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Comparitive effect of Kendall Exercise with conventional therapy and comprehensive corrective exercise program in individuals with upper crossed syndrome

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Abstract
Upper Cross Syndrome (UCS) is a common postural disorder which is marked by a muscular imbalance involving tight upper trapezius, levator scapulae, and pectoral muscles together with weak deep neck flexors and scapular stabilizers. It develops as a result of prolonged use of smartphones and of maintaining fixed sitting postures, especially amongst young adults. The Kendall exercises are designed to correct the muscle imbalance by means of stretching and strengthening, whereas a Comprehensive Corrective Exercise Program (CCEP) places an emphasis on neuromuscular re-education and functional integration. The purpose of this study was to compare the effects of Kendall exercise together with conventional therapy and of Kendall exercise combined with CCEP on pain, disability, postural alignment and muscular imbalance in people with UCS. A pre-test and post-test comparative study was carried out among 30 individuals aged between 18 and 25 years who had UCS. The participants were chosen by convenience sampling and then randomly divided into two groups of 15 each. Group A was given Kendall exercises in conjunction with conventional therapy, while Group B was given Kendall exercises along with CCEP for a period of six weeks. Pain, disability, postural alignment and muscular imbalance were evaluated before and after the intervention using standardised outcome measures. Both groups showed significant improvements in pain, disability, postural alignment and muscular imbalance. Nevertheless, Group B showed greater post-test differences than Group A, the t-values being 5.1446 for pain, 4.6864 for disability, 6.2342 for postural alignment and 9.2406 for muscular imbalance. The study shows that combining CCEP with Kendall exercise is more effective in reducing pain and disability and in improving postural alignment and muscular imbalance in individuals with UCS. The results indicate that CCEP offers further benefits over conventional therapy when it comes to postural correction.

Keywords: Upper Cross Syndrome, Kendall Exercise, comprehensive corrective exercise program, pain, disability, and postural alignment due to muscular imbalance

Introduction

Upper Crossed Syndrome (UCS) is a common musculoskeletal condition marked by a distinct pattern of muscular imbalance and postural dysfunction. This disorder results from sustained poor posture, which causes tightness and weakness in the muscles of the neck, shoulder, and upper back, intersecting between the dorsal and ventral aspects of the body [1]. Upper Crossed Syndrome, also known as "Cervical Crossed Syndrome," was coined by Vladimir Janda in 1979. There are two major categories of derangements: tightness and weakness. The tight muscle group includes the upper trapezius, pectoralis major, and levator scapulae, while a weakening group comprises the rhomboids, middle trapezius, lower trapezius, serratus anterior, and deep neck flexors, frequently including the scalene muscles [2]. The global prevalence of UCS is estimated to range from 10 to 20%, with varying rates observed in different populations. The prevalence rate varies by employment, with IT professionals showing a prevalence of 67%, students having a prevalence of 37.1%, and laundry employees having a prevalence of 28%, among many other professionals who work in a slouched position for an extended duration [3, 4]. Clinical features includes an increase in cervical lordosis, thoracic kyphosis, hunching of the thoracic spine (rounded upper back), forward head posture and shoulder protraction, winging of the scapula, and reduced motion of the thoracic spine. Common symptoms include chest pain, migraine and tension headache, neck, shoulder or upper back pain, sore shoulder blades, pain in the jaw, tiredness, strain in the back of the neck, which is accompanied by weakness in front, neck stiffness, mid-back pain, pain, numbness, and tingling in the upper arm. Hypertonicity may precipitate in the upper trapezius, levator scapulae, pectoralis major, and sternocleidomastoid [5, 6]. These abnormalities can cause structural changes in the body, such as forward shoulders, kyphosis, forward head posture, rounded shoulders, humpback, a reduced degree of lordosis in the cervical region, and the occurrence of emphasis on the neck and shoulder, and can cause pain and numbness and reduce neurological function, musculoskeletal function, and biokinematic function of the body. In addition, upper crossed syndrome can interfere with shoulder function, especially in athletes who perform overhead movements continuously or provide excessive loading to the shoulder, which will lead to muscle imbalance, a high risk of injury, and decreased performance

and functional movement in athletes [7]. Diagnostic criteria for UCS involve assessing the imbalance of shoulder, neck, and chest muscles, the inward curving of the spine at the neck, and the protrusion of the shoulder blades. Assessment of UCS starts with observation. The accurate standing posture, when viewed from the lateral side in a plumb line, normally passes through the ear, shoulder region, greater trochanter, and slightly anterior to the lateral malleoli [1]. Postural evaluation of patients with UCS express a forward head and neck posture with upper cervical lordosis, protracted and elevated shoulders, thoracic hyper-kyphosis, and scapular winging. On palpation, tenderness or trigger point activity will be present in the above-mentioned muscles as well as simultaneously weak rhomboids, serratus anterior, middle trapezius & lower trapezius, deep neck flexors, and scalenes [6]. Upper Crossed Syndrome is associated with significant postural deviations accompanied by clinically meaningful reductions in cervical and shoulder range of motion and increased neck and shoulder-related functional disability, which were consistently linked to impaired joint mobility and higher disability scores, highlighting the functional relevance of these postural alterations rather than viewing them as benign variations [8]. Kendall Exercises (KE) were first described by Florance Kendall to correct the acquired postural fault of forward head posture, kyphosis and rounded shoulders. This technique comprises four exercises, including stretching the tight neck extensors and pectoral muscles, and strengthening the weak deep neck flexors and scapular retractors. Kendall's technique is recommended to correct head and shoulder faulty postures and improve mobility and functional ability of the neck and shoulder complex [9]. The Kendall Exercise, a general treatment method, emphasizes the posture and vertebral alignment. Kendall's method has become a cornerstone in postural rehabilitation, particularly for addressing deviations in the cervical spine and shoulder girdle. It includes targeted exercises that improve the function of the deep cervical flexors, scapular retractors and thoracic extensors, aiming to reduce postural strain and improve biomechanical efficiency. However, the effectiveness of this method can vary depending on the population and the degree of postural deviation [10, 11]. The Comprehensive Corrective Exercise Program, as described by Foad Seidi and his colleagues, is structured in three phases – initial phase, improvement phase and maintenance phase – focusing on postural alignment, neuromuscular re-education, and long-term correction. It combines stretching, strengthening, and control-based exercises progressing in load and complexity. The general purpose of this approach is to pay attention to alignment, muscle activation, and movement pattern simultaneously across the whole body rather than at just a single site during both the assessment and correction phases [12, 13]. The National Academy of Sports Medicine (NASM) and Comprehensive Corrective Exercise Program (CCEP) address the cause of imbalances and incorrect movement patterns that lead to problems with posture, balance, and systemic coordination, then modify the imbalances that improve overall exercise quality. CCEP would significantly correct and enhance strength, alignment, posture, and movement patterns associated with UCS, with a focus on sustaining these improvements during the detraining period [14, 15]. Numerical Pain Rating Scale (NPRS) is used to assess pain, and the Neck Disability Index (NDI) is used to assess disabilities in the neck [16, 7]. Measurement of the craniovertebral angle using Kinovea software is used to assess forward head posture. The cranio-cervical flexion test is used to assess the maximal muscle strength and muscle endurance of the deep cervical flexor muscle group [17, 18, 19].

Methodology

Aim: The aim of the study is to determine the effect of Kendall Exercises along with Conventional Therapy versus Kendall Exercise along with Comprehensive Corrective Exercise Program on pain, disability, postural alignment and muscular imbalance in individuals with Upper Crossed Syndrome.

Selection of subjects: A total of 30 individuals with upper crossed syndrome ranging from 18 to 25 years were selected based on selection criteria using convenience sampling method.

Procedure: Students between the age group of 18 to 25 years of K.G. college of Physiotherapy were assessed and the subjects who fulfilled the inclusion criteria were selected for the study. A total of 30 participants were recruited using a convenience sampling method. Written informed consent was obtained from all participants prior to the commencement of the intervention. The participants were then randomly allocated into two groups, with 15 subjects assigned to Group A and 15 subjects to Group B. Group A received Kendall Exercise along with Conventional Therapy for 45 minutes, 3 sessions per week for 6 weeks. Group B received Kendall Exercise along with Comprehensive Corrective Exercise Program for 45 minutes, 3 sessions per week 6 weeks. Each session began with 5 minutes of warm-up and ended with 5 minutes of cool-down, and all exercises were performed under supervision. 30 subjects in 2 groups underwent assessments using the outcome measures at the beginning of treatment, and at the end of 6 weeks.

Group- A

Kendall Exercise Along with Conventional Therapy

Exercise	Dosage	Description
Strengthening of deep cervical flexors.	5 sets of 10 repetitions, each set interrupted by 30s break.	Chin tucks in supine lying with the head in contact with the floor. Progression from the third week by lifting the head off the floor in a tucked position and holding it for 2–8s.
Stretching the cervical extensors.	Five repetitions were held for 60s each and followed by 60s break.	A chin drop-in sitting progresses by chin drop with hand assistance by placing both hands on the occipital area.
Strengthening shoulder retractors.	Five sets of 10 repetitions, each set interrupted by 30s break.	Shoulder retraction from standing by holding a TheraBand moving scapular blades inwards. Progression to prone lying weight-free then using the weight

		of 1 kg.
Stretching the pectoralis muscle.	Five repetitions were held for 60s each and followed by 60s break.	Pectoral Stretch using the door frame or wall. Progresses by increasing the force of stretch as tolerated.
Moist heat therapy	5 minutes	Hot pack applied to the cervical and upper thoracic region to reduce muscle stiffness and pain.
Neck isometrics	5 repetitions each	Isometric exercises for cervical flexors, extensors and lateral flexors to improve muscle strength and stability.
Thoracic twists	10 repetitions on each side	Active thoracic rotation exercises to improve thoracic spine mobility.
Postural education		Education on correct posture including sitting posture correction, desk and screen height modification, and taking regular breaks during prolonged sitting.

Group- B

Kendall Exercise Along with Comprehensive Corrective Exercise Program

Exercise	Dosage	Description
Strengthening of deep cervical flexors.	5 sets of 10 repetitions, each set interrupted by 30s break.	Chin tucks in supine lying with the head in contact with the floor. Progression from the third week by lifting the head off the floor in a tucked position and holding it for 2–8s.
Stretching the cervical extensors.	Five repetitions were held for 60s each and followed by 60s break.	A chin drop-in sitting progresses by chin drop with hand assistance by placing both hands on the occipital area.
Strengthening shoulder retractors.	Five sets of 10 repetitions, each set interrupted by 30s break.	Shoulder retraction from standing by holding a TheraBand moving scapular blades inwards. Progression to prone lying weight-free then using the weight of 1 kg.
Stretching the pectoralis muscle.	Five repetitions were held for 60s each and followed by 60s break.	Pectoral Stretch using the door frame or wall. Progresses by increasing the force of stretch as tolerated.

CCEP

Initial Phase: 2 Weeks

Exercise	Intensity/ Duration	Equipment
1. Lying supine on the foam roller in three different arm abduction angles.	From 10 s hold × 7 to 15 s hold × 10.	Foam roller.
2. Side lying external rotation.	From 10 s hold × 7 to 15 s hold × 10.	
3. Side lying forward flexion.	From 10 s hold × 7 to 15 s hold × 10.	
4. Standing diagonal flexion.	From 10 s hold × 7 to 15 s hold × 10.	
5. Military press.	From 10 s hold × 7 to 15 s hold × 10.	

Improvement Phase: 4 Weeks

Exercise	Intensity/ Duration	Equipment
6. Side lying external rotation with dumbbell.	From 10 repetitions × 5 to 15 repetitions × 6.	Dumbbell.
7. Side lying forward flexion with dumbbell.	From 10 repetitions × 5 to 15 repetitions × 6.	Dumbbell.
8. Standing diagonal flexion with dumbbell.	From 10 repetitions × 5 to 15 repetitions × 6.	Dumbbell.
9. Standing external rotation with Thera-band.	From 10 repetitions × 5 to 15 repetitions × 6.	Thera-Band.
10. Standing diagonal flexion with Thera-band.	From 10 repetitions × 5 to 15 repetitions × 6.	Thera-Band.
11. Abduction in sitting on a training ball.	From 10 repetitions × 5 to 15 repetitions × 6.	Swiss ball.
12. V, T, and W exercises in prone lying on a training ball.	From 10 repetitions × 5 to 15 repetitions × 6.	Swiss ball.

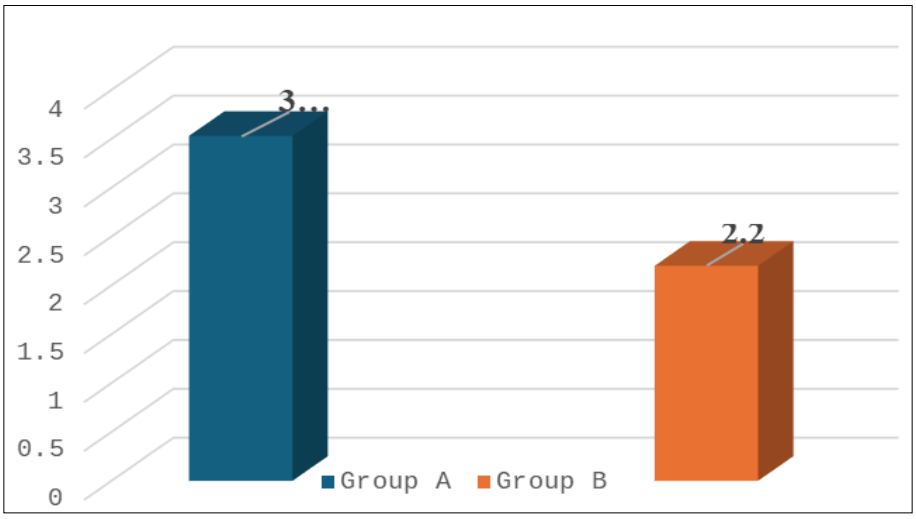
Maintenance Phase: 6 Weeks

The exercises are the same as in the improvement phase without any progression in intensity and frequency.

Numerical Pain Rating Scale

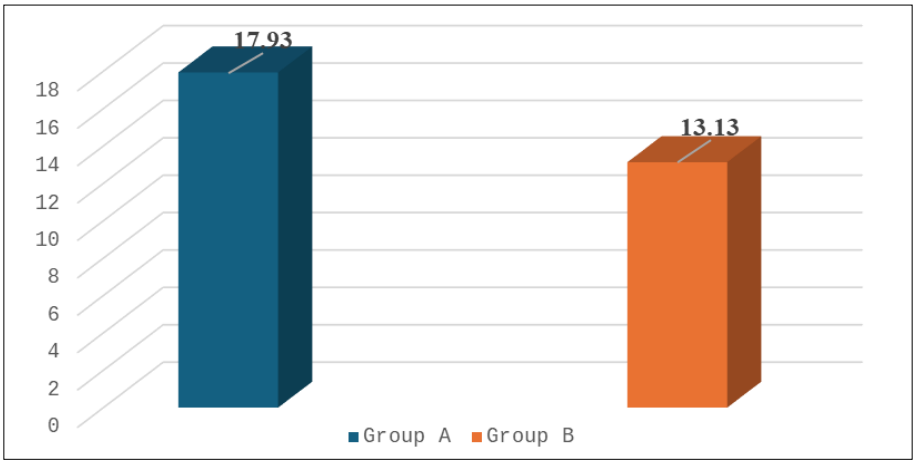
Unpaired 'T' Test - Group-A versus Group-B

S.n	Group	Mean value	Mean difference	Standard deviation	Unpaired 't' test value
1	Group A	3.53	1.33	0.83	5.1446
2	Group B	2.20		**0.56**	



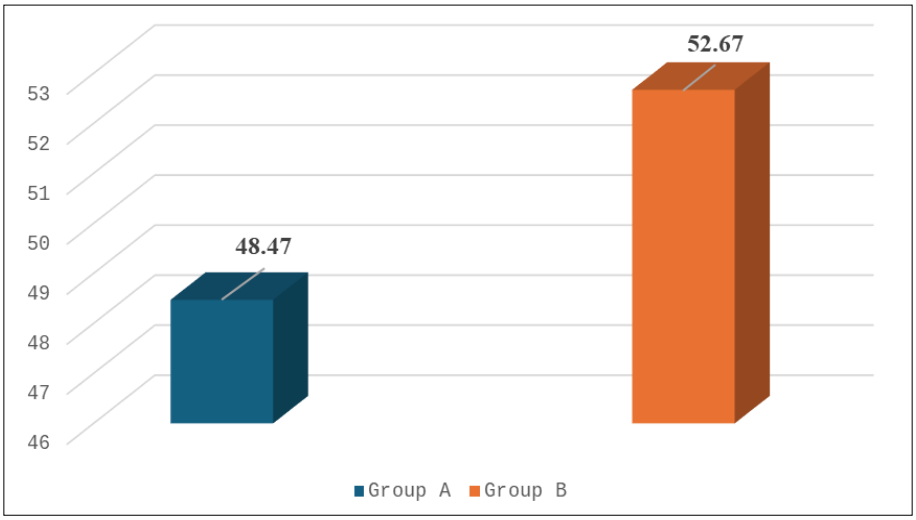
Neck disability index
Unpaired 't' test - Group-A versus Group-B

S.n	Group	Mean value	Mean difference	Standard deviation	Unpaired 't' test value
1	Group A	17.93	4.8	2.81	4.6864
2	Group B	13.13		2.80	



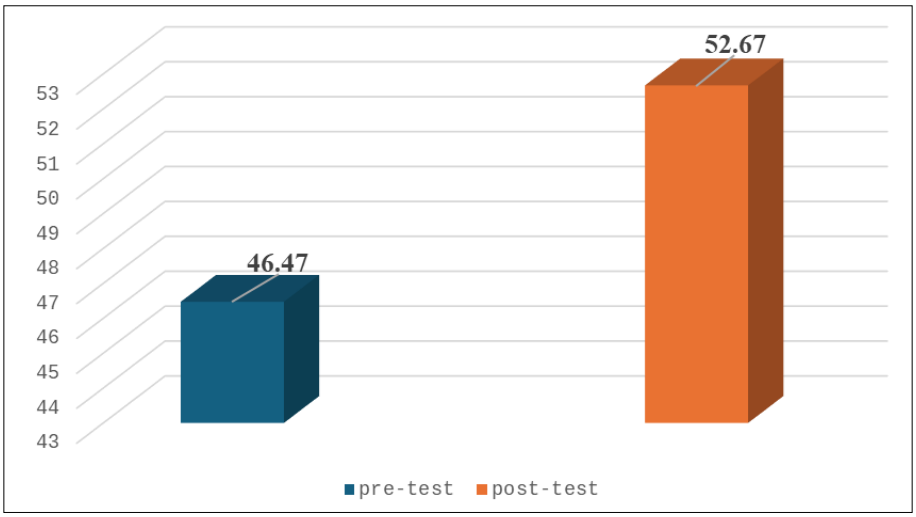
Craniovertebral Angle
Unpaired 't' test - Group-A versus Group-B

S.n	Group	Mean value	Mean difference	Standard deviation	Unpaired 't' test value
1	Group A	48.47	4.2	1.85	6.2342
2	Group B	52.67		1.84	



Cranio-cervical Flexion Test
Unpaired 't' test - Group-A versus Group-B

S.n	Group	Mean value	Mean difference	Standard deviation	Unpaired 't' Test Value
1	Group A	36.60	9.47	2.90	9.2406
2	Group B	46.07		2.71	



Result

The subjects participated in this study were between 18 to 25 years of age in both Group A (Table I) and Group B (Table II). The gender distribution in Group A consisted of 4 males and 11 females (Table III), whereas Group B included 6 males and 9 females (Table IV).

The effects of Kendall Exercises along with Conventional Therapy in Group A were analyzed by comparing the pre-test and post-test values using the paired 't' test. The paired 't' test value for the Numerical Pain Rating Scale (NPRS) in Group A was 14.7886 (Table V), indicating a significant reduction in pain. The paired 't' test value for the Neck Disability Index (NDI) in Group A was 29.7867 (Table VIII), showing a significant improvement in disability. The paired 't' test values for craniovertebral angle and cranio-cervical flexion test in Group A were 12.4746 (Table XI) and 25.2562 (Table XIV), respectively, indicating improvement in postural alignment and muscular imbalance.

The effects of Kendall Exercise along with Comprehensive Corrective Exercise Program in Group B were analyzed by comparing the pre-test and post-test values using the paired 't' test. The paired 't' test value for Numerical pain rating scale in Group B was 17.0756 (Table VI), indicating a greater reduction in pain compared to Group A. The paired 't' test value for Neck disability index in Group B was 37.7500 (Table IX), demonstrating a significant reduction in disability. The paired 't' test values for craniovertebral angle and cranio-cervical flexion test in Group B were 42.8327 (Table XII) and 50.6934 (Table XV), respectively, showing marked improvement in postural alignment and muscular imbalance.

The unpaired 't' test was used to compare the post-test values between Group A and Group B. The unpaired 't' test value for Numerical pain rating scale was 5.1446 (Table VII), for Neck disability index was 4.6864 (Table X), for craniovertebral angle was 6.2342 (Table XIII), and for cranio-cervical flexion test was 9.2406 (Table XVI). These values indicate that the improvements observed in Group B were significantly greater than those in Group A.

Comparing the post-test values of both groups, it was observed that Group B, who underwent Kendall Exercise along with Comprehensive Corrective Exercise Program, showed significantly greater reduction in pain and disability and greater improvement in postural alignment and muscular imbalance than Group A, who underwent Kendall Exercise along with Conventional Therapy. Hence, the results of the study reject the null hypothesis and accept the alternate hypothesis.

Discussion

The purpose of this study is to find out the effect of Kendall Exercise along with Conventional Therapy versus Kendall Exercise along with Comprehensive Corrective Exercise Program on pain, disability, postural alignment and muscular imbalance in individuals with Upper Crossed Syndrome.Upper Crossed Syndrome refers to specific altered muscle activation and changed movement patterns along with some postural deviations in the upper quarter of the body, which may contribute to dysfunction of the cervicothoracic and glenohumeral joints.

Individuals with Upper Crossed Syndrome have problems around neck and shoulder muscles which may lead to postural malalignment, loss of postural control and reduced awareness about postural maintenance.

Hence, treating Upper Crossed Syndrome with a combination of Kendall Exercise and Comprehensive Corrective Exercise Program is essential to reduce pain and disability, normalize postural alignment and correct the muscular imbalances. It is also essential in maintaining the posture during functional activities.

Pain reduction observed in the experimental group may be attributed to improved biomechanical alignment and balanced muscle activation. Recent evidence suggests that Corrective Exercise Programs addressing both muscle imbalance and movement control significantly reduce mechanical stress on cervical and shoulder structures, thereby decreasing pain perception. Stretching of shortened

muscles along with activation of inhibited stabilizers likely reduced abnormal loading patterns contributing to pain.

Functional disability showed marked improvement following the Kendall Exercise along with Comprehensive Corrective Exercise Program. Postural correction combined with functional movement retraining enhances task efficiency and reduces compensatory movement strategies, leading to improved performance of daily activities. The inclusion of neuromuscular re-education and posture awareness within CCEP may explain the greater reduction in disability scores observed in this study.

Postural alignment, assessed through craniovertebral angle, improved significantly in participants receiving Kendall Exercises along with CCEP. Recent studies emphasize that posture-focused exercise programs incorporating motor control and proprioceptive feedback produce more consistent alignment changes than isolated strengthening protocols**.** Continuous reinforcement of correct alignment during dynamic activities may have contributed to sustained postural improvements.

Improvements in muscular imbalance is evident through enhanced deep cervical flexor performance and reduced pectoralis tightnessCombined corrective exercise programs improve deep cervical muscle endurance and normalize muscle length–tension relationships more effectively than Conventional postural exercises alone. The integrated nature of CCEP likely facilitated coordinated muscle recruitment while reducing dominance of superficial muscles commonly seen in UCS.

Overall, the results of this study align with recent evidence supporting the use of integrated Corrective Exercise Strategies for postural dysfunction. While Kendall Exercises effectively address specific muscle imbalances, their combination with a Comprehensive Corrective Exercise Program provides a more holistic intervention by targeting postural alignment, neuromuscular control, and functional movement patterns. This combined approach of Kendall Exercise and Comprehensive Corrective Exercise Program appears to offer superior clinical benefits in reducing pain, minimizing disability, improving posture, and correcting muscular imbalance in individuals with Upper Crossed Syndrome.

Conclusion

The findings of this study highlight that although Kendall Exercise along with Conventional Therapy is beneficial in correcting muscle imbalance and improving posture, their effectiveness is significantly enhanced when integrated with a Comprehensive Corrective Exercise Program. This approach addresses not only isolated muscular deficits but also faulty movement patterns, impaired postural control, and reduced postural awareness commonly observed in individuals with upper crossed syndrome.

Limitations and Recommendations

- The study focused on individuals between the age of 18 to 25 years only.
- The study included a smaller sample size.
- Follow-up assessment was not taken.
- Photographic method was the only tool used to measure craniovertebral angle.
- Future studies can be done including a larger sample size and other variables.
- Follow-up assessment can be taken to evaluate the postural maintenance even after detraining.
- Other radiographic examinations can use used to measure craniovertebral angle.

References

1. Usman T, Babur MN, Aslam E, Rashid MAB, Aslam K, Azam A. Effects of Kendall exercises vs Gong's mobilization on Upper Crossed Syndrome: Kendall Exercises vs. Gong's Mobilization in UCS. J Health Rehabil Res,2024:4(3):1–6. doi:10.61919/jhrr.v4i3.1298.
2. Priyanka S, Prisya MS, Lokesh R. Effectiveness of Pilates exercise and Alexander's technique with corrective exercise among lactating women with Upper Crossed Syndrome – a comparative study. Int J Healthcare Sci,2025:13(1):579–582. doi:10.5281/zenodo.16894323.
3. Akram M, Naqvi R, Liaquat F, Tahira A, Talha M, Zohaib R. Effects of Multimodal Therapy versus Myofascial Release Techniques in Patients with Upper Crossed Syndrome. The Healer Journal of Physiotherapy and Rehabilitation Sciences,2025:5(1):116–123. doi:10.55735/etv2q968.
4. Chaudhuri S, Chawla JK, Phadke V. Physiotherapeutic interventions for Upper Crossed Syndrome: a systematic review and meta-analysis. Cureus,2023:15(9):e45471. doi:10.7759/cureus.45471.
5. Journal of Medical, Pharmaceutical and Allied Sciences (JMPAS). Volume 11, Special Issue – April 2022. India: Medic Scientific, 2022, 11(9).
6. Mol N, Ashok A, Dhanesh Kumar KU. Upper Crossed Syndrome: trends and recent advances in the physiotherapy treatment — a narrative review. J Pharm Res Int,2021:33(64B):359–367.
7. Wiranatha MBK, Putra IPYP, Saraswati PAS, Kinandana GP. The relationship between upper crossed syndrome posture and shoulder disability. Phys Ther J Indones,2024:5(2):137–141. doi:10.51559/ptji.v5i2.209.
8. Rizwan, Bibi M, Hafeez T, Wajid W, Kifayat M, Umar M. Impact of Upper Crossed Syndrome on Shoulder and Cervical Range of Motion and Functional Performance in University Students. J Health Wellness Community Res,2025:3(18):e1027. doi:10.61919/xbd7yz64.
9. Abu-Taleb W, Yamany AAR, Aneis YM, Abu El Kasem ST. Effect of adding global postural reeducation to Kendall exercises for treating asymptomatic forward head posture: a single-blinded randomized controlled trial. J Bodywork Mov Ther,2025:42:938-947. doi:(10).1016/j.jbmt. 2025.01.039.
10. Rahul S, Anitha A, Kamalakannan M, Ramana K. Effectiveness of Kendall exercise for forward head posture among IT workers. Indian J Physiother Occup Ther, 2024, 18(Special Issue).
11. Rasool A, Iftikhar N, Khan R, Idrees K, Affi A, Munir T. Comparative effects of Kendall's exercises versus scapular stabilisation in patients with rounded shoulders. The Healer J Physiother Rehabil Sci,2025:5(2):297–303.
12. Gadara PB, Singh AK. Effectiveness of Janda's approach versus comprehensive corrective exercise program on posture and muscle imbalance in

individuals with Upper Crossed Syndrome. Int J Health Sci Res, 2025, 15(5).
13. Bayattork M, Seidi F, Minoonejad H, Andersen LL, Page P. The effectiveness of a comprehensive corrective exercises program and subsequent detraining on alignment, muscle activation, and movement pattern in men with upper crossed syndrome: protocol for a parallel-group randomized controlled trial. Trials,2020:21:25(5). doi:10.1186/s13063-020-4159-9.
14. Ogino H, Daniels M, Volberding J. The effectiveness of corrective exercises to improve posture in patients with Upper Crossed Syndrome and scapula dyskinesis: a critically appraised topic. Poster presented at: Oklahoma State University Center for Health Sciences Research Week 2022, 2022, (2).
15. Ajith A, Mahto P. The effect of a comprehensive corrective exercise program on strength, posture and movement pattern on gym trainees with Upper Crossed Syndrome: a randomized controlled trial. Tuijin Jishu/Journal of Propulsion Technology,2024:46(03):4851–4854.
16. Krishna P, Shukla M. Effectiveness of Janda's Approach for Upper Crossed Syndrome: A systematic review. Arch Sports Med Physiother,2025:10(1):001–004. doi:10.17352/asmp.000021.
17. Zárate Tejero CA, Rodríguez Rubio PR, Brandt L, Krauss J, Hernández Secorún M, Hidalgo García C, *et al*. Measuring craniovertebral angle reference values in adults using Kinovea software. Appl Sci,2024:14(19):8639. doi:10.3390/app14198639.
18. Daneshjoo A, Mousavi Sadati SK, Pourahmad F. Effect of corrective exercise vs corrective games on upper crossed syndrome in female students. Physical Treatments,2024:11(1):13–24.
19. Wu M, Yi W, Su Q, Huang Y, Zhao Q, Liu S. The predictive value and influencing factors of craniocervical flexion test for patients with chronic non specific neck pain: a case control study. J Pain Res,2024:17:3817–3828. doi:10.2147/JPR.S482325.
20. Shahzad H, Fatima A, Ahmad A, Khan ZA, Gilani SA. Effectiveness of routine physical therapy with and without muscle energy technique in patients with upper crossed syndrome. Rawal Med J,2022:47(3):656-659.
21. Vaishnavi G, Dinesh Kumar S, Mohan Kumar G, Kirupa K, Tharani G, Eliza Giftson T, *et al*. A study to analyse the effect of McKenzie's method of exercise to treat upper crossed syndrome associated with cervicogenic headache. Biomedicine,2021:41(4):855858. doi:10.51248/. v41i4.499.
22. Khosravi Z, Mohammad Ali Nasab Firouzjah E, Homayounnia Firouzjah M. Comparison of balance and proprioception of the shoulder joint in girls with and without upper crossed syndrome. BMC Musculoskeletal Disorders,2024:25(1):618. doi: 10.1186/s12891-024-07552-5. PMID: 39095725.
23. Karimian R, Rahnama N, Ghasemi G, Lenjannejadian S. Association between upper-extremity musculoskeletal disorders and upper crossed syndrome among teachers, and the effects of NASM corrective exercises along with ergonomic intervention on their upper-extremity musculoskeletal disorders. Stud Med Sci,2021:31(4):10–15.
24. Russin NH, Robertson C, Montalvo A. Upper Crossed Syndrome in the Workplace: A Narrative Review with Clinical Recommendations for Non-Pharmacologic Management. Int J Environ Res Public Health,2026:23(1):120. doi:10.3390/ijerph23010120.
25. Kalantariyan M, Sadeghi M, Samadi H. Manual massage versus foam rolling within the NASM corrective framework: a trial for upper crossed syndrome rehabilitation in university students. Sci Rep, 2026. [ePub ahead of print]. doi:10.1038/s41598-026-35030-6. PMID: 41588041.
26. Agarwal K, Baruah Hazra C, Mukherjee S, Kumar D, Ballav R, Parveen S, *et al*. Prevalence of upper crossed syndrome and pre-presbyopic symptoms among handloom cluster of West Bengal. Arch Physiother Rehabil,2026:9(1):37–45. doi:10.26502/fapr0034.
27. Siddique A, Prveen N, Ejaz U, Awan IZ, Zahid M, Shabbir HM, *et al*. The Reliability and Validity of Neck Disability Index-Urdu Mobile App in Chronic Mechanical Neck Pain Patients. JHWCR,2026:4(2):e1245.
28. Popli S, Lamba VK, Kumar R. Interventions for Forward Head Posture and Neck Disability among Administrative Population: A Systematic Review. J Adv Sport Phys Edu,2026:9(1):1–9. doi:10.36348/jaspe.2026.v09i01.001.
29. Kotowicz M, Zielińska M, Szajewski P, Zagórska A, Ciećwierz J, Koczkodaj M, *et al*. Pain Assessment in Palliative Medicine: Review of Pain Rating Scales. QualityinSport,2026:49:67342. doi:10.12775/QS.2026. 49.67342.
30. Fitri AA, Rahayu UB, Wahyuni. Craniovertebral Angle and Postural Control in Forward Head Posture: A Narrative Review. Maj Ilm Fisioter Indones (MIFI),2026:14(1):101–105. doi:10.24843/mifi.000001082.
31. Bhansali V, Arora M. To find if there is any relationship of craniovertebral angle with short deep cervical flexors strength and endurance, suboccipital muscle length and abdominal endurance – cross sectional study. Int J Prevent Ther Physio Rehab Sci, 2025, 4(3).