Original Article

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Physiotherapy Section

Effect of Ergonomic Advice and Postural Correction Exercises on Craniovertebral Angle in Dental Students with Upper Cross Syndrome: A Quasi-experimental Study

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ABSTRACT

Introduction: Dentistry involves prolonged static postures and repetitive movements, predisposing practitioners to Musculoskeletal Disorders (MSD), particularly affecting the neck, shoulders, and upper back. Upper Cross Syndrome (UCS), characterised by muscle imbalance and Forward Head Posture (FHP), is highly prevalent among dental professionals. Ergonomic modifications combined with postural correction exercises may provide a cost-effective and sustainable preventive strategy.

Aim: To evaluate the effect of ergonomic advice and postural correction exercises on Craniovertebral Angle (CVA), muscle strength, muscle length, pain and neck disability in postgraduate dental students with UCS.

Materials and Methods: The present quasi-experimental Study was conducted at the AB Shetty Memorial Institute of Dental Sciences, NITTE (Deemed to be University), Mangaluru, Karnataka, India, over a period of 10 months from February 2023 to December 2023 among 29 postgraduate dental students aged 20-30 years with neck pain measured by Numerical Pain Rating Scale (NPRS) 3-6 and FHP (CVA <49.9°). The study duration was four weeks. CVA was measured using Markus Bader (MB) ruler software. Outcome measures included Neck Disability Index (NDI), NPRS, CVA, muscle strength with hand-held dynamometer, and muscle length by Janda technique. Participants underwent a structured intervention comprising pamphlet-based postural correction exercises and ergonomic advice. Data were analysed using Statistical Package for the Social Sciences (SPSS) version 20.0. Paired t-test was used for pre-post comparison and $p<0.05$ was considered statistically significant.

Results: Post-intervention, statistically significant improvements were observed in all outcome measures. NDI decreased from 14.28±3.61 to 11.48±4.00 ($p<0.001$), NPRS reduced from 5.34±0.61 to 3.97±1.24 ($p<0.001$), and CVA increased from 46.89±1.35° to 48.08±2.13° ($p<0.001$). Muscle strength improved significantly in the neck flexors, middle and lower trapezius, and serratus anterior ($p<0.05$). Muscle length showed significant improvement, with reduced tightness in pectoralis major, pectoralis minor, and latissimus dorsi, and increased length of the upper trapezius ($p<0.05$).

Conclusion: A four-week intervention combining ergonomic advice and postural correction exercises significantly improved CVA, muscle strength, and muscle length, and reduced pain and neck disability in dental postgraduate students with UCS. Early incorporation of ergonomic education and targeted exercise in dental training may help prevent chronic MSDs.

Keywords: Corrective exercises, Forward head posture, Musculoskeletal diseases, Neck pain, Treatment outcome

INTRODUCTION

The UCS is a common postural disorder characterised by a predictable pattern of muscle imbalance, involving tightness of the upper trapezius, levator scapulae, and pectoral muscles, along with weakness of the deep cervical flexors and scapular stabilisers. These imbalances result in FHP, rounded shoulders, and altered scapular alignment, leading to pain, functional limitations, and long-term musculoskeletal dysfunction [1-3].

FHP, a key feature of UCS, increases mechanical stress on the cervical spine and surrounding structures. The CVA is a widely used and reliable measure for assessing FHP, with lower values indicating greater postural deviation [1,4,5]. Accurate assessment of CVA using validated tools such as the MB ruler software allows objective evaluation of postural changes in both clinical and research settings [4,5].

Dental professionals are particularly susceptible to UCS due to the occupational demands of their work, which include prolonged static postures, repetitive movements, and sustained forward bending positions during clinical procedures. These factors contribute to a high prevalence of MSDs, especially affecting the neck, shoulders, and upper back [6,7]. Studies have reported that the prevalence of MSDs among dentists ranges from 64% to 93%, indicating a significant occupational health burden [1,7-9]. Despite this, awareness and implementation of ergonomic principles among dental practitioners remain inadequate [8].

Various physiotherapeutic interventions, including corrective exercises, stretching, and scapular stabilisation, have been shown to improve posture, muscle balance, and pain in individuals with UCS and FHP [10-13]. Ergonomic interventions focusing on posture education and workstation modification have also been recommended to reduce occupational strain in dental professionals [8,14]. However, most existing studies have investigated these interventions in isolation, with limited evidence on their combined effectiveness, particularly in dental postgraduate students who are exposed to increased clinical workload and are at higher risk of developing postural dysfunction.

Moreover, limited evidence exists evaluating the comprehensive impact of combined ergonomic and exercise-based interventions on multiple clinically relevant outcomes such as CVA, muscle strength, muscle length, pain, and functional disability in this population. Addressing these parameters collectively is essential for a holistic understanding of postural correction and functional improvement.

Therefore, the present study aimed to evaluate the effect of ergonomic advice combined with postural correction exercises on CVA, muscle strength, muscle length, pain, and neck disability in postgraduate dental students with UCS. The novelty of the present study lies in its combined intervention approach and its comprehensive assessment of both postural and functional outcomes in a high-risk occupational group, thereby contributing to the development of effective preventive and rehabilitative strategies in dental practice.

MATERIALS AND METHODS

The present quasi-experimental study was conducted at the AB Shetty Memorial Institute of Dental Sciences, NITTE (Deemed to be University), Mangaluru, Karnataka, India, over a period of 10 months from February 2023 to December 2023. The study was registered with the Clinical Trials Registry of India (CTRI/2023/05/053225). Ethical clearance was obtained from the Institutional Ethics Committee of NITTE (Deemed to be University) with Reference No.: NITTE/IEC/MIN/02/2022–2023 prior to commencement of the study. Written informed consent was obtained from all participants before enrolment.

Inclusion and Exclusion criteria: A total of 29 postgraduate dental students, aged between 20 and 30 years, belonging to various specialties including Orthodontics, Prosthodontics, Conservative Dentistry, and Oral Surgery, were included in the study. Participants were included in the study if they had neck pain with a NPRS score between 3 and 6 and demonstrated FHP, defined by a CVA of <49.9°, measured using MB Ruler software. Participants were excluded if they had a history of cervical trauma or surgery, or if they presented with radiating pain or neurological symptoms.

Sample size calculation: The sample size was calculated based on the study conducted by Syed FA et al., which reported a measurable change in CVA following intervention in individuals with UCS [15]. The effect size for the present study was derived from the magnitude of change reported in the reference study using G*Power software version 3.1.9.4. Assuming an effect size of 0.54, a significance level of 5%, and a statistical power of 80%, the required sample size was estimated to be 29 participants.

Study Procedure

After screening participants based on the inclusion and exclusion criteria, eligible individuals were enrolled in the study. Demographic data including age, height, weight, Body Mass Index (BMI), total working hours per day, and number of patients seen per day were recorded. Participants were then assessed using validated outcome measures, including the NDI to evaluate functional disability and the NPRS to assess pain intensity.

The NDI is a reliable and valid questionnaire consisting of 10 items, each scored on a 0-5 scale, with a total score ranging from 0 to 50, where higher scores indicate greater disability. The scores are interpreted as follows: 0-4 (no disability), 5-14 (mild disability), 15-24 (moderate disability), 25-34 (severe disability), and 35-50 (complete disability). The NDI has demonstrated good test-retest reliability (Intraclass Correlation Coefficient (ICC)≈0.90) and high internal consistency (Cronbach's alpha≈0.80-0.90) [16].

The NPRS is a valid and reliable tool used to measure pain intensity, where participants rate their pain on a scale from 0 to 10, with 0 indicating no pain and 10 indicating the worst imaginable pain, and it has shown excellent test-retest reliability (ICC≈0.95-0.97) [17].

Muscle length of the upper trapezius, pectoralis major and minor as assessed using the Janda technique [18], following standard clinical procedures. Muscle strength of the middle trapezius, lower trapezius, serratus anterior, and deep cervical flexors was measured using a hand-held dynamometer, with three trials recorded and the average value considered [Table/Fig-1]. The CVA was measured using MB Ruler software, following standardised photographic analysis protocols [Table/Fig-2] [5].

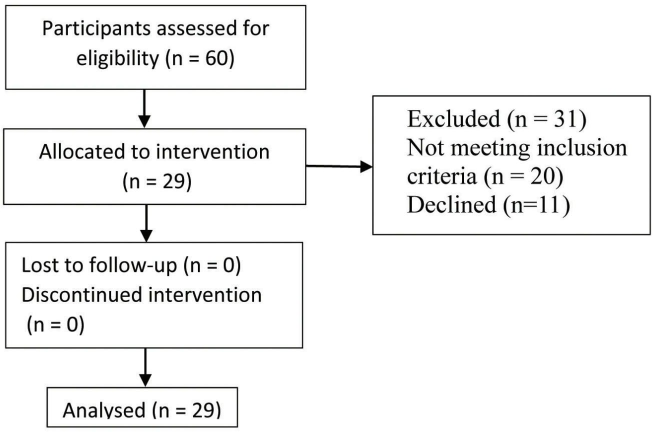
[Table/Fig-1]: Assessing middle trapezius strength using a hand-held dynamometer.

[Table/Fig-2]: Measuring Craniovertebral Angle (CVA) using MB Ruler software.

Following the initial evaluation, a structured 4-week intervention program was implemented. The intervention consisted of corrective exercises and ergonomic education designed to improve posture and address muscle imbalance associated with UCS, based on previously published literature [2,3,13,18]. The intervention included stretching exercises, strengthening exercises, postural correction exercises, and ergonomic education. Stretching exercises included doorway chest stretch, child's pose, upper trapezius stretch, and levator scapulae stretch, while strengthening and postural correction exercises included scapular retractions, shoulder shrugs, wall slides, wall push-ups, and chin tuck exercises. Ergonomic education focused on maintaining neutral posture during clinical work, avoiding prolonged FHP, incorporating regular microbreaks, optimising workstation setup, and maintaining appropriate operator and patient positioning.

The detailed protocol is provided in [ANNEXURE-I]. Each participant received an ergonomic handout containing detailed instructions and pictorial representations of the prescribed corrective exercises. The handout also included guidance on workstation set-up, optimal sitting posture, and daily activity modifications to reduce sustained faulty postures. Exercise dosage, frequency, and progression were clearly outlined and individualised.

Participants were instructed to adhere to the prescribed program. Post-intervention assessment was conducted after four weeks using the same outcome measures. All collected data were compiled and subjected to statistical analysis to determine the effectiveness of the intervention program. The participant flow has been demonstrated in [Table/Fig-3].



[Table/Fig-3]: Participant flow diagram.

STATISTICAL ANALYSIS

The data were analysed using SPSS version 20.0. Categorical variables were expressed as frequency and percentage, while continuous variables were presented as mean±Standard Deviation (SD). A paired t-test was used to compare pre and post-intervention values, with p<0.05 considered statistically significant.

RESULTS

A total of 60 participants were assessed for eligibility, of which 29 met the inclusion criteria and were included in the study. The baseline demographic characteristics of the participants are presented in [Table/Fig-4]. The mean age of the participants was 25.97±1.48 years. The mean values for height, weight, BMI, daily working hours, and number of patients seen per day are detailed in the table.

Variables	Mean±SD	Median (IQR)
Age (Years)	25.97±1.48	26 (25, 27)
Height (cm)	166.9±8.51	170 (162, 171)
Weight (kg)	64.97±11.52	62 (56, 74.5)
BMI (kg/m²)	23.28±3.20	22.7 (21, 25)
Total working hours (per day)	8.21±1.95	8 (6.5, 8.5)
Patients seen per day (clinical workload)	17.45±17.40	12 (8, 15)

[Table/Fig-4]: Participant demographics.

A statistically significant improvement was observed in all primary outcome measures following the intervention [Table/Fig-5]. Specifically, NDI, MB ruler measurements, and NPRS scores showed significant changes post-intervention (p<0.001).

Outcome measures	Mean±SD (Pre)	Mean±SD (Post)	Mean Difference	t-value	p-value
Neck Disability Index (NDI)	14.28±3.61	11.48±4.00	2.80	6.96	< 0.001*
MB Ruler measurements (CVA)	46.89±1.35°	48.08±2.13°	1.19	-4.32	< 0.001*
Numeric Pain Rating Scale (NPRS)	5.34±0.61	3.97±1.24	1.37	5.74	< 0.001*

[Table/Fig-5]: Comparison of outcome measures pre- and post-intervention.

Similarly, all assessed muscle groups demonstrated statistically significant improvements in strength following the intervention {[Table/Fig-6], p<0.05). Notable improvements were observed in the neck flexors and serratus anterior muscles.

Muscle group	Pre (Mean±SD)	Post (Mean±SD)	t	p-value
Neck flexors	1.93±0.46	2.55±0.99	-4.08	< 0.001*
Middle trapezius (right)	8.21±1.24	9.07±1.62	-3.57	< 0.001*
Middle trapezius (left)	7.03±1.64	7.90±1.76	-4.87	< 0.001*
Lower trapezius (right)	7.86±0.99	8.66±1.26	-3.46	0.002*
Lower trapezius (left)	6.79±1.18	7.55±1.35	-3.75	< 0.001*
Serratus anterior (right)	7.00±1.25	7.83±1.61	-4.45	< 0.001*
Serratus anterior (left)	6.17±1.51	6.86±1.51	-3.99	< 0.001*

[Table/Fig-6]: Muscle strength assessment using a hand-held dynamometer.
*p<0.05 - Statistically significant

In addition, significant changes were observed in muscle length across all tested muscle groups ([Table/Fig-7], p<0.05). A reduction in values for the pectoralis major, pectoralis minor, and latissimus dorsi indicates improved muscle flexibility. Conversely, an increase in upper trapezius values reflects improved muscle length.

Muscle group	Pre (Mean±SD)	Post (Mean±SD)	t	p-value
Pectoralis major (right)	8.48±0.91	7.14±1.43	5.62	< 0.001*
Pectoralis major (left)	8.52±1.12	7.34±1.34	4.11	< 0.001*
Pectoralis minor (right)	8.52±0.95	7.24±1.55	5.62	< 0.001*
Pectoralis minor (left)	8.31±1.04	7.28±1.69	3.84	< 0.001*
Latissimus dorsi (right)	7.38±1.50	6.24±1.85	4.36	< 0.001*
Latissimus dorsi (left)	7.55±1.43	6.48±1.98	4.71	< 0.001*
Upper trapezius (right)	12.34±1.11	13.38±1.35	-3.84	< 0.001*
Upper trapezius (left)	12.14±0.64	13.38±1.37	-5.04	< 0.001*

[Table/Fig-7]: Muscle length testing values.
*p<0.05 - Statistically significant

DISCUSSION

Dental practitioners are highly prone to MSDs due to the nature of their work, which involves prolonged static postures, repetitive movements, and awkward positioning. These occupational demands often lead to muscle imbalances, particularly in the upper body, contributing to conditions such as UCS. UCS is characterised by tightness of the upper trapezius, levator scapulae, and pectoral muscles, along with weakness of the deep neck flexors and scapular stabilisers, resulting in FHP, rounded shoulders, and associated pain and dysfunction [3,7,10,19].

The present study investigated the effect of postural correction exercises combined with ergonomic advice on UCS among dental postgraduate students. The findings of this study demonstrated that a 4-week intervention resulted in significant improvements in CVA, muscle strength, muscle length, and a reduction in neck pain and disability. These findings highlight the effectiveness of a combined physiotherapeutic approach in addressing both postural deviations and muscular imbalances associated with UCS.

A total of 29 dental postgraduate students aged between 20-30 years participated in the study. The intervention protocol was designed based on Janda's chain reaction theory [18], which emphasises the interrelationship between muscle imbalances and postural deviations. The exercises specifically targeted FHP, weakened muscles (deep neck flexors, middle and lower trapezius, serratus anterior), and shortened muscles (pectoralis major and minor, upper trapezius, levator scapulae). Additionally, ergonomic advice was provided in the form of a pamphlet to promote sustained postural correction during clinical practice.

Statistical analysis revealed significant differences between pre- and post-intervention values. There was a statistically significant improvement in FHP, muscle strength, and muscle length following the 4-week intervention (p<0.05). The NDI scores showed a significant reduction post-intervention, with a mean difference of 2.80 units (p<0.001), indicating improvement in functional disability. Similarly, the NPRS scores demonstrated a significant reduction, with pre-intervention scores higher by 1.37 units compared to post-intervention (p<0.001), reflecting decreased pain intensity.

These findings are consistent with the study conducted by Boyoung IM et al., who evaluated the effects of scapular stabilisation exercises performed three times per week for four weeks in individuals with FHP and neck pain. The authors reported a significant reduction in NDI scores in the experimental group compared to the control group (p<0.05), along with improvement in neck posture and muscle activation. Similarly, the present study demonstrated a significant reduction in NDI scores from 14.28±3.61 to 11.48±4.00 (p<0.001), indicating improvement in functional disability following intervention [11].

Similarly, Kang JI et al., investigated the effects of scapular stabilisation exercises on neck alignment and muscle activity in individuals with FHP. The study demonstrated significant improvement in CVA and cervical alignment following intervention (p<0.05). In the present study, CVA improved significantly from 46.89±1.35° to 48.08±2.13° (p<0.001), suggesting correction of FHP and improved cervical alignment after the four-week intervention program [12].

The present findings related to pain reduction are also supported by Bolandian P et al., who reported significant reduction in neck pain following an eight-week exercise therapy program among dentists (p<0.05). Although the intervention duration in the current study was shorter, NPRS scores showed significant improvement from 5.34±0.61 to 3.97±1.24 (p<0.001), indicating that even short-term interventions may effectively reduce neck pain associated with UCS [19].

The current study also demonstrated significant improvements in muscle strength of the neck flexors, middle trapezius, lower trapezius, and serratus anterior, as measured using a hand-held dynamometer (p<0.05). These findings are supported by Nitayarak H and Charntaraviroj P who reported that scapular stabilisation exercises significantly improved muscle strength, posture, and flexibility in individuals with UCS. The improvements in scapular stabiliser strength observed in both studies emphasise the importance of targeting these muscle groups in rehabilitation programs [13].

Furthermore, Murugaraj T et al., reported that a comprehensive corrective exercise program significantly improved muscle flexibility, posture, and muscle balance in dental students with UCS (p<0.05). Similar findings were observed in the present study, where significant improvements in muscle length were demonstrated following intervention. The mean values for pectoralis major muscle length reduced from 8.48±0.91 to 7.14±1.43 on the right side and from 8.52±1.12 to 7.34±1.34 on the left-side (p<0.001). Similarly, pectoralis minor muscle length improved from 8.52±0.95 to 7.24±1.55 on the right side and from 8.31±1.04 to 7.28±1.69 on the left-side (p<0.001). Upper trapezius muscle length also demonstrated significant improvement bilaterally following the intervention (p<0.001). These findings suggest that corrective stretching exercises may effectively reduce muscle tightness and improve postural alignment in individuals with UCS [20].

These findings suggest that the intervention had a measurable impact on muscle flexibility and postural muscle imbalance associated with UCS. Supporting these findings Chithra PV and Vishwanath S reported that approximately 65% of college students exhibited tight neck extensors along with patterns of muscle imbalance involving tight pectoral muscles and weak neck flexors [21]. This highlights the high prevalence of postural dysfunction among young adults and supports the importance of early corrective and ergonomic interventions such as those implemented in the present study.

The findings of the present study suggest that a structured exercise program combined with ergonomic education can effectively improve posture, reduce pain, and correct muscle imbalances in individuals with UCS. The integration of ergonomic advice is particularly important in dental professionals, as it promotes long-term adherence to correct posture during clinical practice.

Limitation(s)

The present study had certain limitations. The intervention duration was relatively short, with outcomes assessed only after four weeks of intervention. Additionally, the absence of a control group limits direct comparison of intervention effects and restricts causal interpretation of the findings. Long-term follow-up was not conducted; therefore, the sustainability of improvements in posture, muscle balance, pain, and functional disability could not be determined. Furthermore, subgroup analysis based on gender and dental specialisation was not performed, which may influence the generalisability of findings across different populations.

CONCLUSION(S)

The study concluded that a 4-week intervention consisting of postural correction exercises and ergonomic advice leads to significant improvements in FHP, muscle strength, muscle length, and reduction in neck pain and disability among dental postgraduate students with UCS. These findings support the incorporation of physiotherapy-based postural correction programs in the prevention and management of MSDs in dental professionals.

REFERENCES

[1] Rajeswari SR, Rajula PB, Gowda TM, Kumar TAB, Shankar PLR, Mehta DS. Upper crossed syndrome and dentistry: Why the need for concern. Biomed J Sci & Tech Res.2017;1(7):1860-62. Doi: 10.26717/BJSTR.2017.01.000567.
[2] Ranđelović I, Jorgić B, Antić V, Hadžović M. Effects of exercise programs on upper crossed syndrome: A systematic review. Phys Educ Sport Through Centur. 2020;7(2):152-168. Doi: 10.2478/spes-2020-0012.
[3] Chang MC, Choo YJ, Hong K, Boudier-Reveret M, Yang S. Treatment of upper crossed syndrome: A narrative systematic review. Healthcare (Basel). 2023;11(16):2328. Doi: 10.3390/healthcare11162328.
[4] Arif T, Shakil Ur Rehman S, Ikram M. Effects of cervical stabilisation exercises on respiratory strength in chronic neck pain patients with forward head posture. J Pak Med Assoc. 2022;72(8):1635-38. Doi: 10.47391/JPMA.4226.
[5] Kadu DV, Shetye JV. Reliability of "MB-ruler software" to measure craniovertebral angle using the photographic method. *J Health Allied Sci NU*. 2022;12(3):307-11. Doi: 10.1055/s-0041-1741415.
[6] Leggat PA, Kedjarune U, Smith DR. Occupational health problems in modern dentistry: A review. Ind Health. 2007;45(5):611-21. Doi: 10.2486/indhealth.45.611.
[7] Ohlendorf D, Erbe C, Nowak J, Hauck I, Hermanns I, Ditchen D, et al. Constrained posture in dentistry–A kinematic analysis of dentists. BMC Musculoskelet Disord. 2017;18(1):291. Doi: 10.1186/s12891-017-1650-x.
[8] Rajvanshi H, Anshul K, Mali M, Sarin S, Zaidi I, Kumar VR. Ergonomics in dentistry: An ounce of prevention is better than pounds of cure: A review. Int J Sci Stud. 2015;3(6):183-87. Doi: 10.17354/ijss/2015/419.
[9] Meisha DE, Alsharqawi NS, Samarah AA, Al-Ghamdi MY. Prevalence of work-related musculoskeletal disorders and ergonomic practice among dentists in Jeddah, Saudi Arabia. Clin Cosmet Investig Dent. 2019;11:171-79. Doi: 10.2147/CCIDE.S204433.
[10] Firouzjah MH, Firouzjah EMAN, Ebrahimi Z. The effect of a course of selected corrective exercises on posture, scapula-humeral rhythm and performance of adolescent volleyball players with upper cross syndrome. BMC Musculoskelet Disord. 2023;24(1):489. Doi: 10.1186/s12891-023-06592-7.
[11] Im B, Kim Y, Chung Y, Hwang S. Effects of scapular stabilization exercise on neck posture and muscle activation in individuals with neck pain and forward head posture. J Phys Ther Sci. 2015;28(3):951-55. Doi: 10.1589/jpts.28.951.
[12] Kang JI, Choi HH, Jeong DK, Choi H, Moon YJ, Park JS. Effect of scapular stabilization exercise on neck alignment and muscle activity in patients with forward head posture. J Phys Ther Sci. 2018;30(6):804-08. Doi: 10.1589/jpts.30.804.
[13] Nitayarak H, Charntaraviroj P. Effects of scapular stabilization exercises on posture and muscle imbalances in women with upper crossed syndrome: A randomized controlled trial. J Back Musculoskelet Rehabil. 2021;34(6):1031-40. Doi: 10.3233/BMR-200088.
[14] Shirzaei M, Mirzaei R, Khaje-Alizade A, Mohammadi M. Evaluation of ergonomic factors and postures that cause muscle pains in dentistry students' bodies. J Clin Exp Dent. 2015;7(3):e414-e418. Doi: 10.4317/jced.51909.
[15] Syed FA, Zahoor IA, Shabbir S, Rana AA, Ibrahim M, Ghaffar E. Effects of active release technique and active isolated stretching on muscles of upper cross syndrome. Pak Biomed J. 2022;5(7):334-39. Doi: 10.54393/pbmj.v5i7.621.
[16] Mapi Research Trust. Neck Disability Index [Internet]. Lyon (FR): Mapi Research Trust; 2023 [cited 2023 Apr 7]. Available from: https://eprovide.mapi-trust.org/instruments/neck-disability-index.
[17] Farrar JT, Young JP Jr, LaMoreaux L, Werth JL, Poole RM. Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale. Pain. 2001;94(2):149-58.
[18] Janda V. Muscles and motor control in cervicogenic disorders. In: Grant R, editor. Physical Therapy of the Cervical and Thoracic Spine. New York: Churchill Livingstone; 1994. p. 195-216.

[19] Bolandian P, Rajabi R, Alizadeh M, Sohrabi A, Miri H, Bolandian A. Efficacy of eight weeks of exercise therapy for neck pain among general dentists. *J Islam Dent Assoc Iran*. 2015;27(2):104-08.

[20] Seidi F, Bayattork M, Minoonejad H, Andersen LL, Page P. Comprehensive corrective exercise program improves alignment, muscle activation and movement pattern of men with upper crossed syndrome: Randomized controlled trial. Sci Rep. 2020;10(1):20688.

[21] Chithra PV, Vishwanath S. Prevalence of upper-cross syndrome in college-going students: A cross-sectional study. Int J Res Med Sci. 2023;11(1):284-88. Available from: https://www.msjonline.org/index.php/ijrms/article/view/11485.

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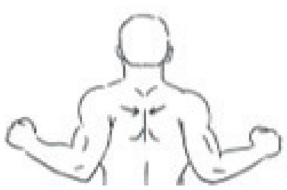
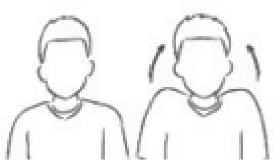
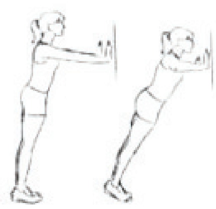
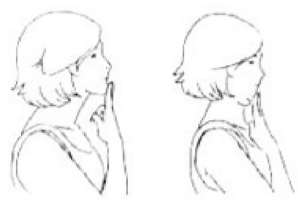
ANNEXURE I -EXERCISE PROTOCOL

EXERCISE	EXPLANATION
	**Doorway Chest Stretch:** Perform this stretch 3–4 times per session, holding for 30–45 seconds, and repeat it 5–7 times a week. Stand at the edge of a doorway with your arms raised sideways up to 90°, palms forward, and elbows bent at 90°. Place one foot forward and lean in gently until you feel a stretch across your chest and shoulders.
	**Child's Pose (Back Stretch):** Do this stretch 3–4 times, holding for 30–45 seconds, and aim for 5–7 sessions weekly. Begin in a crawling position and sit back onto your ankles while stretching both arms forward as far as possible, allowing your lower back to arch and relax into the stretch.
	**Upper Trapezius Stretch:** Repeat this 3–4 times per side, holding each stretch for 30–45 seconds, done 5–7 times a week. Sit upright with your head in a neutral position, place your left hand behind your back, tuck your chin in, and use your right hand to gently pull your head sideways toward the right shoulder. Repeat on the opposite side.
	**Levator Scapulae Stretch:** Perform this 3–4 times on each side, holding for 30–45 seconds, 5–7 times a week. Sit at the edge of a chair with your feet flat and reach under the chair with your left hand to stabilize. Turn your chin toward your right armpit and use your right hand over your head to deepen the stretch. Switch sides and repeat.
	**Scapular Retractions:** Do 20 repetitions per session, holding each for 5 seconds, 2–3 times weekly. Stand or sit upright, raise both arms to your sides, and draw them backward while squeezing your shoulder blades together.
	**Shoulder Shrugs:** Perform 20 repetitions, holding for 5 seconds each, 2–3 times a week. Raise your shoulders toward your ears, hold briefly, and then relax them back to the starting position.
	Wall Slides: Complete 20 repetitions, holding each for 5 seconds, 2–3 times per week. With your back to the wall, arms raised and elbows bent, steadily raise and lower your arms while keeping them in touch with the wall.
	**Wall Push-Ups:** Do 2 sets of 15 repetitions, 2–3 times per week. Stand facing a wall with palms pressed against it, lean slightly forward, and lower your chest while keeping elbows straight and your body aligned. Push back to starting position and repeat.
	Chin Tucks: Repeat 15 times for 3 sets, holding each for 5–10 seconds, 2–3 times per week. Sit or stand tall, relax your shoulders, and gently draw your chin back as if creating a double chin. Hold, then return to the neutral position.

Ergonomic Advice:

- Avoid sitting for long periods; take regular micro-breaks throughout the day.
- Set reminders or timers to help you move and stretch frequently.
- Keep your elbows at a 90-degree angle when working at a desk.
- Sit with your feet flat on the floor and shoulders relaxed.
- Use an ergonomic chair that offers proper lumbar (lower back) support.
- Place tools and instruments within easy reach to avoid overreaching.
- Use magnification aids to reduce the need to lean forward.
- Organize your workspace to encourage a neutral, comfortable posture.