

# **Correlation between head posture, scapular dyskinesis and upper extremity stability in dental professionals: A pilot study**

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**Abstract:** Dental professionals are routinely required to maintain prolonged static postures, repetitive upper limb movements, and sustained cervical flexion during clinical procedures, predisposing them to work-related musculoskeletal disorders. Although forward head posture, scapular dyskinesis, and upper extremity stability have been studied individually, evidence regarding their interrelationship in dental professionals is limited. This pilot study aimed to evaluate the correlation among head posture, scapular dyskinesis, and upper extremity stability among dental professionals. Twelve dental professionals aged 25–36 years with clinical experience of at least 1 year old were eligible in the study. Head posture was examined by measuring the Craniovertebral Angle (CVA) using Kinovea software, Scapular dyskinesis using the Lateral Scapular Slide Test (LSST), and Upper extremity stability using the Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST). Pearson's correlation analysis was performed, with a significance threshold of  $p < 0.05$ . A marked positive relationship was noted with CVA and CKCUEST ( $r = 0.845$ ,  $p = 0.001$ ), suggesting that improved head posture were significantly associated with greater upper extremity stability. Weak negative, non-significant association were showed between CVA and LSST ( $r = -0.327$ ,  $p = 0.299$ ) and between LSST and CKCUEST ( $r = -0.162$ ,  $p = 0.615$ ). Among dental professionals, better head posture was significantly associated with greater upper extremity stability, whereas scapular dyskinesis showed no significant relationship with either head posture or upper extremity stability. The findings highlight the need to maintain proper cervical alignment and adopt ergonomic practices along with preventive physiotherapy interventions to minimize the risk of musculoskeletal disorders among dental professionals. Further research involving larger sample sizes is recommended to confirm and strengthen these findings.

**Keywords:** Craniovertebral angle, Dental professionals, Head posture, Scapular dyskinesis, Upper extremity stability.

## **INTRODUCTION**

Dental professionals are routinely required to maintain prolonged static postures, repetitive upper limb movements, and sustained cervical flexion while performing precision-based clinical procedures. These occupational demands place dental professionals more susceptible for experiencing occupation related musculoskeletal conditions, with the neck, shoulders, and upper limbs being the most commonly affected regions. Dental professionals frequently experience musculoskeletal problems as a result of inadequate ergonomics, repetitive clinical procedures, and prolonged static working postures.<sup>1</sup>

Among dental professionals, forward head posture is a commonly observed postural adaptation associated with the demands of clinical practice. Prolonged forward head posture alters cervical alignment, disrupts muscle balance, impairs proprioception, and affects neuromuscular control, leading to functional deficits in postural stability.<sup>2</sup>

Altered cervical posture may also influence scapular alignment and movement. Sustained postural deviations can contribute to scapular dyskinesis through changes in muscle activation and scapulothoracic mechanics.<sup>3</sup> Poor working posture in dental professionals has been linked to increased scapular asymmetry and diminished scapular stability, contributing to neck-related musculoskeletal dysfunction.<sup>4</sup>

Efficient upper extremity stability depends on optimal cervical and scapular function. Impairments in proximal stability may adversely affect upper limb performance, coordination, and functional capacity required during dental procedures.<sup>5</sup> Occupational exposure to prolonged static posture and repetitive upper limb activity has also been associated with reduced upper extremity function.<sup>6</sup>

Although head posture, scapular dyskinesis, and upper extremity stability have each been investigated individually, evidence exploring their interrelationship among dental professionals has not been fully elucidated. Accordingly, this study focused to explore the association between head posture, scapular dyskinesis and upper extremity stability among dental professionals.

## **RESEARCH METHODOLOGY**

A pilot correlational study was undertaken to evaluate the interrelationship among head posture, scapular dyskinesis, and upper extremity stability among dental professionals.

## Participants

Twelve dental professionals aged 25–36 years who had been engaged in clinical dental practice for a minimum of one year were recruited in the study. Participants were enrolled using convenience sampling from various dental institutions in Mangaluru, Karnataka. Eligible participants were actively involved in clinical practice and worked a minimum of 4 hours/day for at least 3 days/week. Individuals with a history of recent upper limb or cervical spine trauma, diagnosed musculoskeletal or neurological disorders affecting the neck or shoulder, congenital postural deformities, or treatment within the last 3 months were excluded.

## Outcome Measure

- **Head posture:** Assesed using the Craniovertebal angle (CVA) measured using Kinovea software
- **Scapular dyskinesis:** Assesed using Lateral scapular slide test
- **Upper extremity stability:** Assesed using the Closed kinetic chain upper extremity stability test (CKCUEST)

## Statistical Analysis

Data were processed using SPSS version 29.0. Mean  $\pm$  standard deviation were calculated. Descriptive statistical techniques were applied to summarize the data. Categorical variables were expressed as frequencies and percentages, whereas continuous variables were reported as mean  $\pm$  standard deviation (SD). Pearson's correlation was conducted to determine the relationships among outcome measures. Statistical significance was established at  $p < 0.05$ .

## RESULTS

**Table 1: Descriptive Statistics of Demographic Characteristics of Dental Professionals**

|                     |              | Frequency | Percent |
|---------------------|--------------|-----------|---------|
| Age                 | 25- 29 years | 7         | 58.3    |
|                     | 30- 34 years | 5         | 41.7    |
| Gender              | Female       | 6         | 50.0    |
|                     | Male         | 6         | 50.0    |
| Clinical experience | 2- 5 years   | 8         | 66.7    |

|                   |            |   |      |
|-------------------|------------|---|------|
|                   | 6- 9 years | 3 | 33.3 |
| Working hours/day | < 5 years  | 5 | 41.6 |
|                   | >= 5 years | 6 | 58.4 |

A total of 12 dental professionals were enrolled in the study. Most of the subjects were between 25 and 29 years of age (58.3%), while 41.7% were aged 30–34 years. The participants had a mean age of  $29.167 \pm 2.918$  years.

Gender distribution was equal, with 50.0% females and 50.0% males.

Most participants had 2–5 years of clinical experience (66.7%), whereas 33.3% had 6–9 years of experience, with a mean clinical experience of  $4.583 \pm 2.429$  years.

Regarding daily working hours, 58.4% worked  $\geq 5$  hours/day, while 41.6% worked  $< 5$  hours/day, with a mean working duration of  $5.917 \pm 1.165$  hours/day.

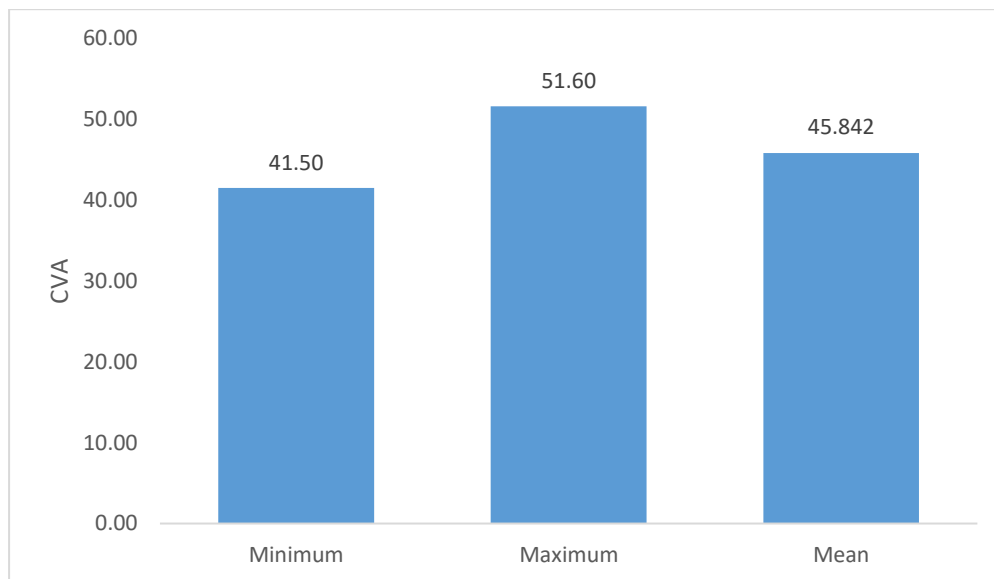
**Table 2: Descriptive Statistics of Craniovertebral Angle (CVA), Lateral Scapular Slide Test (LSST), and Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) Scores among Dental Professionals**

|         | Minimum | Maximum | Mean   | Std. Deviation |
|---------|---------|---------|--------|----------------|
| CVA     | 41.50   | 51.60   | 45.842 | 3.135          |
| LSST    | 0.00    | 2.40    | 1.367  | 0.714          |
| CKCUEST | 13.00   | 23.00   | 17.833 | 3.040          |

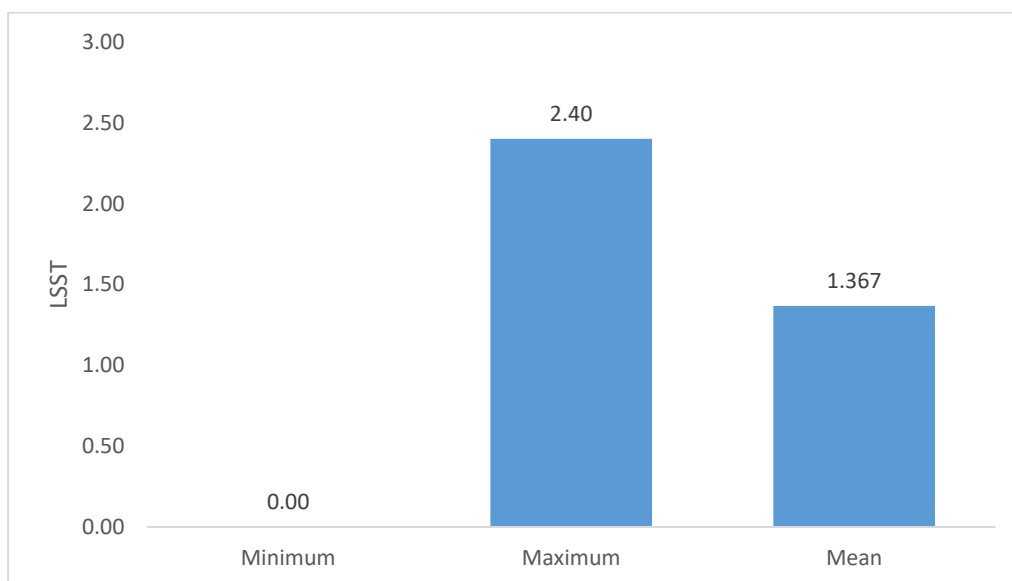
The Craniovertebral Angle (CVA) scores ranged from 41.50 to 51.60, with a mean of  $45.842 \pm 3.135$ .

The Lateral Scapular Slide Test (LSST) scores ranged from 0.00 to 2.40, with a mean of  $1.367 \pm 0.714$ .

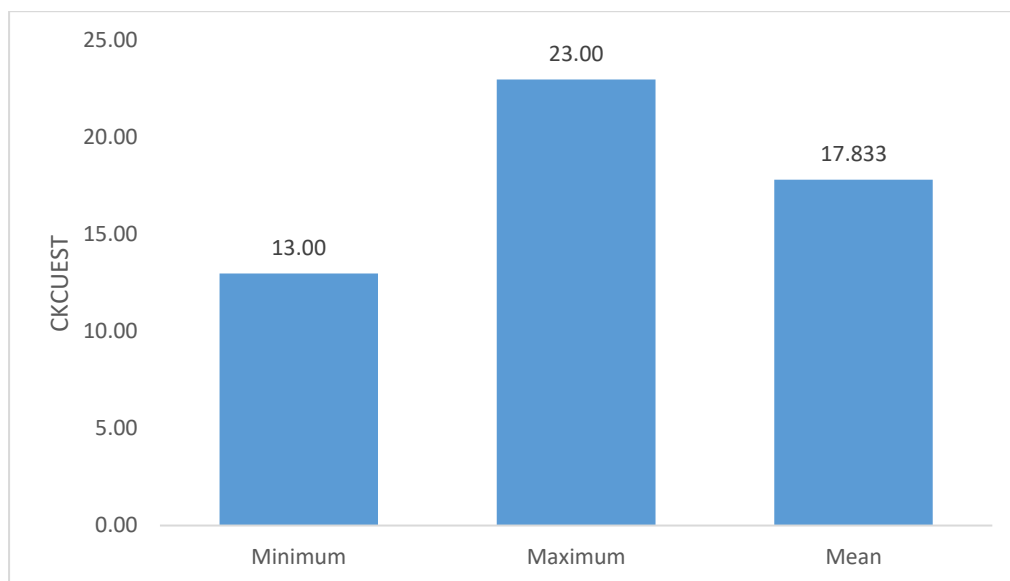
The Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) scores ranged from 13.00 to 23.00, with a mean of  $17.833 \pm 3.040$ .



**Figure 1: Representing the Mean Distribution of Craniovertebral Angle (CVA) Scores among Dental Professionals**



**Figure 2: Representing the Mean Distribution of Lateral Scapular Slide Test (LSST) Scores among Dental Professionals**



**Figure 3: Representing the Mean Distribution of Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) Scores among Dental Professionals**

**Table 3: Correlation between Craniovertebral Angle (CVA) and Lateral Scapular Slide Test (LSST) among Dental Professionals**

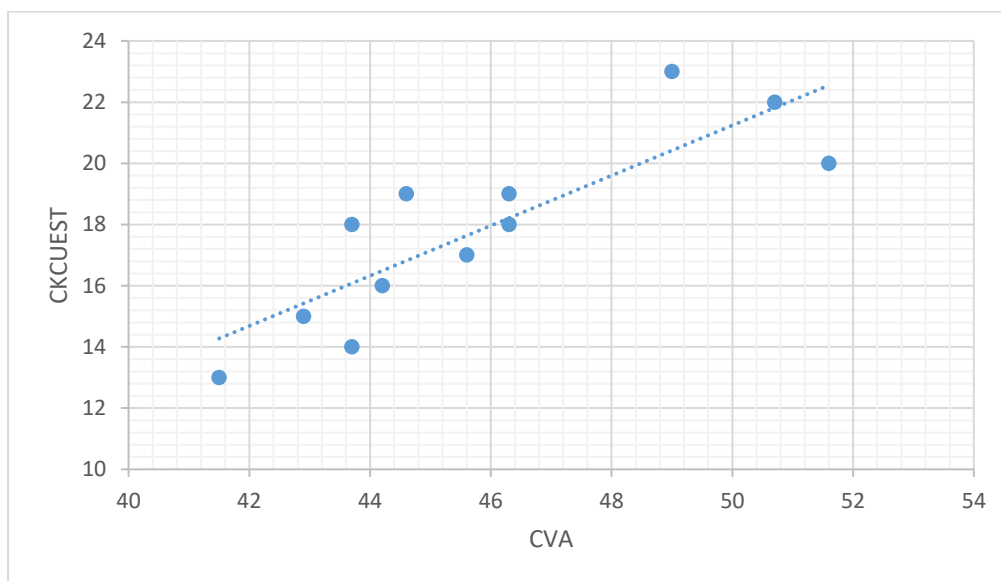
|     |         | LSST  |
|-----|---------|-------|
| CVA | r value | -.327 |
|     | p value | .299  |
|     | N       | 12    |

The correlation analysis between the Craniovertebral Angle (CVA) and the Lateral Scapular Slide Test (LSST) showed a weak negative correlation ( $r = -0.327$ ). The association, however, did not demonstrate any statistical significance ( $p = 0.299$ ), indicating that changes in head posture were not significantly associated with scapular dyskinesis among the dental professionals.

**Table 4: Correlation between Craniovertebral Angle (CVA) and Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) among Dental Professionals**

|     |         | CKCUEST |
|-----|---------|---------|
| CVA | r value | .845**  |
|     | p value | 0.001*  |
|     | N       | 12      |

The correlation between the Craniovertebral Angle (CVA) and the Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) showed a strong positive correlation ( $r = 0.845$ ). This relationship was statistically significant ( $p = 0.001$ ), indicating that better head posture (higher CVA) was significantly associated with greater upper extremity stability among the dental professionals.



**Figure 4: Representing the Correlation between Craniovertebral Angle (CVA) and Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) among Dental Professionals**

**Table 5: Correlation between Lateral Scapular Slide Test (LSST) and Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) among Dental Professionals**

|      |         | CKCUEST |
|------|---------|---------|
| LSST | r value | -.162   |
|      | p value | .615    |
|      | N       | 12      |

The correlation analysis between the Lateral Scapular Slide Test (LSST) and the Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) showed a weak negative correlation ( $r = -0.162$ ). However, the findings did not demonstrate a statistically significant association ( $p = 0.615$ ), indicating that scapular dyskinesis was not significantly associated with upper extremity stability among the dental professionals.

## DISCUSSION

The present study investigated the correlation between head posture, scapular dyskinesis, and upper extremity stability among dental professionals. The findings demonstrated a strong positive and statistically significant correlation between craniovertebral angle (CVA) and upper extremity stability (CKCUEST). However, weak negative, non-significant correlations were observed between CVA and scapular dyskinesis (LSST), as well as between LSST and CKCUEST. The results indicate that improved cervical alignment is associated to better upper extremity stability, whereas scapular dyskinesis alone does not appear to significantly affect upper extremity stability among the participating dental professionals.

The study findings demonstrated a strong positive association between CVA and CKCUEST, indicating that dental professionals with better head posture exhibited superior upper extremity stability. Forward head posture alters cervical alignment, impairs proprioception, and disrupts the coordinated activation of the deep cervical flexors and scapular stabilizers, thereby reducing proximal stability and efficient force transmission through the upper limb. A comparable finding was reported by Reddy et al., who found that forward head posture adversely affects cervical proprioception in dentists.<sup>2</sup> Khayati et al. reported reduced postural stability in subjects with forward head posture,<sup>16</sup> and Gupta et al. observed improved functional outcomes following correction of forward head posture in dentists.<sup>15</sup> These observations

reinforce the importance of maintaining optimal cervical alignment to preserve upper extremity stability during occupational tasks.

The analysis indicated a weak inverse association between CVA and LSST, implying that although greater forward head posture tended to be associated with increased scapular asymmetry, the relationship was not statistically significant. Scapular positioning is influenced by multiple factors, including thoracic posture, muscle strength, fatigue, proprioception, and neuromuscular control; therefore, cervical posture alone may not determine scapular mechanics. The findings are partially consistent with Keskin and Kaya, who reported an association between working posture and scapular asymmetry in dentists,<sup>19</sup> and Verma et al. who observed reduced scapular stability among dental students with neck pain.<sup>4</sup> The absence of statistical significance in the present study is likely related to the relatively lesser number of participants included in the study and the inclusion of predominantly asymptomatic dental professionals.

Similarly, a weak negative, non-significant correlation was observed between LSST and CKCUEST, indicating that scapular dyskinesis alone did not significantly influence upper extremity stability. Although the scapula provides a stable base for upper limb movement, performance during CKCUEST depends on integrated activation of the cervical musculature, scapular stabilizers, trunk muscles, and shoulder girdle. Therefore, mild scapular asymmetry may be compensated for by intact neuromuscular control in healthy individuals. A comparable finding was noted by Barbosa et al., who found no significant difference in CKCUEST performance among asymptomatic participants with scapular dyskinesis and those who did not exhibit scapular dyskinesis, concluding that scapular dyskinesis alone is not associated with poorer upper extremity physical performance.<sup>9</sup> These findings differ from those of Gawde and Dabholkar, who reported a significant association between scapular stability and distal upper extremity function.<sup>20</sup> Differences in the characteristics of the participants, their symptom status, and the sample size could have contributed to the variation in results.

## CONCLUSION

The results of this pilot study revealed a strong positive and statistically significant relationship between craniovertebral angle and upper extremity stability among dental professionals, indicating that better head posture is associated with improved upper extremity stability. However, weak negative and non-significant correlations were observed between head posture and scapular dyskinesis, as well as between scapular dyskinesis and upper extremity stability.

These findings suggest that while cervical posture may influence upper extremity function, scapular dyskinesis, may not independently affect upper extremity stability in this population. The results underscore the importance of maintaining optimal head posture and implementing ergonomic and preventive physiotherapy strategies to enhance upper extremity function and reduce the likelihood of occupation-associated musculoskeletal conditions in dental professionals. Further research involving larger participant groups and more comprehensive assessments of dynamic scapular function is needed to confirm these findings and provide a broader understanding of the observed relationships.

## **DECLARATIONS**

### **Study Limitations**

The limited sample size of dental professionals included in this pilot study may reduce the extent to which these findings can be applied to a wider population. Since the data were collected at a single point in time, the observed associations cannot be interpreted as causal relationships. Participants were recruited using convenience sampling from a limited geographical region, which may introduce selection bias. Additionally, only asymptomatic dental professionals were included, and factors such as muscle strength, fatigue, ergonomic workstation characteristics, physical activity level, and psychosocial variables were not assessed, although these may influence posture, scapular mechanics, and upper extremity stability.

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### **Funding Source**

Nil

### **Competing Interests**

There are no financial or charitable organization to carry out this research

### **Ethical Approval**

The study was approved by the Institutional Ethics Committee, A. J. Institute of Medical Sciences & Research Centre, Mangaluru, Karnataka, India. Ethical approval was granted under

Reference No. AJEC/REV/209/2025 on 27 June 2025. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

### **Informed Consent**

All subjects give consent prior to the study.

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