

A study on relationship between neck pain and handgrip strength in dentists as an occupational hazard

Jyoti Kiran Kohli¹ and Himanshu Thukral^{2*}

¹Department of Anatomy, Manav Rachna Dental College, Sector-43, Delhi-Surajkund Road, Faridabad-121004, Haryana, India and ²Department of Physiology, Manav Rachna Dental College, Sector-43, Delhi-Surajkund Road, Faridabad-121004, Haryana, India

Abstract: *Objective:* To find the correlation between neck pain and handgrip strength among male and female dentists separately. *Background:* Dentists are more prone to repetitive strain injury and work related musculoskeletal disorders (MSDs). Handgrip is the functional unit of dentists, used to hold instruments firmly as slight movement in instrumentation while doing their job may affect patient badly. Muscles of handgrip are supplied by cervical nerves. Dentist while doing their job put more strain on neck for prolonged period of time and this leads to acute pain in neck which if prolonged becomes chronic. This is one of the reason to make them leave the job. *Methodology:* 40 dentists were observed, who were suffering from pain in neck since few months (out of which 25 female and 15 male). Their ages ranged from 23 to 26 years with no medical history of trauma. Pain intensity was determined by visual analog scale (VAS) and handgrip strength was measured using standard adjustable handgrip dynamometer in kilogram (kg) unit. *Result:* On data analysis result showed significant negative correlation between neck pain and handgrip strength with p-value ($p < 0.05$). *Conclusion:* There is indirect correlation between neck pain and handgrip strength.

Keywords: Visual Analog Scale, Musculoskeletal disorder, Neck pain.

Introduction

Dentists are more prone to repetitive strain injury and work-related osteomuscular disturbances leading to biomechanical risks at workplace and these incidences have increased over years [1-2]. Neck pain is one of the occupational risk factors in dental profession [3-4]. Many studies showed that neck pain in dental career starts early during educational training [5-6]. In a recent study, 72.80% of dentist had musculoskeletal pain during practice in India [7] and in K.S.A 54% dentist found with neck pain and 21.69% of them drop out of job [8].

Any discomfort in the anatomical area concerning in the region of occiput and 3rd thoracic vertebrae and laterally between middle margin of scapula is referred as neck pain [9]. Pain in neck is considered to be chronic if the suffering for the patient is more than three months [10]. Neck pain may be caused by spondylosis, spinal stenosis, disc herniation, stress, poor posture and prolonged posture [3]. Symptoms associated with neck pain are various such as neck soreness and headache, pain around shoulder blades, arm complaints i.e numbness or weakness.

Musculoskeletal disorders such as neck pain are among the most widely spread occupational problems for both developed and developing countries, in industries and services, with increasing expenses of salary compensation with respect to health costs, declining productivity and lower quality of life. These disorders are caused by different risk factors' interactions resulting from several causes, which can be categorized into individual, psychosocial and physical factors. Observational and instrument based techniques are proposed in research to provide a quantitative measure for the degree of discomfort and postural strain caused by different body positions.

Recently it was shown that there is strong correlation between work duration and neck pain in the staff of dental school [11]. Whereas hand is the functional unit of dentist and is used for firm holding of instruments and tools [12]. The amount of static force that hand can squeeze around dynamometer is referred as handgrip [13]. Grip strength may be affected by gender (male > female), age

(peaked at 4th decade), dominant more than non-dominant hand [13]. Handgrip strength used to assess functional activity. Measurement of handgrip strength used to detect whole upper arm strength [14]. Many studies that show reduction of handgrip, 20-30% less on painful side. In addition to that, unilateral musculoskeletal pain cause delay in initiation of grip and getting relaxed [15]. So the purpose of the study was to define correlation between neck pain intensity and handgrip strength in male and female dentists.

Material and Methods

Subject Selection: This study was carried out on 40 dentists with neck pain in both the genders as 25 female and 15 male from Manav Rachna Dental College, Faridabad. The distribution of selected demographic parameters of the volunteers is presented in Table 1. Sub-district health promoting hospital, local district and tertiary hospital under Manav Rachna Dental college were included into this study by cross-sectional design. Exclusion criteria for the study included any history of smoking or alcoholic habits, any orthopaedic or neurologic diseases and respiratory diseases.

A written consent was taken from all participants before commencement of the study. All the participants were assessed clinically through history taking and detailed clinical examination before the study. The study protocol was approved by the Institutional Ethical Committee on the use of Human as an Experimental Subjects and experiment conforms to the principles outlined by the Declaration of Helsinki protocol, 1964.

Sr. No.	Parameters	Male (n=15)	Female (n=25)
1	Age (Years)	23±1.51	23±1.29
2	Height (cm)	169.93±2.62	161.82±6.84
3	Weight (Kg)	71.81±4.21	58.62±8.73
4	BMI (kg/m ²)	24.86±1.23	22.32±2.46

Values expressed in Mean ± S.D; BMI, Body mass index; cm, centimeters; Kg, Kilogram; m=meters

Experimental Design: Grip strength was measured in the same position in all dentists; seated on chair with back support and arm rest, shoulder abducted, elbow 90 degree flexed, forearm and wrist in mid- position [16]. Hold the dynamometer by dominant hand. Instructor gave the instructions to squeeze around dynamometer as much as one can. Instructor was to stand in front of dentist to read the amount of force. We took handgrip measurements in kg unit. As subject squeeze around handgrip dynamometer intensity of pain is measured (if any), on VAS rating from (0= no pain, 10= unbearable pain) [17].

Data Analysis: Data was collected from the sheet and the statistical analysis was performed using R software (v. 3.2.5). All data taken is presented as (Mean ±Standard Deviation [SD]) values throughout. Data analysed and significant correlation was considered in male and female dentist with p value as (p<0.05).

Results

Among 25 female dentist and 15 male dentist, results of the study showed extremely significant correlation between neck pain and handgrip strength with p-value (p<0.05) as seen in table 2-3 and the slope is significantly different from zero as seen in figure 1-2.

A descriptive statistics including mean±SD of handgrip strength and neck pain is presented in Table 2. The result of correlation between neck pain and handgrip strength in males shown in Table 2 and Figure 1 with negative correlation (-0.6030) and p-value 0.0173 (p<0.05) which is statistically significant.

Grip Strength	Neck Pain	p-value	Correlation Value
29.4±4.03	4.87±2.36	0.0173	-0.6030

Values expressed in Mean ± S.D; Significance level (p<0.05)

Fig-1: Correlation between neck pain and Handgrip strength in Males

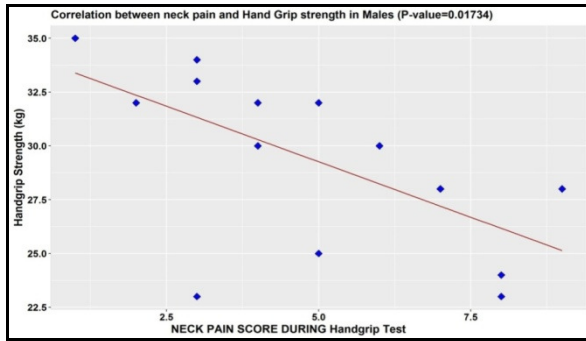
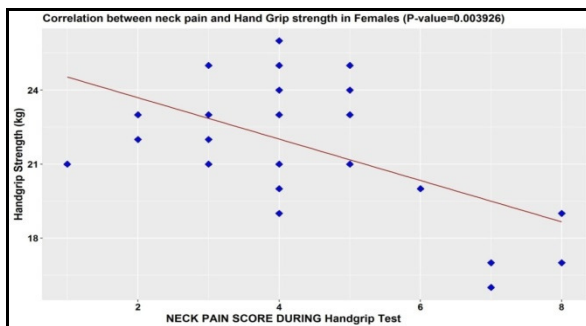


Table 3 and Figure 2 showed significant correlation between neck pain and handgrip strength in females with negative correlation (-0.5557) and p-value 0.0039 (p<0.001) which is statistically significant.

Table-3: Correlation between neck pain and Handgrip strength in Females (n=25)			
Grip Strength	Neck Pain	p-value	Correlation Value
21.68±2.69	4.4±1.78	0.0039	-0.5557
Values expressed in Mean ± S.D; Significance level (p<0.001)			

Fig-2: Correlation between neck pain and Handgrip strength in females



Discussion

In the present study we examined the relationship between neck pain and handgrip strength among young dentists in India and its effect on male and female dentist separately was also analysed. Evaluating grip strength is one of the bench mark in hand functioning. It is beneficial to provide objective index of the functional integrity of the upper extremity and component of hand rehabilitations for effective therapy. It is more

common among subjects who carried out repeated movements of wrist or fingers for longer duration in day to day life. Perhaps the common cause for persistent pain in neck is compression of cervical nerve roots as a consequence of cervical spondylosis [18].

In support of results of the present study showed significant negative correlation between neck pain and handgrip strength [19]. As increase in neck pain intensity leads to decrease in handgrip strength. These finding may be attributed to abnormality of sensory, motor and autonomic neurons found in neck pain lead to deficit in the quality of sensory information that generate motor output [20]. There is an existence of interconnected system of neuronal nodes between head and grip of hand which permit varied degree of influence on each other [21].

Our results disagree with Fayez ES, [16] who found that grip strength increases significantly in direct proportion in patients with neck pain as it can be said if you squeeze your hand more, pain will be more. Michael et al., [20] found that grip strength decreases significantly in patients with spondylosis compared with control group in dominant and non-dominant hand. They clarified that degenerative changes leads to increased pressure on tissue and it comprises of changes in myoneural conduction velocity, oxygenation and tissue blood flow. All these factors correlate to interfere in the ability of nervous system to activate hand muscles [18].

Conclusion

To conclude there is significant indirect correlation between neck pain intensity and handgrip strength in dentist. Repetitive work in same posture may rapidly fatigue muscle, making them more susceptible to injury and inflammation. So injuries and illness of active muscles can be minimised by minimising their fatigue.

Keeping this correlation in mind some measures to be included in duties to minimize shoulder and neck injuries and illness of neck muscles in dentists and to ensure the health, safety, high performance, motivation and satisfaction of Indian dentists.

Acknowledgement

The authors are sincerely and wholeheartedly acknowledge the contribution of the subjects

participated in this study. The authors are also thankful to laboratory staffs and attendants for extending their support for the present study.

References

- Rucker LM, Sunell S. Ergonomic risk factors associated with clinical dentistry. *J Cal Dent Assoc* 2002; 30:139-148.
- Pasternak JB, Sousa Neto MD, Dionisio VC, Pecora JD, Silva RG. Analysis of kinematic, kinetic and electromyographic patterns during root canal preparation with rotary and manual instruments. *J Appl Oral Sci* 2012; 20:57-63.
- El Keshawi A. Neck pain and work-related factors among administrative and academic staff of the Islamic University of Gaza. *The Islamic University-Gaza, Deanery of Higher Studies, Faculty of Education*. 2008; 115.
- Bernard M, Karnath M. Identifying the Musculoskeletal Causes of Neck Pain. *The Journal of musculoskeletal medicine*. 2012; 29: 82-86.
- Yousef M, Al-Zain A. Posture Evaluation of Dental Students. *JKAU Med Sci.*, 2009; 16:51-68.
- Morse T, Bruneau H, Dusssetschleger J. Musculoskeletal disorders of the neck and shoulder in the dental professions. *Work*, 2010; 35:419-429.
- Chandra S, Shahi AK, Bhargava R. Prevalence of Neck and Lower Back Pain among Dentists from Three Dental Colleges in Patna City: A Questionnaire Study. *Int J Sci Stud* 2015; 3(8):71-76.
- Al-Mohrej OA, AlShaalán NS, Al-Bani WM, Masuadi EM, Almodaimegh HS. Prevalence of musculoskeletal pain of the neck, upper extremities and lower back among dental practitioners working in Riyadh, Saudi Arabia: a cross-sectional study. *BMJ Open*. 2016; 6(6): 1-8.
- Fejer R. Neck pain (Prevalence, genetic and environmental factors). *University of Southern Denmark*, 2006.
- Jensen I, Harms-Ringdahl K. Strategies for prevention and management of musculoskeletal conditions. Neck pain. *Best Pract Res Clin Rheumatol*, 2007; 21: 93-108.
- Finsen L, Christensen H, Bakke M. Musculoskeletal disorders among dentists and variation in dental work. *National Institute of Occupational Health, Denmark*, 1998; 29:119-125.
- Barut C, Demirel P. Influence of testing posture and elbow position on grip strength. *Medical Journal of Islamic World Academy of Sciences*. 2012; 20:94-97.
- Hanten WP, Chen WY, Austin AA, Brooks RE, Carter HC, et al. Maximum grip strength in normal subjects from 20 to 64 years of age. *J Hand Ther*, 1999; 12: 193-200.
- Bohannon RW. Is it legitimate to characterize muscle strength using a limited number of measures? *J Strength Cond Res*. 2008; 22:166-173.
- Seo NJ, Sindhu BS, Shechtman O. Influence of pain associated with musculoskeletal disorders on grip force timing. *J Hand Ther*, 2011; 24:335-343.
- Fayez ES. The correlation between neck pain and hand grip strength of dentist. *Occupational Medicine & Health Affairs*. 2014; 2:5.
- Kane RL, Bershady B, Rockwood T, Saleh K, Islam NC. Visual Analog Scale pain reporting was standardized. *J Clin Epidemiol*, 2005; 58:618-623.
- Reading I, Walker-Bone K, Palmer KT, Cooper C, and Coggon D. Anatomic Distribution of Sensory Symptoms in the Hand and Their Relation to Neck Pain, Psychosocial Variables, and Occupational Activities. *Am J Epidemiol* 2003; 157(6): 524-530.
- Egwu MO, Ajao BA, Mbada CE, Adeosun IO. Isometric Grip Strength and Endurance of Patients with Cervical Spondylosis and Healthy Controls: A Comparative Study. *Hong Kong Physiotherapy Journal*, 2009; 27:2-6.
- Huysmans MA, Hoozemans MJ, Visser B, van Dieën JH. Grip force control in patients with neck and upper extremity pain and healthy controls. *Clin Neurophysiol*, 2008; 119:1840-1848.
- Kumar N, Daniel C, Hilda M, Dharmarajan R. Grip strength: influence of head-neck position in normal subjects. *J Neurol Res* 2012; 2:93-98.

Cite this article as: Kohli JK and Thukral H. A study on relationship between neck pain and handgrip strength in dentists as an occupational hazard. *Al Ameen J Med Sci* 2018; 11(1):27-30.

*All correspondences to: Dr. Himanshu Thukral, Lecturer, Department of Physiology, Manav Rachna Dental College, Sector-43, Delhi-Surajkund Road, Faridabad-121004, Haryana, India. E-mail: drhimanshuthukral@hotmail.com