSDs in lower back region followed by shoulder. 3) Majority of the practitioners who reported WMSDs were found to be overweight/obese. 4) Higher prevalence of WMSDs was reported from practicing endodontic/restorative procedures followed by orthodontic procedures. 5) 19.7% of study population is on the verge of abandoning the profession. **Conclusion:** Risk factors are highly predictive of developing WMSDs. Incorporation of Ergonomics and acquisition of such knowledge can minimize future contaminations in dental practice.

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INTRODUCTION

Ergonomics, as a discipline, has its formal beginnings immediately after the Second World War. During this time, the focus of concern expanded to include worker safety, as well as productivity.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 to optimize human well-being and overall system performance.²

Dentistry is a profession where the practitioners are at a considerable risk of being subjected to various occupational hazards. Musculoskeletal disorders (MSDs) are the most common form of occupational hazards in dentistry.³ It's also one of the first to show manifestations. MSDs are identified as damages to the human support system of muscles, ligaments, tendons, nerves, blood vessels, bones, and joints, and can occur from a single event or cumulative trauma. These disorders are identified by pain and dysfunction of the neck, back, hands, legs and fingers. Musculoskeletal symptoms are significant; serious workplace problems affect occupational health, causing pain, weakness and paraesthesia, muscle ischemia, imbalances,

necrosis, reduced range of joint mobility, spinal disk herniation or degeneration as well as other associated symptoms.⁴

According to a study conducted in 2015 in major cities of north India, the overall prevalence of work related musculoskeletal problems in practicing dentist was found to be 68.3%.⁵ Dentists are also exposed to psychological stress when dealing with patients due to the need to work with high concentration and precision, which is associated with an elevated risk of developing WMSD. Dentists face the psychosocial risk factors of high job demands, low job control and limited social support. Personal characteristics such as gender, height and insufficient rest periods can increase the risk of developing WMSDs. Physical inactivity during leisure, work and family overload can also increase these odds.⁶ All these factors contribute to reasons behind early retirement of dentists-29.5 %.⁷

One of the main goal of ergonomics in dentistry is to minimize the amount of physical and mental stress that sometimes occurs day to day in a dental practice the pains associated with ergonomics could begin to appear at the beginning of their clinical practice as students and accompany them for the rest of their professional life.⁸ Ergonomics it is acquiring relevance worldwide, more companies in field of dentistry are applying ergonomic policies. It takes account of the worker's

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capabilities and limitations to ensure that tasks, equipment, information and the environment suit each worker. Therefore, the current observational survey is aimed to evaluate the awareness, attitudes, and practice of ergonomics during routine dental procedures among practicing dentists of Uttar Pradesh India.

METHODOLOGY

The study was approved by the Institutional Ethics and Review Board (IERB) of Kothiwal Dental College and Research Centre, Moradabad. The study was a cross-sectional, questionnaire-based survey. The participants for the study were dental practitioners practicing in the state of Uttar Pradesh (U.P.). Contact details of the participating dentists were taken from the district IDA (Indian Dental association) office.

A total of 432 dental practitioners were sent a self-administered questionnaire. The basic Nordic questionnaire for the analysis of musculoskeletal symptoms was modified to meet the demands and objectives for the study. A pilot testing of the questionnaire based on content validity, and pretesting among ten general dental practitioners was done. The suggested changes were made. The final questionnaire was formulated using Google's google forms online survey tool. The first part of the questionnaire framed questions enquiring personal details of the participants like age, gender, body weight and height. Based on the responses, BMI of every individual was calculated. The second part of the questionnaire enquired regarding various WMSDs, their impact, attitude towards ergonomic considerations in general dental practice, and factors affecting them, comprising of a total of 22 open as well as closed ended questions. The form was sent to the practitioners through E-mail addresses, Short Message Service and Social Networking Links. After completion of the above, dentists were asked to complete and send back the survey questionnaire responses within a span of 4 weeks. Due reminders were made through E-mails and social networking links.

The data was analysed using IBM statistical package for social sciences (SPSS v.24). Frequency distribution and response rate for each question were obtained. Chi-square test was performed. $p < 0.05$ was considered statistically significant.

RESULTS

The present study analysed the prevalence of various work related musculoskeletal disorders among general dentists practicing in the district of Uttar Pradesh, India. A survey was conducted which included dentists who were registered under the IDA (U.P. Branch). 139 dentists agreed to participate and responded to the study questionnaire. A low response rate was attained, due to non-updated information at IDA and Lack of response of the questionnaire.

The overall prevalence of work related musculoskeletal disorders in the form of ache, pain and discomfort for last 12 months was found to be 75.5%. Female practitioners reported greater work related musculoskeletal disorders (88.5%) as compared to males (71.5%). Majority of the practitioners who reported work related musculoskeletal disorders were found to be overweight or obese (85.7%) which was statistically significant, p value=.0001 (Table 1). This table has further demonstrated prevalence of work-related musculoskeletal

disorders distributed with gender, weight, type of clinical practise, clinical working time and work experience.

Musculoskeletal discomfort was seen higher in lower back region in 44 (41.9 %) cases followed by shoulder 17(16.19%) cases, neck region 15(14.12%) cases, hand and wrist 14(13.3%) cases, upper back region 10(9.50%) cases and very few participants reported work-related musculoskeletal disorders in relation to hip, knee and ankle region (Table-2). Both genders reported a higher prevalence of lower back pain with the values being statistically significant (p values 0.0021 and 0.0063 respectively). Obese /overweight participants also had a statistically significant higher prevalence of lower back pain (p value=0.0001). (Table -2)

The study revealed that Endodontic/restorative procedures carry maximum trouble in clinical practitioners (69.1%) followed by Orthodontic procedures- 10.3%, Oral prophylactic procedures- 9.6%, Prosthetic procedures -9% and Oral Surgical procedures -6% respectively.

The study found that 70.5% use measures to combat trouble experience due to works at dental office. Among them 52.2% use medications, 20.4% use home exercises, 14.2% visit gym and 12.4% practice yoga. Moreover 51.1% of participants have reported to a doctor /physiotherapist or chiropractor or other such persons because of trouble related to work since last 12 months. 66.7% of participants were having problem in doing normal work (at home or away from home) due to work related physical discomfort and 72.3 % of the participants agreed that physical discomfort (ache, pain, discomfort) hamper the quality and quantity of work in dental office.

48.9% of participants reported adjusting the dental chair and stool for every patient. Only 53.3% of participants consider ergonomics a necessity when purchasing equipment for workstation and 19.7 % of participants think of changing the profession due to the work related musculoskeletal problems.

Table 1 Work related musculoskeletal disorders distribution with age, weight, type of practice, clinical working time and work experience

	Total	M.S.D. Present	p Value
Males	102	73(71.5%)	0.0393
Females	35	31(88.5%)	
Normal Weight and underweight	44	15(34%)	0.0001
Overweight/Obese	95	90(94.7%)	
Private Practitioners	69	55(79.7%)	0.6717
Dental/Hospital Jobs	29	22(75.8%)	
Private Practitioners	69	55(79.7%)	0.1926
Both Practice and Jobs	38	26(68.4%)	
Chair Time 1-5 Hrs	93	71(76.3%)	0.8636
Chair Time More than 5 hours	44	33(75%)	
Work experience 0-5 Years	34	20(58.8%)	0.9032
Work experience 6 years and above	105	63(60%)	

DISCUSSION

Work related musculoskeletal disorders are one of the most important occupational health issue among health care workers particularly dental surgeons, who maintain static postures using precise hand and wrist movements.³ Development of these work related musculoskeletal disorders in dentistry can be linked to repetitions, forceful exertions, awkward postures,

contact stress, vibration, poorly designed equipment at workstation, improper work habits, genetics, medical conditions, poor fitness levels, physical/mental stress, lack of rest/recovery, poor nutrition and environmental factors.⁹

male counterparts. This is accounted for by their higher body weight, smaller height, differences in muscle strength and composition, hormonal differences and higher prevalence of deficiency disorders. Dental practitioners have reported maximum discomfort while performing endodontic procedures

Table 2 Distribution of discomfort in various locomotor organs with gender and weight

	Lower back (41.9%)	Upper Back (9.5%)	Shoulder (16.1%)	Neck (14.12%)	Hand and wrist (13.3%)	Others (4.5%)	p value
Males	38(37.6%)	6(5.9%)	16(15.8%)	13(12.8%)	21(20.7%)	7(6.9%)	0.0021
Females	17(48.5%)	6(17.1%)	5(14.2%)	3(8.5%)	3(8.5%)	1(2.8%)	0.0063
Overweight/ Obese	39(41.05%)	9(9.4%)	17(17.8%)	8(8.4%)	15(15.7%)	6(6.3%)	0.0001
Normal/ Underweight	4(9%)	1(2.2%)	2(4.5%)	2(4.5%)	6(13.6%)	0	0.2990

This study has identified an alarmingly high prevalence (75.5%) of work related musculoskeletal disorders among dentists in U.P. Other studies done in various parts of India have also interpreted a high prevalence of WMSDs among dentists like Chetna Batham *et al*, 2016 (92 % in central India),¹⁰ Taje Tamo *et al*, 2015 (70.5% among north east Indian dentists)¹¹ and Devanand Gupta *et al*, 2014 (79.0% among dentist in western India).¹² Studies done in other countries have reported a lower prevalence of WMSDs like Evangelos C Alexopoulos *et al* have reported 62 % prevalence in Greece¹³ and Beibei Feng *et al* in year 2014 have reported a prevalence of only 42 % in USA⁶. In 2004 Dentist-population ratio in India was 1:30000. According to World Health Statistics - 2014, the ratio was 1:10000¹⁵. Higher number of patients per dentist, high competition in private sector, lack of practicing six handed dentistry and according to Few of the studies conducted on the rural population of India have concluded that the unmet treatment need of the population is very high and the services present are inadequate in most parts of the country¹⁴ these situations have led to occupational health programs are not being carried out in a satisfactory manner and adequate training activities are not being promoted. Furthermore, the results of this study have identified obesity as an important factor associated with WMSDs in the dental profession. Majority of practitioners have reported trouble in the lower back region. The aetiology of dental lower back pain has been associated with poor work practise precipitating deviant intrinsic lumbopelvic musculoskeletal alignment.¹⁵ According to the American Obesity Association, episodes of musculoskeletal pain, and specifically back pain, are prevalent among the nearly one-third of Americans who are classified as obese. The American Obesity Association also reports that more obese persons say they are disabled and less able to complete everyday activities than persons with other chronic conditions.^{16,17} In particular, pain and problems in the lower back may be aggravated by obesity. This occurs for people who are overweight because excess weight pulls the pelvis forward and strains the lower back, creating lower back pain. To compensate for extra weight, the spine can become tilted and stressed unevenly, over a time, the back may lose its proper support and an unnatural curvature of the spine may develop which led to development of chronic episodes of pain.¹⁷

The prevalence of work related musculoskeletal disorders is found to be high in female professionals compared with their

(69.10%), this may be linked to long chair side time per patient, repetitive movements of hand and wrist, use of more technique sensitive equipment. However, the newer equipment designed in the field of dentistry are manufactured with ergonomic factors being considered at priority for example use of elbow rest in dental chair provide more comfortable and ease while clinical working time, use of endomotor and endodontic loops reduces the clinical working time and provide better vision without stain for precise procedures.

Higher prevalence in private practitioners when compared with practitioners with jobs in dental/ medical institutions can be accounted for Greater clinical working time and Lack of intermittent rest. The study has highlighted that Maximum Dentists Prefer Medications over Exerciset to Combat Trouble During Practice ashaving Drugs are the easier way out which saves time, and doesn't bring halts in day to day routine.

Ergonomics has contributed a major part when it comes to efficiency and productivity in dental profession. The poison of WMSDs has toxified the profession so much that almost 19.7% of our study population is on the verge of abandoning it. If these odds continue to prevail we would face major loss in dental manpower. So, further development of dental ergonomics must take place based on a coherent vision of the future. In this regard, it must be clear exactly what ergonomics is and what developments have already taken place. Some aspects of interest are: (i) the prevention of occupational diseases; (ii) legal responsibility for protecting the health and safety of employees and students; (iii) education, academic development and research of dental ergonomics.¹⁸ By practising correct postures, the working capacity and productivity of dental professionals will enhance. They can work in a pain-free environment for quality dental care to their patients.

Limitations

It is accepted that the present study has limitations due to the relatively small number of participants, which have consequences for the general is ability of the outcomes. Further the information collected is a self-reported data. Hence, there is higher propensity for social desirability bias. A longitudinal study would be more inferential. The current study is a snapshot of the relation between ergonomic and related various musculoskeletal disorders and their potential factors affecting them.

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