International Journal of Advanced Biotechnology and Research (IJBR)
ISSN 0976-2612, Online ISSN 2278–599X,
Vol-8, Issue-3, 2017, pp2203-2208
http://www.bipublication.com

Research Article

The accuracy of the ergonomic position among dentists

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ABSTRACT

Background : Considering the high prevalence of muscoloskeltal disorders among dentists and the crucial role of ergonomic standards in reducing this prevalence this study tends to design a questionnarie for evaluating dentists working posture and to determine whether this questionaries' is valid and reliable or not. **Methods:** After indicating ergonomically critical joint angles; Photos form three different angels were taken from twenty six last year students of dentistry. Photos were imported to computer and angles were measured by three dependent analyzers. Single measures analysis and Cronbach's Alpha were tested to check the reliability of the test. **Findings:** According to Cronbach's alpha and single measure analyses results the questionnaires has enough reliability for studied angels. **Conclusion:** Designed questionnaire can be used for evaluating the dentist working posture.

Keywords: Dentistry, Ergonomy, Evaluating, Muscoloskeletal disorders

INTRODUCTION

Musculoskeletal pains are common in society and obvious problem related to occupation as work related musculoskeletal disorders (WMSDs). The symptoms are prevalent among workers involved physical exertion work and sedentary work. The sedentary work is defined as occasionally lifting no more than ten pounds, and sitting with occasional walking and standing. The prolonged sitting, awkward posture, repetitive motions are physical ergonomic factors related to WMSDs (Fredriksson et al. 2002). Dental nurses and dentists are types of health care professional required a high skill job and prolonged sitting to perform daily task.

Repetitive movements of upper limbs while bending trunk forwards to focus on small work pieces for oral health care of patient possibly are work ergonomic factors. Back pain was highest complaint among WMSDs in dentists that ranged from 36.3% to 60.1% followed by neck pain ranged from 19.8% to 85.0% (Hayes et al. 2009).

The high prevalence of musculoskeletal disorders pain among dentists is well documented, constituting a major health problem, especially as back pain. A summary of published musculoskeletal disorders prevalence rates are provided in Table 1 and the paucity of data relating to dentists in South Africa is noted. Possible risk factors of musculoskeletal disorders have been classified as biomechanical, ergonomic and work factors (psychosocial risk factors due to job stress) (Moodley and Naidoo, 2015).“Self-recognition” of the problem is generally the first step in alerting the clinician of the need to

consider changes. Dentists have also been advised to seek and receive education about their musculoskeletal health, injury prevention and ergonomics to improve their working environment (Diaz-Cabellero et al. 2010). Also, Rising et al. (2005) s study investigated the body distribution and severity of musculoskeletal pain in dental students and reported an incidence of between 46%-71%.

The most frequently affected area was in the neck and shoulder area, followed by mid back, lower back, right arm/hand and left arm/hand. A significantly higher prevalence of pain was reported among dental students who were enrolled in clinical skills training and who were engaged in performing dental procedures. Ellapen et al. (2011) reported in a study carried out in South Africa (on dentists from Durban and Verulam) that the frequency of pain and discomfort was 49.3 % in the vertebral area, 18.7% in the wrist, 16.6% in the shoulder and 12.5% in the lower leg. Studies have shown that the best strategy to prevent musculoskeletal disorders is interventions to reduce exposure to risk factors such as repetitive movements, excessive force, awkward postures, vibration, and static work. This means that the risk factors for musculoskeletal disorders should be assessed in the work stations (Burdorf, 2010).

Additionally, Shaik and partners (2011) stated that 70% of dentists sometimes suffer from neck pain, And 23% of severe suffering from neck pain, 83% suffer from occasional back pain and 73 percent suffer from chronic back pain (Shaik et al., 2011). So, the aim of the current study was to design a questioner form for evaluating dentists working posture and to determine whether this questionaries' is valid and reliable or not.

MATERIAL & METHODS

This study was designed based on questioner form in dentistry department of the Tehran University of Medical Science.

In this study, 26 dental students were included. To determine the accuracy of the ergonomic position and design the questioner form keywords were RULA and REBA questionnaire, Musculoskeletal Pain, Nordic and Ergonomy. Then the questionnaire was designed based on position of the hand and neck, hands, Waist and torso and legs and lower parts of the body as listed below:

I. head and neck
1) proximal-caudal neck position
2) Head position
3) Rotation head position
II. Waist and torso
1) Waist angle with the horizon
2) Waist angle to the sides
III. Legs and lower parts
1) Thighs angle to the horizon
2) Legs angle to the thighs
IV. Hands
1) Hands angle to the body
2) Wrist angle and movements

Then the questionnaire form as a check list was prepared. The form was filled for angle and positions using 3 expert specialists. After indicating ergonomically critical joint angles; Photos form three different angels including beside, back and upper head were taken in all dentistry students.

Photos were imported to Auto Cad software and angles were measured by three dependent analyzers. Single measures analysis and Cronbach's Alpha were tested to check the reliability of the test. All students informed about the study and signed the agreement form to include into study.

STATISTICAL ANALYSIS

Data were analyzed using SPSS 16.0 for Windows (SPSS, Inc., Chicago, IL, USA). For treatment showing a main effect, the mean compared with one way ANOVA and Tukey-Kramer test. $P<0.05$ was considered as significant differences between treatments.

A B C

Figure 1. Photos form three different angels including (A) beside, (B) upper head and (C) back side.

Table 1. the results for different angle in siting position of the dentistry students

Position	First observer	Second observer	Third observer	Mean of the observers	Sd
Forearm angle with the horizon	24.69	25.80	23.96	24.82	9.44
Neck angle with the vertical line	40.15	39.96	38.69	39.6	10.21
Tight angle with the horizon	23.03	24.15	24	23.73	15.52
Leg angle with thigh	92.61	92.8	93.3	92.91	27.25
Proximal-caudal angle of the Waist with the vertical line	9.38	10.42	9.88	9.89	14.67
Wrist and forearm angle	4.34	5.34	5.8	5.16	8.47
Hand angle with the vertical line	10.15	11.88	12.38	11.47	9.66
Arms angle with the vertical line	21.46	22.07	21.80	21.78	19.58
Wrist Arms angle with the vertical line	3.73	5	4.76	4.5	5.6

Table 2. the correlation between Single Measures and Cronbach's Alpha in different angels in siting position of the dentistry students

Angle name	Single Measures	Cronbach's Alpha
Forearm angle with the horizon	0.771	0.910
Neck angle with the vertical line	0.936	0.978
Leg angle with thigh	0.976	0.992
Thigh angle with the horizon	0.962	0.987
Back with the vertical line	0.987	0.996
Wrist angle with the forearm	0.923	0.973
Neck angle with the vertical line	0.970	0.990
Arm angle with the vertical line	0.986	0.995
Angle with the vertical line	0.940	0.979

RESULTS

According to the results, the wrist angle to the horizontal line was 0.910 based on the Cronbach's Alpha and single measure was p=0.771. The neck angle with horizontal line was 0.978 based on the Cronbach's Alpha and single measure was p=936. Leg angle with the tight and the tight angle with the horizon based on the Cronbach's Alpha were p=0.976 and 0.978, respectively. Wrist Arms angle with the vertical line according to the Cronbach's Alpha was p=0.996. The wrist Arms angle and neck angle with the vertical line on the Cronbach's Alpha and single measure were p=0.973 ns p=0.990, respectively.

DISCUSSION

The present study was performed aimed to assess the prevalence of musculoskeletal disorders and postural evaluation among dentistry students in Tehran. According to Cronbach's alpha and single measure analyses, results the questionnaires have enough reliability for studied angels. Designed questionnaire can be used for evaluating the dentist working posture.

The high prevalence of musculoskeletal disorders among dentists certainly reduces efficiency and quality of the healthcare system. These results confirm implement appropriate interventions and workplace redesign of equipment and tools used to reduce musculoskeletal disorders. The result of this study confirms the effect of environmental factors on the prevalence of musculoskeletal disorders (Rahnamaye Tamrooiy et al. 2015). Posture assessment results show that most of the 92 dentists studied the level of risk (corrective action) 3 with a frequency of 54% and the lowest risk level 1 and 2. 6.4 points for the final score indicates a high risk of exposure to musculoskeletal problems in the future (Rahnamaye Tamrooiy et al. 2015).

It was found that 81(90%) subjects were suffering from one or more musculoskeletal disorders. The proportion of musculoskeletal disorders in current study was much higher than a previous study by Emmanuel et al (2012) among tertiary health care workers, they reported 68.7% occurrence of musculoskeletal disorders. Rambabu et al (2014) conducted a study among various health care givers and concluded that 60% of the dentists, 40% of the surgeons and 15% of the physicians included in the study were having musculoskeletal disorders. Yasobant et al (2014) they observed most commonly reported musculoskeletal disorders in the shoulder (39.4%), upper back (38.1%) followed by neck (37.5%) and wrist (29.4%) among dental professional. This region wise pain is due to working in the same position, performing the same task again and again and ignoring the early signs of musculoskeletal pain (Yasobant et al 2014).

According to the analytical RULA results, the work posture of dentists was poor, with the results showing “further investigation” or “investigation and implement change”. In particular, the work posture required to treat maxillary second molars was worse than that required to treat anterior teeth, both of which showed strong burdens on the lower back and neck. According to the analytical QEC results, the work posture of dentists was worse in cases of treating the maxillary second molar, with the highest risk in the neck and vibration. In summary, with regard to dentists’ work postures, the posture required for treating maxillary second molars was the worst, while the neck showed the highest risk of musculoskeletal disorders (Park et al. 2015). Dentistry demands high precision and is often performed with the arms unsupported and the cervical spine rotated and flexed forward (Cha et al. 2007). Holding a static load for a long duration may because symptoms associated with the musculoskeletal system. Dentists have a high frequency of symptoms in the neck and shoulder regions20). A high static load is induced on the shoulder-neck region and shoulder joint by this posture. Yoo et al. (2008) conducted research using a sample of dental hygiene students. Based on the reports, physiotherapeutic suggests preventing the development of musculoskeletal system among dentists. First, to prevent neck pain, dentists should perform sufficient neck extension exercises after treating each patient. This may include straightening their lower back and bending their head back until they can see the ceiling and then turning their head to let the lower jaw touch the acromion five to seven times. Muscle strengthening exercises for the muscles behind the neck are also critical. Neck pain is closely related to the shoulder and upper extremity activity (Ko et al. 2010).

Most of the dentists (57%) in our study were treating 1–3 patients per day, which indicates that the incidence of back pain does not correlate with the number of patients treated or number of hours worked per day. Only a few dentists (17%) exercised during their rest time even though 57% of them took breaks during their working period. This is a major concern in regard to the high incidence of “work-related musculoskeletal

disorders" musculoskeletal disorders among dentists. It is the role of an ergonomist or physical therapist to teach an appropriate set of relaxation and stretching exercises to dentists in order to avoid or reduce the occurrence of musculoskeletal disorders among dentists (Alexopoulos et al. 2004). The current study also revealed that even though 63% of the subjects were aware of the advantage of using assistive tools, only 40% were using any kind of assistive devices. This issue also needs to be addressed by ergonomists or physical therapists (Hayes et al. 2013). By promoting awareness of the value of using available assistive devices, the rate of musculoskeletal disorders could be reduced. In dental professionals, the risk of developing musculoskeletal disorders could be reduced through a combination of prevention, ergonomic guidance, and specialized therapeutic interventions (Nemes et al. 2013). Dentists are able to recognize and identify their own postures and equipment usage patterns that lead to high risks for musculoskeletal pain, especially LBP. Such recognition is the first critical step to neutralize non-ergonomic behavior and reduce risks to dental practitioners (Rafeemanesh et al. 2013). In conclusion, designed questionnaire can be used for evaluating the dentist working posture.

REFERENCES

1. Alexopoulos EC, Stathi IC, Charizani F: Prevalence of musculoskeletal disorders in dentist. BMC Musculoskelet Disord, 2004, 5: 1–8.
2. Burdorf A. 2010. The role of assessment of biomechanical exposure at the workplace in the prevention of musculoskeletal disorders. Scandinavian journal of work, environment & health, 36, 1-2.
3. Cha JH, Ryu TB, Choi HS, et al.: Survey of musculoskeletal disorders in Korean dentists. J Ergono Soci Kore, 2007, 26: 137–147.
4. Diaz-Cabellero A, Gomez-Palentia IP, Diaz Gadenas S. Ergonomic factors that cause the presence of pain muscle in students of dentistry. Med Oral Patol Oral Cir Bucal 2010;15: 906–11.
5. Ellapen TJ, Narsigan S, Van Heerden HJ, PillayK, Rugbeer N. Impact of poor dental ergonomical practice. South African Dental Journal 2011; 66:272-7.
6. Emmanuel C, Obembe AO, Bamidele S. Work-Related Mus¬culoskeletal Disorders among Health Workers in a Nigerian Teaching Hospital. TAF Prev Med Bull. 2012; 11: 583-88.
7. Fredriksson K, Alfredsson L, Ahlberg G, Josephson M, Kilbom A, Jelm EW, et al. Work environment and neck and shoulder pain: the influence of exposure time. Results from a population based case-control study. Occup Environ Med 2002; 59: 182-8.
8. Hayes M, Cockrell D, Smith DR. A systematic review of musculoskeletal disorders among dental professionals. Int J Dent Hyg 2009; 7(3): 159-65.
9. Hayes MJ, Smith DR, Taylor JA: Musculoskeletal disorders and symptom severity among Australian dental hygienists, 2013, 4: 250–260.
10. Ko TS, Jeong UJ, Lee KW: Effects of the inclusion thoracic mobilization into cranio-cervical flexor exercise in patients with chronic neck pain. J Phys Ther Sci, 2010, 22: 87–91.
11. Moodley R, Naidoo S. The prevalence of musculoskeletal disorders among dentists in KwaZulu-Natal. SADJ 2015, 70(3): 98-103.
12. Nemes D, Amaricai E, Tanase D: Physical therapy vs. medical treatment of musculoskeletal disorders in dentistry—a randomised prospective study. Ann Agric Environ Med, 2013, 20: 301–306.
13. Park HS, Kim J, Roh HL, Namkoong S. 2015. Analysis of the risk factors of musculoskeletal disease among dentists induced by work posture. J. Phys. Ther. Sci. 27: 3651–3654.
14. Rafeemanesh E, Jafari Z, Kashani FO, et al.: A study on job postures and musculoskeletal illnesses in dentists. Int J Occup Med Environ Health, 2013, 26: 615–620.
15. Rahnamaye Tamrooiy F, Akbari Javar M, Salimi S, Mohammadpour H, Avakh A, Faizollahi S. 2015. A survey on Prevalence of musculoskeletal disorders in dentists of Tehran

and their posture assessment by RULA method. Intl. Res. J. Appl. Basic. Sci. Vol., 9 (5), 666-671.

16. Rambabu T, Suneetha K. Prevalence of Work Related Muscu¬loskeletal Disorders among Physicians, Surgeons and Dentists: A Comparative Study. Ann Med Health Sci Res. 2014; 4(4): 578-82.
17. Rising DW, Bennett BC, Hursh K,Plesh O. Reports of body pain in a dental student population. Journal of the American Dental Association 2005;136: 81-86.
18. Shaik AR, Rao SB, Husain A, D'sa J. 2011. Work-related musculoskeletal disorders among dental surgeons: A pilot study. Contemporary clinical dentistry, 2, 308.
19. Yasobant S, Paramasivan Rajkumar P. Work-related musculo¬skeletal disorders among health care professionals: A cross-sec¬tional assessment of risk factors in a tertiary hospital, India. Indian J Occup Environ Med. 2014; 18(2): 75-81.
20. Yoo JH, Ro HL, Lee MY: The musculoskeletal pain and inconvenient feeling during hand instruments with mannequin and intra-oral cavity in dental hygiene students. J Kore Soci Physi Med, 2008, 13: 247–254.