

Relationship between Forward Head Posture, Neck Pain, and Disability among Dentists with Mechanical Neck Pain

Alaa Elsayed Elsayed¹, Enas Fawzy Youssef², Amal Fathy kaddah³, Marihan Zakaria Aziz Makary⁴

¹ Physical therapist, Cairo Health Administration, Egypt

^{2,4} Department of Musculoskeletal Disorder and Its Surgery Faculty of Physical Therapy, Cairo University, Giza, Egypt.

³ Department of Prosthodontic Faculty of Oral and Dental Medicine, Cairo University, Cairo, Egypt.

*Corresponding author: Alaa Elsayed, Mobile: (+02) 01007606903, E-mail: Alaaelshrief15@gmail.com

ABSTRACT

Background: Dentistry is a high-risk profession for neck pain due to stressful work positions such as neck flexion, arm abduction, and inflexible postural positions, which can cause a forward head posture (FHP).

Objective: This study aimed to explore whether there is a relationship between FHP and the severity of neck pain and disability among dentists with mechanical neck pain. **Methods:** A cross-sectional study was carried out on twenty-six dentists with FHP and chronic mechanical neck pain lasting more than 3 months. All participants were assessed for FHP by photometric measurement of cranio-vertebral angle (CVA), neck pain through the visual analogue scale Arabic version (VAS-AR), and neck disability through the neck disability index Arabic version (NDI-AR).

Results: The forward head and the neck disability had a weak, inverse, and non-significant correlation ($r = -0.250$, $p = 0.219$). While, the forward head and pain had a weak, direct, and non-significant correlation ($r = 0.132$, $p = 0.250$).

Conclusion: Forward head posture may contribute to the exacerbation of neck pain and disability among dentists.

Keywords: Dentists, Forward head posture, Neck pain, Neck disability.

INTRODUCTION

Neck pain is the second most common musculoskeletal disorder in population surveys and primary care. It causes a significant health and economic burden and is consequently considered the leading cause of disability worldwide^(1,2). Neck pain can be classified into specific to serious conditions such as neurological disorders, infections, neoplasms, and cervical spine fractures, or non-specific (neck pain without known cause)⁽³⁾. Non-specific neck pain (NSNP) is mechanical neck pain affecting people, especially in middle age^(1,4).

Dentistry is a profession at high risk of musculoskeletal disorders with a high prevalence of neck pain observed annually at 58.5%⁽⁵⁾. Nonspecific neck pain is commonly associated with disturbed normal mechanical balance of upper quadrants and poor posture⁽⁴⁾.

Furthermore, the most assumed position by dentists is the sitting position. Due to the requisite attributes of focusing and precision in dental practice, dentists adopt an inflexible posture characterized by neck flexion, arm abduction, and fixed postural positions. This posture may potentially contribute to FHP, neck discomfort, and postural abnormalities⁽⁶⁾. The prolonged FHP, in which the head is placed anteriorly to the gravitational axis, puts more strain on the cervical region and leads to neck pain⁽⁶⁾. Given the high prevalence of neck pain among dentists, this study aimed to investigate whether FHP is a potential risk factor that may affect the magnitude of neck pain and disability experienced by dentists.

MATERIALS AND METHODS

Study design: A cross-sectional research design was carried out on twenty-six dentists of both genders. The

dentists were selected according to the inclusion criteria facilitated by direct referrals from specialists at Al-Qasr Al-Aini Dentistry Hospital, the study period extended from April 2023 and June 2023.

Ethical considerations: The study was conducted in compliance with the ethical standards of Declaration of Helsinki. It received approval from the Faculty of Physical Therapy, Cairo University, Egypt's Ethical Committee under the reference number P.T REC/012/004771. After signing informed consent, all dentists were enrolled in this study.

Sample size calculation: For determining the appropriate sample size, the statistical software G*POWER (version 3.0.10; Franz Faul, Universität Kiel, Germany) was utilized. The correlation normal model was selected for this analysis. Based on parameters including a power of 0.80 (one-tailed), an alpha level of 0.05, and an anticipated effect size of 0.47, the software recommended a sample size of 26 dentists.

Inclusion criteria: Dentists aged 27 to 40 years with a body mass index (BMI) of 25 to 29.9 kg/m² and specific years of work experience (more than 5 and less than 15 years). Dentists had FHP with a CVA of less than 50° as a reference angle⁽⁷⁾, with chronic mechanical neck pain lasting more than 3 months, a baseline NDI score of at least 10 points (20%)^(8,9), and at least 3 out of 10 pain intensity on VAS⁽⁹⁾.

Exclusion criteria: History of cervical fracture or trauma, cervical surgery, temporomandibular surgery or

dysfunction⁽¹⁰⁾, cervical radiculopathy, intervertebral disc hernias, and cervical spondylolisthesis^(11, 12).

PROCEDURES

The investigator collected the subsequent demographic data: age, gender, body mass, height, BMI, hand dominance, working years, average workdays per week, and daily work hours. Afterwards, the screening procedure for forward head posture and mechanical neck pain was conducted:

1-Assessment of forward head posture (Craniovertebral angle):

The photometric method was used to assess the CVA with tools using a 16.3MP ½.3BSI CMOS image sensor, a 21x optical zoom lens with a 32-483 (35 mm equivalent) focal length, an f/2.8-5.9 aperture camera, tripod, and Kinovea software. Subjects assumed a standing position with a natural head position by instructing them to flex and extend their necks three times while maintaining relaxed arms by their sides⁽¹³⁾. The anatomical landmarks were determined by the Biotonix™ system C7 and the tragus of the ear and markers were placed on the anatomical land markers⁽¹⁴⁾.

Secondly, the camera was placed 1.5 meters away from the subject on a tripod with height adjusted at the level of the subject shoulder^(11, 13, 15). The photo was captured from the lateral side according to the dominance of the hand the right-handed participant was captured from the right side and vice versa⁽¹⁶⁾. The latter, the CVA is analyzed through Kinovea software⁽¹⁷⁾.

To measure the CVA angle intersection between two lines one passes horizontally through C7 and the other line connects C7 to the Tragus of the ear⁽¹⁰⁾. Smaller angles indicate a more forward head posture. Frequently, 50° is chosen as a reference angle⁽⁷⁾. Three measurements were taken, and the mean was obtained⁽¹³⁾.

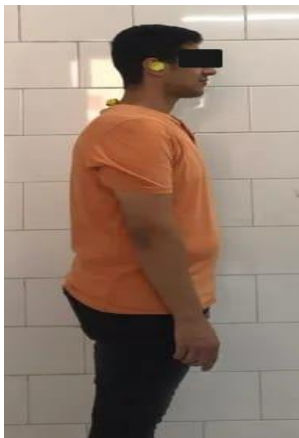


Figure (1): Assessment of FHP (CVA).

2- Assessment of neck pain:

The neck pain was assessed with VAS-AR. The therapist asked the patient to express how potentially he or she feels current pain or the last 24 hours' pain by choosing

a point on a 100-mm line drawn between two ends. One end refers to the absence of pain and the other refers to the worst intense pain the line was measured with a ruler⁽¹⁸⁾.

3- Assessment of neck disability:

Neck disability was evaluated using the Arabic version of the Neck Disability Index (NDI-AR). This tool comprises 10 items, which include pain intensity, personal care, lifting, reading, headaches, concentration, work, driving, sleeping, and recreation⁽¹⁹⁾. Each item is scored on a scale ranging from 0, indicating no disability, to 5, denoting total disability. Therefore, the overall score can vary from 0 to 50, encompassing a broad spectrum of disability levels. However, the NDI is frequently reported as a percent⁽²⁰⁾. The dentist responds to questions about the activities he has performed and in case the 10 items are completed the score is multiplied by 2. On the other hand, if there are items not answered the score is divided by the number of completed questions multiplied by 5 to get the percentage.

Statistical analysis

Descriptive statistics as mean ± SD was used to describe the characteristics of the experimental group. The Pearson correlation coefficient was used to find out the relation between FHP and neck pain and disability. The data analysis in this study was conducted using the Statistical Package for the Social Sciences (SPSS) computer program, version 20, designed for Windows and developed by SPSS Inc. in Chicago, Illinois, USA. A p-value of less than or equal to 0.05 was set as the threshold for statistical significance.

RESULTS

Demographic data of subjects: A total of 26 dentists with FHP participated in this study (11 females and 15 males). Their mean values of age, weight, height, BMI, experience years, number of working days per week, and number of working hours per day were listed in table (1).

Table (1): Subject characteristics of the experimental group

Measured variable	Experimental group Mean±SD
Age (years)	30.8 ± 4.3
Weight (kg)	74.3 ± 11.8
Height (cm)	172.9 ± 9.8
BMI (kg/m ²)	25 ± 3.2
Experience years	7.7 ± 3.7
Number of working days/week	5.2 ± 1.4
Working hours/day	7.4 ± 1.9
Sex	N (%)
Males	15 (57.7%)
Females	11 (42.3%)

Normality test: The data underwent preliminary checks to verify assumptions of normality, homogeneity of variance, and to identify any extreme scores. The Shapiro-Wilk test was utilized to test for normality, and it confirmed that all the measured variables were normally distributed. The measured experimental parameters were shown in table (2).

Table (2): Mean values of measure of the experimental group

Measured variables	Experimental group Mean ± SD
CVA (degrees)	42.7 ± 3.3
NDI (%)	14.6 ± 5.4
VAS (cm)	4.8 ± 2.2

SD: standard deviation, CVA Craniovertebral angle, NDI: neck disability index, VAS: visual analogue scale.

Correlation between forward head, neck pain, and neck disability: The Pearson coefficient correlation was employed to examine the relationships between the variables. There was a weak inverse non-significant correlation between FHP and NDI ($r = -0.250, p = 0.219$). While, there was a weak direct non-significant correlation between FHP and pain ($r = 0.132, p = 0.250$), and between NDI and pain ($r = 0.171, p = 0.404$) (Table 3).

Table (3): Correlation between CVA, NDI, and VAS

Correlation		r value	p-value	Sig
CVA	NDI	-0.250	0.219	NS
CVA	VAS	0.132	0.250	NS
NDI	VAS	0.171	0.404	NS

CVA Craniovertebral angle NDI: Neck disability index, VAS: Visual analogue scale NS: Non-significant

DISCUSSION

This study was carried to investigate whether there was a relationship between FHP, neck pain, and disability among dentists with mechanical neck pain.

Twenty-six dentists were enrolled in the study and CVA was assessed with the photometric method and analyzed with Kinovea software. Neck pain was measured by VAS-AR, and neck disability was measured by NDI-AR where their validity and reliability were proved (16, 20).

Results of this study showed that a weak inverse non-significant correlation was reported between FHP and NDI ($r = -0.250, p = 0.219$). While, there was a weak direct non-significant correlation between FHP and pain ($r = 0.132, p = 0.250$), and between NDI and pain ($r = 0.171, p = 0.404$).

Based on the findings, there was an association between a decrease in CVA and the severity of neck pain. Furthermore, there was a positive association between neck pain and neck disability. This association could be

attributed to the fact that prolonged forward positioning of the head may result in a greater strain on non-contractile structures, inducing abnormal stress on the posterior cervical structures and leading to the development of myofascial pain. (21). Furthermore, tilting the head forward may produce increased tension in the neck and shoulder muscles, especially the levator anguli scapulae. This increased tension can put extra pressure on the cervical discs in the spine, leading to premature degeneration. This degeneration can contribute to neck pain (22, 23). The result of the current study comes in agreement with the finding by Yip *et al.* (10) who claimed that poor head posture is proved as a cause of neck pain. Poor postural awareness and habitual incorrect postures can increase loading on the supporting structures, leading to sensitization and pain.

Also, this finding is supported by the study conducted by Kim *et al.* (13), which demonstrated that bending the head forward applies pressure on the neck extensor muscles, the semispinalis capitis and levator scapulae, resulting in muscle fatigue in the posterior neck. Moreover, sustaining this posture for an extended period to align the eye level may result in a reduction in CVA and exert undue stress on the facet joint. This can cause physiological limitations and pain. Moreover, the result is confirmed by Silva *et al.* (24) who stated that anterior neck structures may be stretched, and posterior muscles shortened, resulting in pain due to forward head posture. Consequently, regular physical postural assessment is recommended for dentists.

CONCLUSION

Dentists with chronic mechanical neck pain had a reduction of the CVA. Therefore, it is imperative to recognize that forward head posture contributes significantly to the exacerbation of neck pain within the dental profession. Appropriate measures should be taken to control dentists' postural malalignment.

Limitation

The forward head position was assessed in the standing position although the most assumed position by dentists during work is sitting in which the CVA angle is less than in the standing position. Therefore, future research can assess the FHP in the sitting position.

RECOMMENDATION

Future investigations are required to evaluate the correlation between varying levels of pain and the extent of FHP as the present study solely examined mild pain. Regular postural assessment for dentists is recommended to control any possible misalignment.

- **Data availability:** The data employed in this study are available for sharing. Should there be a reasonable

request, the corresponding author is prepared to make these datasets publicly accessible.

- **Conflict of interests:** No conflict stated by authors.
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