

Keywords



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Identification of Problem Related to Musculoskeletal Disorder Amongst Dentists: A Questionnaire Based Survey

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Abstract

Work-related impairment is caused commonly due to Musculoskeletal disorders in various professions including dentistry. Dentistry involves overstrained, awkward and prolonged static postures while performing extremely precise procedures in a limited workspace. Furthermore, due to the limited rest periods between two procedures, use of non-ergonomic chairs and nonavailability of required tools, dentists are more prone to Work-related Musculoskeletal Disorders (WMSDs). WMSDs affect the functioning of bones, muscles, tendons, and joints. Study was focused towards identifying the problems related to musculoskeletal disorder among dentists, its related factors and their consequences. An online questionnaire survey was conducted. Questions included demographic data like gender, height, weight and professional data and data related to musculoskeletal disorders, their reasons and their consequences. The questionnaire was mailed to 100 dentists amongst which 79% responded. 60 out of 79 respondents reported excessive fatigue in the shoulders and neck. As a result of which 55% of dentists have reduced their working hours.

1. Introduction

A safe work posture is necessary to maintain balance between neck and back. Unbalanced postures results in musculoskeletal disorder which can be prevented by maintaining a required height of dental chair, using ergonomically designed chair, rest and stretching between two procedures during a shift. Use of magnification for critical procedures to get a clearer view is also recommended [1].

Unbalanced posture for prolonged static positions is one of the major ergonomic factor responsible for the development of MSD. Repetitive motion of upper limb with postural load on neck and upper back during dental work for long time and also psychological stress have important role in engaging dentists with these musculoskeletal symptoms. These occupational hazards result in absence from work and finally reduce the quality and productivity of their practices [2].

It was observed that the back and neck pain was directly proportional to the age of the dentists and the time they spend in the clinics during prolonged treatments. Prosthodontists experienced more pain as they have, to deal with more crucial and time-consuming procedures including replacing teeth and restoring the oral health and function of the entire mouth. Furthermore, after performing posture analysis it was observed that upper right posterior region was most difficult to treat, secondly the upper left and lower right were equally difficult, treating which gave rise worst postures [3].

It is observed that the main cause of MSD is due to Dentist's working posture. During dental work, dominant and non-dominant hand performs different tasks. The dominant hand is performing precise motor coordination, according to manipulative demands throughout the procedure, while at the same time the non-dominant hand is used mostly as a support. Thus, asymmetry of body sides during dental work is one of the risks of the development of MSDs. Thus, to minimize MSD, it is necessary to be attentive towards the potential fatigue and adopt changing postures. [4].

The level of risk causing work-related musculoskeletal disorders (WMSDs) depends on the intensity, frequency and duration of the exposure to these conditions. Intervention and prevention strategies to reduce MSDs include, use of ergonomic dental chair, dentists' seat, proper positioning of the patient, proper positioning of hand instruments for the dentist as well as dental assistant, use of mechanized instruments and proper dental operating light [5].

Adopting correct posture avoids musculoskeletal disorders which further reduces the risk of disability. Spine problems can be decreased with proper posture, rest, stretching during the work shift and also monitoring weight of the dentists [6].

The setup of dental clinic and the postures exhibited by the dentists affect their health. Improper workstation setup such as the dentist chair is high or low, inadequate ventilation and lighting. There are various postures that dentists take such as working on one side, excessive twisting, forward bending, shoulders flexed and abducted. The primary objective of Ergonomics is the prevention of MSDs. In dentistry, uncomfortable physical posture contributes greatly to musculoskeletal disorders, stress and loss of productivity. Lower back pain can be reduced if the lower back curve is maintained while sitting. Healthier posture can be obtained correct selection and use of magnification as a result of which there is reduced back pain. To attain maximum ergonomic benefits, dentists should be aware of the adjustments done in their chair. Alternate sitting and standing helps to bypass the injuries. In order to have an easy reach it is important for a dentist to position his patient and the instruments before performing the dental procedures. [7].

All procedures carried out by the dentists require enormous neck bending and cervical twisting. A saddle seat maintains a lumbar lordosis related with lower disc pressure thus providing a healthy posture. Saddle seat furthermore helps in reducing the load on arms and trunks while carrying out the dental treatment.[8].

The neck is most commonly affected due to poorly designed workstations. It was observed that due to improper vision or access to the patient's oral cavity, the doctor had to bend into awkward positions to have a better view of the operating region. This results into deviation from the balanced posture. A significant relation was found when relating doctor's neck and back pain after prolonged clinical work. Incorrect neck position may radiate an incorrect back position thereby causing backache whose prevalence is quite high in dentists (76%) [9].

The research concluded that, the postures adopted by dentists scored between 3-7 and none of the posture was found acceptable according to RULA Method and the posture adopted was categorized as having high to very high level of MSD risk. Therefore, ergonomic interventions are required [10].

Prevalence of MSDs among Indian dentists is very common as seen in various research studies. The research concluded that 92.4% dentists were suffering from pain and uneasiness in either of their body part during last 12 months. Among all reported MSDs, neck pain was reported most of the times followed by lower back and wrist [11].

The study revealed that occurrence of lower back pain increases with increase in BMI. It showed a strong association between obese individuals and lower back pain. Proinflammatory pathways were activated in obese people due to increased production of cytokines and acute-phase reactants which resulted in pain. Neck pain is related to height and weight of the dentists. Among the various risk factors associated

with neck pain, height of the individual has a positive correlation. Taller individuals are more susceptible to neck injury. This can be due to the presence of association between height and disc herniation [12].

The research showed a high prevalence of MSDs including commonly in the neck, back, shoulder, and arm. It explained that using magnification loupes had a significant effect on reducing discomfort intensity in these body areas. So, loupes appeared to be effective in reducing the incidence of MSDs. Dentists thus agreed that using these loupes improved their working conditions [13].

The study shows that there is considerable difference in postures in conventional and saddle seats. The dentists using saddle seat felt more comfortable to work than conventional seats. Furthermore, magnification lenses help in improving the visibility and the posture of dentists as the inclination and twisting of body was no longer required to get the clearer view [14].

Dental doctors are more prone to musculoskeletal disorders due to awkward and prolonged static postures, repetitive movements, forward bending, excessive twisting, and shoulders flexed and abducted. These can be reduced by maintaining healthier postures and using ergonomically designed chairs. The objective of the study was to find out that despite of the advancement in the modern dentistry equipment, dentists are still suffering from musculoskeletal disorders and there is a need to improve upon the features of existing dentistry tools and chair. A questionnaire was prepared and data was collected related to Dentist chairs. The chairs available in the market are very costly and mostly imported. They are designed as per US anthropometric standards hence Indian dentists are facing problems related to body posture.

2. Material and Methods

In a survey, questions were designed to assess the physical work load, body discomfort or work stress in the dentists and incidence of risk factors contributing to pain due WMSDs, all the relevant details regarding ergonomics were included. Dentists responded to a questionnaire about their practice pattern (years of practice, hours of work, specialization, two-handed/four handed dentistry, use of magnifications etc.), their general lifestyle including exercise, prevalence of MSDs and their general awareness regarding MSDs.

Questionnaire is focused on the data related to musculoskeletal symptoms, Musculoskeletal disorders, dental procedures causing pain and fatigue, the years of practice after which the dentists started feeling pain and Musculoskeletal disorders was introduced. The objective of the questionnaire was to identify the problems faced by the dentists. It was observed that majority of the dentists were unaware of the prevalence of MSD. Some of them stated that it was a part and parcel of their occupation, so they considered it for granted. And did not realize that this can be avoided if taken care of at the proper time. One of the major problems associated with MSD is that it gets reflected after a long duration usually after 3 to 4 years when there is no scope for corrective action. Hence it is utmost necessary to educate the doctors and help them adopting proper posture while carrying out different dental procedures. The responses were analyzed using pareto analysis showing the most significant occurrence.

Inclusion criteria

- Working experience of at least 12 months of duration
- Dentists carrying out the tasks while standing and sitting
- Both Left-handed and Right-handed
- Private and institutional practitioners
- All specializations of dentists
- Different age, height and weight
- Gender

3. Results and Discussions

To develop a time efficient system using IR sensors which detect Min. amount of products required in the inventory. To notify the user about availability and un-availability of the products in inventory racks.

A total of 100 dentists from IDA and institute were contacted, 79 dentists responded, 39.24% were female and 60.75% were male. Age of the respondents varied from 24 years to 54 years. Height varied from 149 to 189 cm. Weight varied from 49 to 111kg. Considering the BMI, 32 are overweight and 8 are obese. 73.41% of our respondents were in private practice alone, and 11.39% were in academic positions while 15.18% were both in private practice and in academic positions. 94.9% of the respondents were right-handed, while 5.1% were left-handed. Years of practice varied from 1 to 30 years, 30% lies between 6 to 10 years.

Table 1: Specialization

Specialization	No. of respondents
Aesthetic dentistry	2
Cosmetic dentistry	1
General dentistry	36
Dental surgeon	5
Endodontics	2
MDS	5
implantology	1
Conservative & Endodontics	1
Periodontics and Implantology	1
Maxillofacial surgery	2
oral medicine and radiology	2
Paediatric dentistry	2
Periodontics	4
MDS oral surgeon	2
Prosthodontics	5
Orthodontics	2
Oral & maxillofacial surgery	1
Oral and maxillofacial Radiologist	1
Oral pathologist	1
Orthodontia, endodontics	1
Periodontist & oral implantologist	1
Public Health Dentistry	1

It was observed in the working pattern of the dentist that nearly 29% work 8 hours a day, 84% work 6 days a week. Position of respondent during work include sitting 43%, standing 7.6% and alternate sitting and standing 49.4%. Out of the total respondents, 63.3% respondents did not use magnification devices. Out of remaining 36.7%, 73% used loupes 18.9% used LCD and only 8.1% used microscope. It was further found that 12.8% used them always but not throughout the procedures. Nearly 70% dentists do not use a saddle seat chair or therapeutic arm rest.

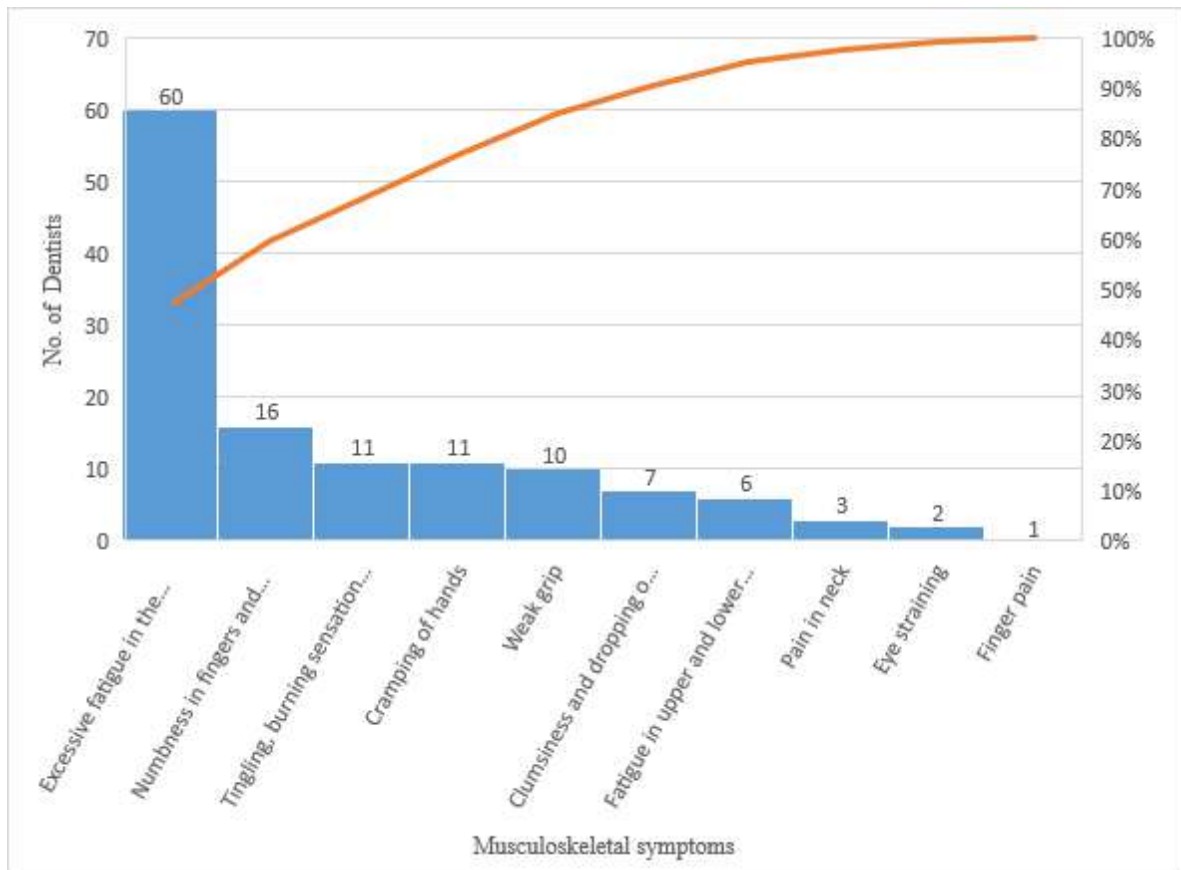


Fig. 1. Musculoskeletal symptoms

Many advancements are reported in modern dentistry but still there are lots of occupational health issues experienced by dentists. Majority of dentists are concerned about Musculoskeletal symptoms. MSD results in uneasiness, presence of persistent pain in the joints, muscles, tendons, caused by repeated movements and prolonged awkward postures and obesity. It was observed that 60 out of 79 respondents were suffering from “excessive fatigue” in the neck and shoulders which was due to bending, and working in prolonged static postures (PSP) with the arms holding the dental instruments and are unsupported for longer time while carrying out the procedures. Based on the data collected, a Pareto chart was prepared which revealed that almost 80% of the problems are related to excessive fatigue in shoulder and neck (Figure 1). The main focus thus needs to be on reducing the shoulder and neck fatigue.

Musculoskeletal Disorders including disc problem, Spondylitis, Sciatica are due to prolonged bending and are related to awkward postures of spine and Carpel tunnel syndrome, Tennis Elbow are due to repetitive work and awkward posture of the arms for long time which contribute to major portion of the disorders. When dentists are in awkward positions, the spine is overloaded and there is excessive strain in upper body. There are discomforts caused in head and upper limb positions. Muscle disorders in areas of head and neck are caused due to frontal flexion of the head and elevated limbs. Musculoskeletal disorders which are mainly located in neck and shoulders. Major concern is MSDs including Disc problem, Spondylitis, Sciatica.

Due to MSD, pain is aggravated in various parts of the body including shoulders, neck, hands, lower back. This affects the efficiency of the work performed. The data collected shows that 55% of the dentists have reduced their working hours due to the induced pain.

A lower percentage of MSDs was found in dentists of a higher age group; this could be attributed to their better coping measures, given their greater experience. Another reason could be that young dentists work

more in their early years of practice, leading to MSDs and the resultant muscle stiffness. It was observed that the doctors reduced their working hours after a certain number of years. This led to reduced patients treated by expert doctors.

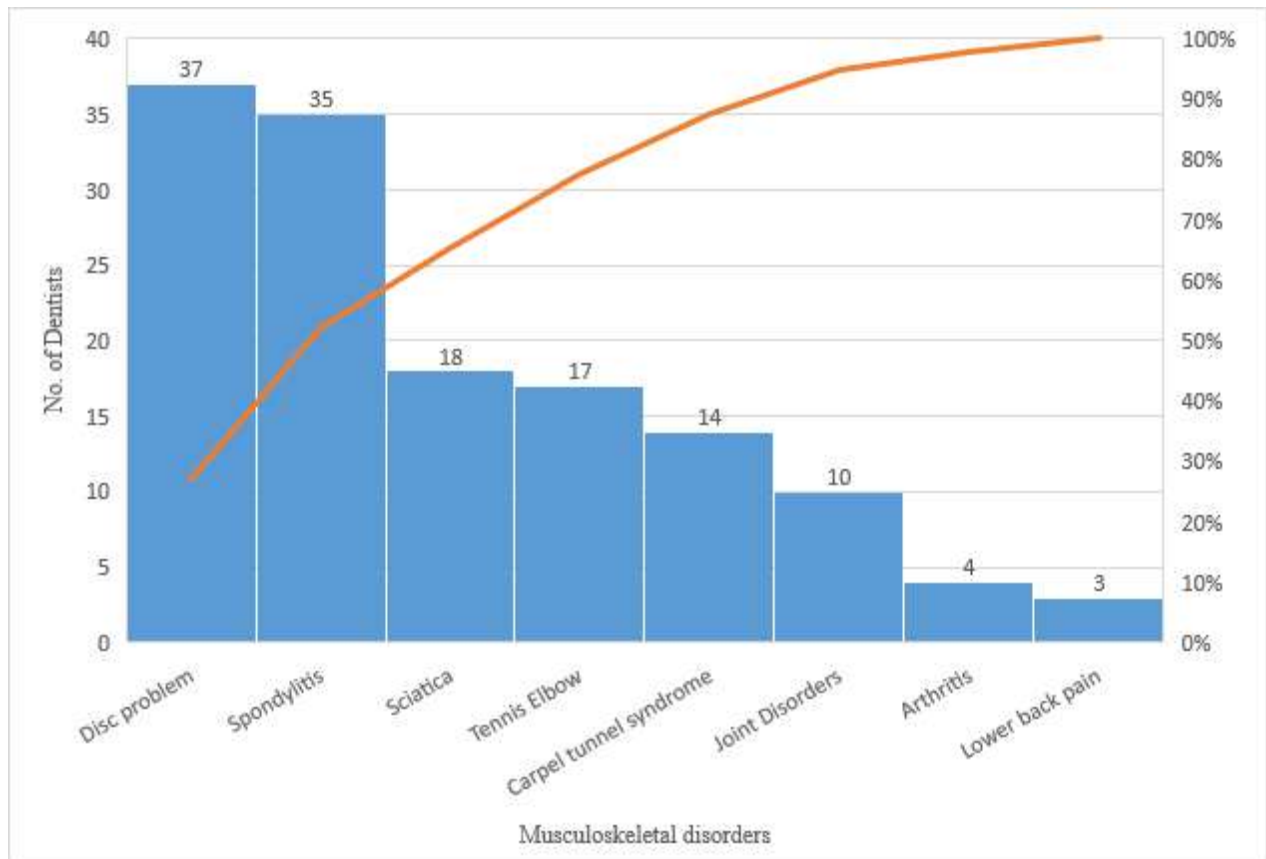


Fig. 2. Musculoskeletal Disorder

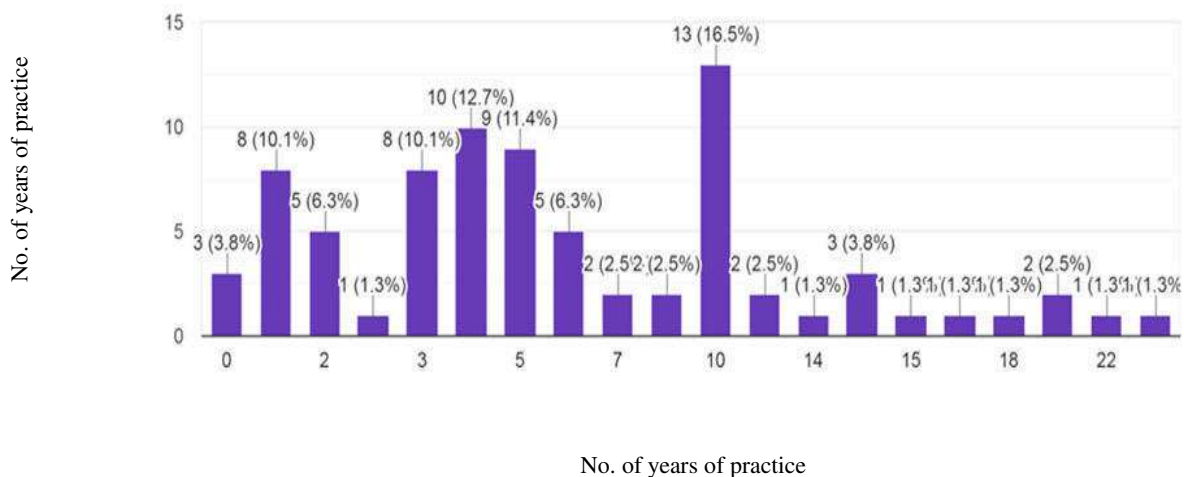


Fig. 3. No. of doctors started feeling pain in years of practice

Dental procedures were carried out and analyzed and it was found that root canal and tooth extraction are the procedures carried out frequently.

Root canal causes feel pain and fatigue due to more time duration and awkward posture. The main cause for this is also the time required to carry out these procedures. Tooth extraction requires more force and thus this procedure is to be performed in standing position and doctor has to bend, causing musculoskeletal disorder.

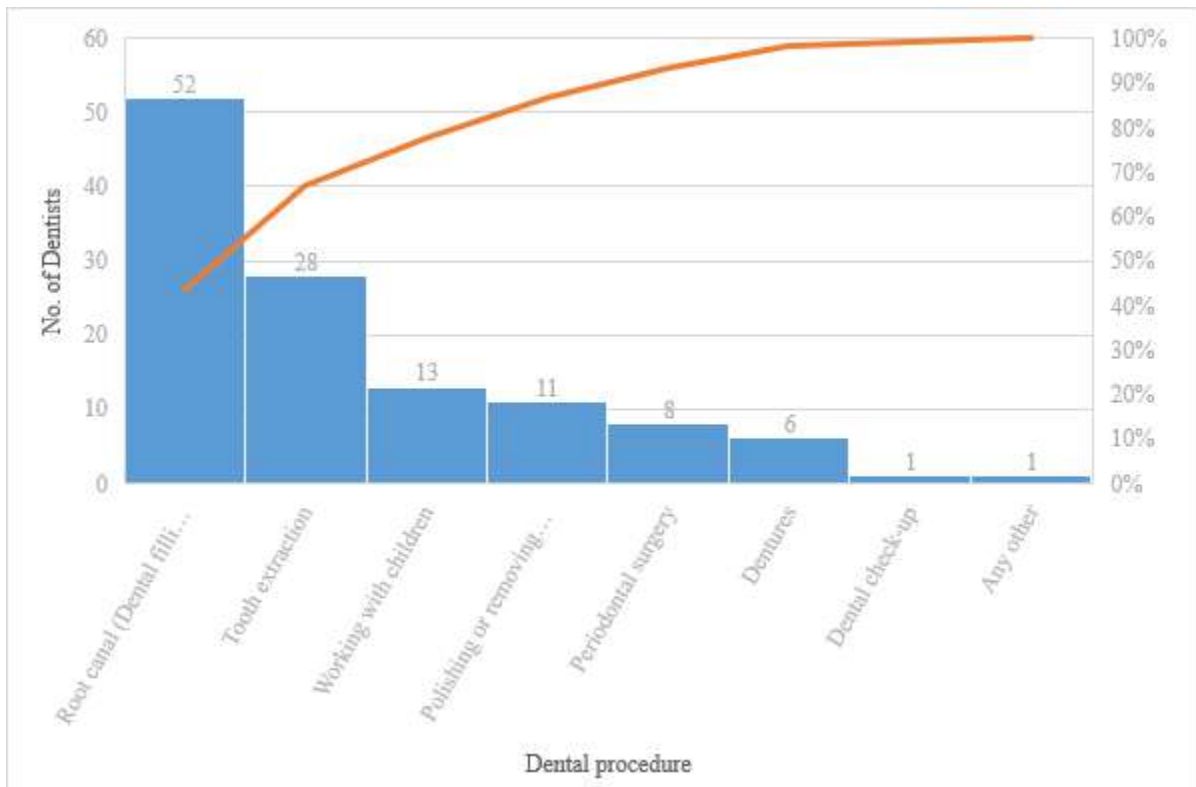


Fig. 4. Dental procedure causing pain and fatigue

4. Conclusion

Musculoskeletal disorder, pain or injury is due to the working pattern in dentistry which are the major reasons for increase in the rate of diseases and reduction in work efficiency. Study have shown that the disorders are resulting due to unbalanced postures, prolonged static postures, inadequate ergonomic aids. Thus, majority of dentists have excessive fatigue in the shoulders and neck. More than 65 % dentists work in same position that PSP (prolonged static postures) which increases the risk of pain. Effect of pain results in reduced working hours. Major MSDs observed among the dentists include Disc problem, Sciatica, Spondylitis. There is maximum pain in neck, shoulder, lower back. Premolar posterior Maxillary teeth creates more difficulty and fatigue due to indirect vision. Root canal and tooth extraction causes feel pain and fatigue.

It is observed that 47% of the dentists are suffering from excessive fatigue in the shoulders and neck, 40% are suffering from MSD like disc problem and Spondylitis. 68% of dentists are suffering from fatigue and pain due to common procedures like root canal and extraction of tooth.

Thus, it is necessary to select appropriate ergonomic equipment's. Considering the physical workload and mental stress of the dentists it is further necessary to plan the working pattern and the duration of work. It is also required for the dentists to maintain their BMI as obese individuals are prone to neck and back pain.

Nomenclature

- MSD* : Musculoskeletal Disorder
PSP : Prolonged Static Posture
WMSD : Work related Musculoskeletal Disorder

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References

- [1] Krishnakumar Raja V B, Elavenil P, Reflected vision in surgical practice – A novel method to circumvent posture related Musculo-skeletal disorders, *Journal of Oral and Maxillofacial Surgery*, 2018 Jan;76(1):8-9
- [2] Narges Sadat Shams-Hosseini, TaherehVahdati, Zeinab Mohammadzadeh, Ali Yeganeh, Somayeh Davoodi, Prevalence of Musculoskeletal Disorders among Dentists in Iran: A Systematic Review, *Mater Sociomed* ,2017 Dec; 29(4): 257-262
- [3] Rajeshree Moodley, Saloshni Naidoo and Jacqueline van Wyk, The prevalence of occupational health-related problems in dentistry: A review of the literature, *Journal of Occupational Health* 2018; 60: 111-125
- [4] NatašaPejčić, MilicaĐurić-Jovičić, NadicaMiljković, Dejan B. Popović, VanjaPetrović, Posture in dentists: Sitting vs. standing positions during dentistry work – An EMG study, *Srpski Arhiv za Celokupno Lekarstvo* 2016 Mar-Apr;144(3-4):181-187
- [5] Roma Yadav, Radhika Rai, Abhishek Yadav, Meetika Pahuja and Savita Solanki, Ergonomics for pain free dental practice –a review, *International Journal of Information Research and Review*, June, 2016 Vol. 03, Issue, 06, pp. 2562-2565,
- [6] Jinu Merlin Koshy, Archana, R, Bini Markose, Johnson, W. M. S, Sankar Narayanan, Sathya priya, B., Evaluation of working posture among the dentist using rula and reba, *International Journal of Current Research*, December, 2017 Vol 9, Issue, 12, pp.63316-63320.
- [7] Suvarna V Biradar, Kuldeep Singh, Bhoomika, An Insight into Ergonomics, *International Journal of Oral Health and Medical Research*, ISSN 2395-7387, MARCH-APRIL 2016, VOL 2, ISSUE 6
- [8] Vanessa Silvaa,, Pedro Fonsecab, Maria Eugénia Pinhoa, Joaquim Góisa,Mário Vaza, José Reis-Campos , *Sociedade Portuguesa de Estomatologia e Medicina Dentária*, Biomechanical study of dentists' posture when conventional chair versus a saddle-seat chair, Published by SPEMD ,report estomatol med dent cir maxilofac. 2017;58(1):39-45
- [9] Shravani Deolia, Shivani Dubey, Aditi Chandak, Tanvi Patni, Noopur Padmawar, Sourav Sen, Application of Ergonomic Postures during Routine Dental Procedures in a Private Dental Institute, *Dentistry and Medical Research* 2018;6:41-5.
- [10] Singh LP, Prevalence of Musculoskeletal Disorders Risk among Dentist: A Study in Northern India, *Ergonomics International Journal* ISSN: 2577-2953August 07, 2018 Vol 2 Issue 7
- [11] Chetna Batham, Sandul Yasobant, A risk assessment study on work-related musculoskeletal disorders among dentists in Bhopal, India, *Indian Journal Dental Research* 2016;27:236-41.
- [12] Koyyalamudi Prudhvi, K Raja V Murthy, Self-reported musculoskeletal pain among dentists in Visakhapatnam: A 12-month prevalence study, *Indian Journal of Dental Research*, 2016;27: 348-52.
- [13] Mashallah Aghilinejad, Elaheh Kabir-Mokamelkhah, Atefeh TalebiRoghayeh Soleimani, Naser Dehghan, The effect of magnification lenses on reducing musculoskeletaldiscomfort among dentists, *Medical Journal of the Islamic Republic of Iran (MJIRI)*, 28 December 2016
- [14] Rajani A. Dable, Pradnya B. Wasnik, Babita J. Yeshwante Smita I. Musani, Ashishkumar K. Patil, Sunilkumar N. Nagmode,Postural Assessment of Students Evaluating the Need of Ergonomic Seat and Magnification in Dentistry, *Journal of Indian Prosthodont Soc (December 2014)* 14(Suppl. 1): 51–8
- [15] Shobha Subedi, Prevalence of Musculoskeletal disorders (MSDs) Among Dental Health Professionals: A Review, of the Literature, *Virginia Journal Of Public Health, Official Journal of the Virginia Public HealthAssociation*Vol,4,No.3, Fall 2020, pg.6