

Evaluating Trapezius Muscle Tenderness and its Correlation with Craniovertebral Angle Among Hairdressers with Prolonged Neck Flexion

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Abstract:

➤ Background:

Hairdressers frequently work with sustained or awkward neck and upper-body postures, repetitive movements, prolonged standing, and limited rest periods. These occupational demands may contribute to trapezius muscle tenderness and postural alterations such as forward head posture.

➤ Objectives:

To assess craniovertebral angle (CVA), determine the grade of bilateral upper trapezius muscle tenderness, and analyze the correlation between trapezius muscle tenderness and CVA among hairdressers exposed to prolonged neck flexion.

➤ Methods:

A cross-sectional observational study with correlational analysis was conducted among 46 hairdressers aged 20–30 years in Jalgaon. Participants were recruited using non-probability convenience sampling. Trapezius tenderness was assessed bilaterally using a clinical tenderness grading scale, and CVA was measured from a lateral photograph using MB-Ruler software. Descriptive statistics were used for demographic and clinical variables, and Spearman's rank-order correlation was used to examine the relationship between bilateral tenderness score and CVA. Statistical significance was set at $p < 0.05$.

➤ Results:

The participants had a mean age of 25.35 ± 2.77 years; 40 (87.0%) were male and 6 (13.0%) were female. Left-sided tenderness was graded 0 in 32 participants, grade 1 in 11, and grade 2 in 3. Right-sided tenderness was graded 0 in 27 participants, grade 1 in 18, and grade 2 in 1. The mean CVA was $49.92 \pm 4.01^\circ$. Spearman's correlation demonstrated a weak negative relationship between bilateral trapezius tenderness score and CVA ($\rho = -0.148$), which was not statistically significant ($p = 0.326$).

➤ Conclusion:

A weak negative correlation was observed between trapezius muscle tenderness and CVA; however, the relationship was not statistically significant. The findings suggest that trapezius tenderness and cervical posture should be considered as related but distinct clinical findings when screening hairdressers for occupational musculoskeletal problems.

Keywords: Hairdressers, Trapezius Muscle Tenderness, Craniovertebral Angle, Forward Head Posture, Occupational Musculoskeletal Disorders, Physiotherapy.

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I. INTRODUCTION

The trapezius muscle is a large postural muscle of the neck and upper back and is susceptible to overload when individuals maintain awkward or non-neutral positions for prolonged periods. Repetitive work, static loading, and sustained muscle activity may contribute to local tenderness, discomfort, and reduced movement tolerance.

Hairdressers routinely perform cutting, styling, colouring, blow-drying, and hair-washing tasks that may require sustained neck and trunk flexion, repetitive upper-limb activity, prolonged standing, and work with limited rest. Occupational studies have reported a substantial burden of work-related musculoskeletal disorders among hairdressers, including symptoms involving the neck, shoulder, upper back, lower back, and upper extremities. In an Indian study of 384 hairdressers and 384 controls, neck pain was reported by 26.3% of hairdressers and shoulder pain by 27.9%, with significantly higher odds than controls. Longer daily working hours were also associated with increased risk of musculoskeletal disorders (Mishra & Sarkar, 2021).

Evidence from occupational literature indicates that hairdressers are exposed to biomechanical and organizational risk factors including repetitive movements, awkward spinal postures, prolonged standing, high mechanical workload, overtime, and inadequate breaks. Such exposure provides a rationale for assessing both muscular symptoms and objective postural characteristics in this occupational group.

The craniovertebral angle is a commonly used photographic measure of sagittal head and neck posture. It is formed by the horizontal line through the C7 spinous process and the line connecting C7 to the tragus of the ear. A smaller CVA indicates a greater degree of forward head posture. Photographic CVA measurement has demonstrated good reliability, and MB-Ruler software has been reported to have excellent intra-rater and high inter-rater reliability for photographic CVA assessment (Kadu & Shetye, 2022).

Previous research has also examined relationships between forward head posture and upper trapezius characteristics. Recent work has reported negative associations between CVA and upper trapezius stiffness or tone, while other studies have emphasized that subjective symptoms do not always correspond directly with objective postural or muscle measurements. However, limited information is available regarding the relationship between clinically graded trapezius tenderness and CVA specifically among hairdressers.

Therefore, the present study was undertaken to determine the relationship between trapezius muscle tenderness and CVA among hairdressers exposed to prolonged neck flexion. The findings may assist physiotherapists in occupational screening and in planning preventive ergonomic and postural interventions.

II. METHODS

➤ Study Design and Participants

A cross-sectional observational study with correlational analysis was conducted over a six-month period among hairdressers in Jalgaon, Maharashtra. The study included 46 participants aged 20–30 years who were currently employed as hairdressers or barbers and had at least one year of continuous work experience. Participants were recruited using non-probability convenience sampling. The mean age calculated from the participant master chart was 25.35 ± 2.77 years. The institutional ethics committee of Dr. Ulhas Patil College of Physiotherapy, Jalgaon approved the study. Written informed consent was obtained from all participants, and the study procedures were conducted in accordance with ethical principles for research involving human participants.

➤ Eligibility Criteria

Inclusion criteria were willingness to participate; age 20–30 years; current employment as a hairdresser/barber involving cutting, styling or colouring with at least one year of continuous work experience; and ability to stand and follow instructions for postural and muscle assessment. Exclusion criteria were recent cervical or shoulder trauma or surgery within six months; diagnosed cervical radiculopathy, myelopathy, peripheral neuropathy or another neurological disorder affecting neck/upper-limb function; systemic musculoskeletal disease such as rheumatoid arthritis, ankylosing spondylitis or fibromyalgia; and current treatment likely to affect measurements, including active physiotherapy, dry needling, corticosteroid injection, botulinum toxin or regular opioid/chronic analgesic use within the previous six weeks.

➤ Research Instruments

Trapezius muscle tenderness was assessed bilaterally using the clinical tenderness grading scale recorded in the project report: Grade 0, no tenderness; Grade 1, patient complains of pain; Grade 2, patient complains of pain and winces; Grade 3, patient winces and withdraws the joint; and Grade 4, patient does not allow palpation of the injured area or joint. In the present dataset, no participant had unilateral Grade 3 or Grade 4 tenderness.

Craniovertebral angle was assessed using a lateral photograph in the participant's usual standing posture. The participant stood relaxed with the arms by the side and looked toward a point directly ahead. The camera was placed on a tripod approximately 60 cm from the participant. Adhesive markers were placed over C7 and the tragus of the ear. The CVA was defined as the angle between the horizontal line through C7 and the line joining C7 to the tragus, and was measured using MB-Ruler software. The project report cites excellent intra-rater reliability (ICC = 0.999) and high inter-rater reliability (ICC = 0.892) for MB-Ruler photographic CVA measurement (Kadu & Shetye, 2022).

➤ Procedure

After ethical approval and informed consent, demographic information including age and sex was recorded. Bilateral trapezius tenderness was assessed and right- and left-sided grades were recorded separately. The right and left grades were summed to obtain a bilateral total tenderness score. A lateral photograph was then obtained for CVA measurement using the standardized landmarks and positioning described above. The collected data were compiled for statistical analysis.

➤ Data Analysis

Descriptive statistics were used to summarize participant characteristics and study variables. Continuous variables were expressed as mean $\pm$ standard deviation and categorical variables as frequency and percentage.

Spearman's rank-order correlation was selected because tenderness grade is an ordinal clinical variable. The correlation coefficient (Spearman's ρ) and corresponding p-value were calculated for the bilateral total trapezius tenderness score and CVA. Statistical significance was set at $p < 0.05$.

III. RESULTS

A total of 46 hairdressers aged 20–30 years were included. The mean age was 25.35 ± 2.77 years. Forty participants (87.0%) were male and six (13.0%) were female. The mean CVA was $49.92 \pm 4.01^\circ$.

Table 1 summarizes the demographic and CVA characteristics of the sample.

Table 1 Demographic Characteristics and Craniovertebral Angle of Participants

Variable	Category / value	n (%) / Mean $\pm$ SD
Age	20–25 years	24 (52.2%)
Age	26–30 years	22 (47.8%)
Age	Overall	25.35 ± 2.77 years
Sex	Male	40 (87.0%)
Sex	Female	6 (13.0%)
Craniovertebral angle	Overall	$49.92 \pm 4.01^\circ$

Unilateral trapezius tenderness was predominantly absent or mild. On the left side, 32 participants had Grade 0, 11 had Grade 1, and 3 had Grade 2 tenderness. On the right

side, 27 had Grade 0, 18 had Grade 1, and 1 had Grade 2 tenderness.

Table 2 Unilateral Trapezius Muscle Tenderness Grading

Tenderness grade	Left, n (%)	Right, n (%)
0	32 (69.6%)	27 (58.7%)
1	11 (23.9%)	18 (39.1%)
2	3 (6.5%)	1 (2.2%)
3	0 (0%)	0 (0%)
4	0 (0%)	0 (0%)

When right- and left-sided tenderness grades were summed, 23 participants (50.0%) had a bilateral total score

of 0, 13 (28.3%) had a score of 1, 7 (15.2%) had a score of 2, 2 (4.3%) had a score of 3, and 1 (2.2%) had a score of 4.

Table 3 Bilateral Total Trapezius Tenderness Score

Bilateral total tenderness score	n	Percentage
0	23	50.0%
1	13	28.3%
2	7	15.2%
3	2	4.3%
4	1	2.2%

Spearman's rank-order correlation showed a weak negative relationship between bilateral total trapezius

tenderness score and CVA ($\rho = -0.148$). The association was not statistically significant ($p = 0.326$).

Table 4 Correlation Between Trapezius Muscle Tenderness and Craniovertebral Angle

Variables	Spearman's ρ	p-value	Interpretation
Bilateral total trapezius tenderness score vs. CVA	-0.148	0.326	Weak negative, not statistically significant

IV. DISCUSSION

The present study evaluated whether clinically graded trapezius muscle tenderness was associated with craniovertebral angle among 46 hairdressers exposed to prolonged neck flexion. The main finding was a weak negative correlation ($\rho = -0.148$) that did not reach statistical significance ($p = 0.326$). Thus, the study did not establish a significant association between the two variables.

The occupational context of the sample is important. Hairdressers commonly perform repetitive upper-limb tasks while standing and may maintain awkward positions of the neck and trunk. Mishra and Sarkar (2021) reported a high burden of work-related musculoskeletal disorders among urban Indian hairdressers, with neck and shoulder pain affecting more than one quarter of the hairdressers studied. The present study similarly identifies measurable trapezius tenderness in a proportion of hairdressers, supporting the relevance of muscular assessment in this occupational group.

Half of the participants had no bilateral tenderness, and most of the remaining participants were concentrated in the lower tenderness-score categories. The restricted distribution of higher tenderness scores may have reduced the ability to detect a stronger correlation with CVA. In addition, tenderness is a subjective clinical response influenced by individual pain sensitivity and response to palpation, whereas CVA is an objective angular measure of posture. Consequently, these variables may not change proportionally within an individual.

The direction of the correlation is nevertheless clinically interesting. The negative coefficient indicates a tendency for higher tenderness scores to occur with lower CVA values, which is consistent with the general concept that a smaller CVA represents greater forward head positioning. Recent studies have reported relationships between reduced CVA and upper trapezius stiffness or tone. Lee et al. (2025) observed moderate negative correlations between CVA measured in habitual working posture and upper trapezius stiffness and tone in asymptomatic office workers. Suzuki et al. (2025) similarly reported a weak negative correlation between CVA and upper trapezius shear elastic modulus in young men. These findings concern muscle stiffness or tone rather than palpation tenderness, so direct equivalence with the present study should be avoided.

The use of photographic CVA measurement with MB-Ruler is supported by reliability evidence. Kadu and Shetye (2022) found excellent intra-rater and high inter-rater reliability for MB-Ruler measurement of CVA using the photographic method. Therefore, the objective postural measurement used in this study is supported as a practical assessment method. The present results also reinforce the importance of assessing both subjective muscular findings and objective posture rather than assuming that one measure fully represents the other.

From a physiotherapy perspective, CVA and trapezius tenderness can be incorporated into occupational screening of hairdressers. The absence of a statistically significant correlation does not indicate that either measure is clinically unimportant; rather, it suggests that factors other than CVA alone may contribute to trapezius tenderness. Occupational exposure duration, daily working hours, repetitive movements, workstation design, rest breaks, pain perception, and other postural characteristics may all influence symptoms.

The study has several limitations. The sample was relatively small and predominantly male, which limits generalizability and gender-based comparison. Tenderness was assessed using a subjective grading scale and therefore may be influenced by individual response to palpation. The cross-sectional design prevents conclusions about causality or temporal relationships. The study also did not include detailed quantitative occupational exposure measures or objective assessment of upper trapezius mechanical properties. Future research should use larger and more gender-balanced samples and combine CVA with pain intensity, disability, work exposure, and objective muscle measures.

V. CONCLUSION

Among 46 hairdressers aged 20–30 years, a weak negative correlation was observed between bilateral trapezius muscle tenderness and craniovertebral angle ($\rho = -0.148$), but the association was not statistically significant ($p = 0.326$). Therefore, no significant relationship between trapezius tenderness and CVA was established in this sample. Assessment of both muscular tenderness and cervical posture may nevertheless be useful for occupational physiotherapy screening and preventive ergonomic care.

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➤ *Conflict of Interest*

The author declares that this research is free from conflicts of interest with any party.

➤ *Author's Contribution*

Disha Santosh Chitkalwar contributed to the conception and design of the study, participant recruitment, data collection, data analysis, interpretation of findings, preparation of the manuscript, and final approval of the manuscript.

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