EFFECTIVENESS OF MANUAL THERAPY ON PAIN AND POSTURAL MODULATION IN INDIVIDUAL PRESENT WITH FORWARD HEAD POSTURE .

Abstract:

Forward Head Posture (FHP) is a common postural abnormality characterized by anterior positioning of the head relative to the body's vertical alignment, often associated with neck pain, muscle imbalance, reduced cervical mobility, and functional limitations. This study aims to evaluate the effectiveness of manual therapy on pain reduction and postural modulation in individuals presenting with forward head posture. Manual therapy techniques, including soft tissue mobilization, joint mobilization, and myofascial release, are widely used in physiotherapy to restore musculoskeletal function, improve alignment, and decrease discomfort. The intervention focuses on relieving muscular tension, enhancing cervical spine mobility, and correcting postural deviations. The expected outcomes include significant reduction in pain intensity, improvement in craniovertebral angle, better postural alignment, increased range of motion, and enhanced functional performance in daily activities. The findings of this study may support the clinical use of manual therapy as an effective non-invasive treatment approach for managing pain and improving postural control in individuals with forward head posture, thereby contributing to better quality of life and long-term musculoskeletal health.

Key words:-

Forward Head Posture (FHP), Manual Therapy, Pain Reduction, Postural Modulation, Cervical Spine, Postural Correction, Neck Pain, Craniovertebral Angle, Soft Tissue Mobilization, Joint Mobilization, Myofascial Release, Physiotherapy, Musculoskeletal Dysfunction, Cervical Mobility, Rehabilitation.

Introduction:-

Posture refers to the way different parts of the body are aligned with each other and with the gravitational line during both rest and movement.. Proper postural alignment allows the musculoskeletal system to maintain balance with minimal muscular effort and mechanical stress on joints and supporting structures. Forward Head Posture (FHP) is considered one of the most common postural abnormalities seen in the modern population.. It is characterized by the anterior displacement of the head relative to the trunk in the sagittal plane. This altered alignment shifts the center of gravity of the head forward, resulting in increased mechanical stress on the cervical spine and surrounding soft tissues. [1]. This postural deviation alters the normal biomechanics of the cervical spine and can lead to musculoskeletal dysfunction, pain, and reduced functional capacity.

Sustained forward head posture leads to characteristic musculoskeletal adaptations. Tightness commonly develops in the upper cervical extensors, sternocleidomastoid, levator scapulae, and upper trapezius muscles, whereas the deep cervical flexor muscles often become weak or inhibited. This imbalance contributes to altered muscle activation patterns and impaired postural stability [3]. Individuals presenting with forward head posture frequently report associated symptoms such as neck pain, headaches, reduced 2 cervical mobility, and functional limitations during daily activities. The prevalence of these symptoms has increased with the widespread use of computers, smartphones, and other digital devices that promote prolonged forward-flexed neck posture.

Manual therapy techniques are also widely used in physiotherapy practice to address musculoskeletal dysfunction. Techniques such as joint mobilization, soft tissue mobilization, myofascial release, and muscle energy techniques can improve joint mobility, reduce muscle tension, and facilitate neuromuscular control. These effects may contribute to improved postural alignment and reduction of neck pain[6]. These techniques can help reduce muscle tightness, improve circulation, and enhance neuromuscular control, thereby facilitating postural correction.

Previous studies have suggested that combining manual therapy with exercise-based rehabilitation may produce better clinical outcomes compared with exercise therapy alone. However, further investigation is required to determine the effectiveness of manual therapy specifically for improving postural modulation and pain in individuals with forward head posture. [7]. However, the effectiveness of manual therapy specifically for improving postural modulation and pain in individuals with forward head posture still requires further investigation.

Posture describes the spatial orientation of body segments relative to each other and to gravitational forces during both static and dynamic tasks. When alignment is optimal, the musculoskeletal system operates with minimal energy expenditure while placing reduced mechanical demand on passive structures such as ligaments, intervertebral discs, and joint capsules. (1,26). In the sagittal plane, ideal alignment is characterised by a vertical line passing through the external auditory meatus, acromion process, greater trochanter, a point slightly anterior to the knee joint axis, and a point slightly anterior to the lateral malleolus. This configuration allows gravitational forces to act close to joint axes, thereby minimising the muscular effort required to maintain an upright posture (1). Deviations from this ideal alignment redistribute mechanical load, heighten stress on supporting structures, and increase susceptibility to pain and functional impairment.

A. Epidemiology and Contributing Factors

Digital device proliferation has corresponded with escalating FHP incidence rates. Extended engagement with handheld technologies and desktop workstations promotes chronic cervical flexion posturing patterns and lifestyle-driven postural deterioration(20). Contributing factors include sustained sitting, ergonomically suboptimal workstation design, excessive mobile device usage, physical inactivity, repetitive forward-bending activities, and psychosocial stress—all promoting prolonged cervical flexion and musculoskeletal imbalancing (5). High prevalence of cervical postural abnormalities has been reported among students, office workers, and individuals engaged in prolonged computer use (6,8).

B. Pathomechanics of Forward Head Posture

Cervical pain in FHP populations reflects convergent biomechanical and neurophysiologic processes(9). Mechanistically, persistent anterior head displacement initiates multiple harmful cascades: (1) increased posterior element compressive loading, particularly affecting facet articulations; (2) aberrant disc stress distribution potentially generating discogenic pain signals; (3) sustained ligamentous and muscular tensioning producing microtraumatic changes and myofascial trigger development; (4) distorted arthrokinematics generating abnormal motion patterns and secondary inflammation responses.

C. Pain Mechanisms in Forward Head Posture

Pain experienced by individuals with forward head posture emerges from an interaction between biomechanical insult and neurophysiological response. Mechanically, the sustained anterior positioning of the head creates several deleterious effects: (1) increased compressive loading within the posterior elements of the cervical spine, particularly affecting the zygapophyseal (facet) joints; (2) abnormal stress distribution within intervertebral discs, potentially creating discogenic pain through nociceptive activation; (3) prolonged tensile stress on ligamentous and muscular stabilizers leading to microtrauma and myofascial trigger point development; and (4) altered arthrokinematics creating abnormal motion patterns and secondary inflammatory responses. (12)

Sustained muscular contraction resulting from postural compensation can impair local blood circulation, leading to tissue ischemia and the development of myofascial trigger points (12). At the neurophysiological level, persistent nociceptive input from sensitized cervical tissues may lead to central sensitization, a condition characterized by increased excitability of dorsal horn neurons and amplified pain perception (14).

Neurophysiological Contributors

Persistent nociceptive input may lead to central sensitization, characterized by increased excitability of dorsal horn neurons and amplified pain perception [14]. Therefore, effective management should address both mechanical correction and neuromuscular re-education.

Postural Modulation and Sensorimotor Control

Postural modulation encompasses the sensorimotor processes maintaining appropriate cephalic and cervical positioning throughout postural and functional tasks. Cervical musculature exhibits exceptional proprioceptive density through abundant spindle populations, facilitating sophisticated sensorimotor integration. (15). Research indicates that neck pain populations frequently demonstrate compromised cervical position sense and reduced deep cervical flexor endurance capacity, culminating in diminished postural stability and control. Therefore, effective rehabilitation must concurrently address structural positioning and sensorimotor reeducation. (11,10)

LITERATURE SURVEY:-

Walaa H. Elsayed et al., (2025) conducted a randomized controlled trial to investigate the impact of forward head posture correction programs on craniovertebral angle, neck disability, and spinal muscle activity. They examined 60 individuals with FHP distributed across two intervention pathways: regional cervicothoracic exercises versus comprehensive correction incorporating both cervicothoracic and lumbar-pelvic elements. Using CVA, NDI, and EMG as assessment tools, the broader intervention strategy generated significantly superior improvements across all outcome domains ($p < 0.05$), supporting integrated postural rehabilitation approaches [01].

Rania Reffat Ali et al., (2025) conducted a randomized controlled trial to investigate the effectiveness of the Integrated Neuromuscular Inhibition Technique (INIT) in individuals with forward head posture and chronic neck pain. They compared conventional physiotherapy against an integrated neuromuscular inhibition protocol in FHP populations with chronic neck pain. The neuromuscular-focused approach demonstrated substantially greater improvements in pain reduction, postural alignment, and cervical mobility metrics ($p < 0.05$), suggesting that targeted inhibitory techniques provide additive benefits beyond standard exercise protocols [02].

features for clustering on split nodes and regression on leaf nodes by extending principal component analysis **Salah Eid Ahmed et al., (2025)** conducted a randomized controlled trial to evaluate the effect of adding cervical stability training to conventional treatment modalities in individuals with forward head posture and chronic mechanical neck pain. They whether combining cervical stabilization training with routine physiotherapy enhanced outcomes in mechanical neck pain with FHP. The combined protocol yielded significantly superior postural correction, neuromuscular control enhancement, and symptom reduction compared to conventional modalities alone ($p < 0.05$) [03].

Hussein Youssef et al., (2024) conducted a randomized controlled trial to investigate the effectiveness of posterior cervical weighting orthosis for correcting forward head posture. They evaluated posterior cervical weighting orthoses versus isolated deep cervical flexor exercises in 61 FHP participants. Post- 14 intervention comparisons revealed superior postural correction and analgesic effects in the orthotic group ($p < 0.05$), indicating mechanical load redistribution benefits for postural restoration [04].

Mohamed Hussein Elgendy et al., (2024) conducted a randomized controlled trial to evaluate the efficacy of a head postural correction program on craniovertebral angle (CVA), scapular position, and hand grip strength in individuals with forward head posture. They examined structured postural correction programming in FHP populations, measuring CVA, scapular positioning, and grip strength outcomes. Post-intervention analysis demonstrated significant improvements in cervical alignment and scapular mechanics in the intervention cohort, with concurrent functional strength enhancements ($p < 0.05$) [05].

Birkenmeier R et al. (2012) Aisha Salim Al Suwaidi et al., (2023) conducted a randomized controlled trial to compare two corrective approaches for forward head posture (FHP) in elderly individuals with chronic non-specific neck pain. Sixty-six participants with craniovertebral angle (CVA) less than 50° were randomly allocated into a Chiropractic BioPhysics® (CBP) group and a standard exercise group. Both groups received 18 treatment sessions over 6 weeks with a 3-month follow-up. The CBP group performed mirror-image exercises along with a Denneroll cervical traction orthotic, whereas the standard group performed conventional stretching and strengthening exercises. Outcome measures included CVA, pain intensity, Berg Balance Scale (BBS), Head Repositioning Accuracy (HRA), and Cervical Range of Motion (CROM). Results showed significant improvement in CVA and functional outcomes in the CBP group ($p < 0.001$), and improvements were maintained at follow-up, suggesting that postural correction contributes to sustained clinical improvement [06].

RESEARCH METHODLOGY:-

A. Study Design

The research project was conducted over a total period of eight months. This time frame covered multiple stages of the research process, including formulation of the research proposal, obtaining approval from the institutional ethics committee, participant recruitment and screening, baseline assessment, implementation of the intervention program, and post-treatment evaluation. Additional time was dedicated to data entry, statistical processing of the collected information, and preparation of the final dissertation.

Each participant completed an intervention program lasting four weeks. The overall data collection process was carried out across approximately four to six months, depending on participant availability and adherence to the treatment schedule.

Participants were allocated using a random assignment method to one of two treatment groups:

Group A (Experimental Group): Manual Therapy

Group B (Control Group): Conventional Physiotherapy Protocol

B. Sampling Method and Randomization

Sampling Technique Participants were recruited using a convenience sampling method. Potential subjects were identified through referrals from the physiotherapy outpatient department (OPD) and through clinical screening conducted in the Department of Physiotherapy. Individuals who satisfied the established inclusion criteria and did not meet any of the exclusion criteria were invited to participate in the study. Recruitment continued consecutively until the target sample size of 30 participants was achieved.

C. Selection Criteria

Inclusion Criteria

Participants were included in the study if they met the following conditions:

1. Individuals aged 25–45 years.
2. Clinically diagnosed Forward Head Posture (FHP) confirmed by a craniovertebral angle (CVA) less than 50°.
3. Presence of mechanical neck pain lasting at least four weeks.
4. Pain intensity of 3 or higher on the Visual Analog Scale (VAS).
5. Mild to moderate disability as assessed by the Neck Disability Index (NDI).
6. Physically capable of undergoing manual therapy and conventional physiotherapy interventions.
7. Able to understand and follow treatment instructions.
8. Willing to attend three treatment sessions per week for four weeks.
9. Provided written informed consent to participate in the study.

Exclusion Criteria

Participants were excluded from the study if they had any of the following conditions:

1 Cervical radiculopathy.

2 History of cervical spine surgery.

3 Recent cervical spine trauma.

4 Structural deformities of the spine.

5 Neurological disorders affecting the cervical region.

6 Pregnancy

D. Procedure of Treatment

The total study duration was four weeks. All participants attended physiotherapy sessions three times per week on alternate days, resulting in a total of 12 treatment sessions. Each treatment session lasted approximately 30–40 minutes.

Before the initiation of treatment, all participants were informed about the treatment protocol and written informed consent was obtained. Baseline assessment of outcome measures was performed prior to the start of treatment.

Physiotherapy Protocol Participants were randomly allocated into two groups:

Group A: Manual Therapy

Group B: Conventional

Manual Therapy

Participants in Group A received manual therapy techniques aimed at reducing pain, improving joint mobility, and correcting postural alignment.

Total treatment time was approximately 20 minutes per session.

1. Cervical Joint Mobilization Patient Position: The participant was positioned prone on the treatment table with the head in a neutral position.

Technique:

Posterior–anterior (PA) mobilizations were applied over the cervical vertebrae C3–C7 using the therapist's thumbs or pisiform contact.

Dosage:

• Grade I–III oscillatory mobilizations were applied based on patient tolerance.

• Three sets of 30 seconds were performed with 30 seconds rest between sets.

Thoracic Spine Mobilization

This technique was used to improve mobility of the upper thoracic spine, which contributes to postural correction.

Patient Position:

The participant was placed in prone lying on the treatment table. Technique: Central posterior–anterior mobilizations were applied to the T3–T6 vertebral levels.

Dosage:

• Grade II–III mobilizations

• Three sets of 30 seconds.

Suboccipital Release

This technique was used to release tight suboccipital muscles, which are commonly shortened in individuals with forward head posture.

Patient Position:

The participant was positioned in supine lying with the head supported by the therapist's hands.

Technique:

Gentle sustained pressure was applied under the occipital region to release suboccipital muscle tension.

Duration:

• 60–90 seconds hold

• Repeated 2–3 times depending on patient tolerance.

GROUP B

Conventional Physiotherapy Protocol

Participants in Group B received therapeutic exercises designed to strengthen weakened muscles, stretch tight structures, and improve postural alignment.

Total exercise time was approximately 20 minutes per session.

1. Deep Cervical Flexor Strengthening (Chin Tuck Exercise)

This exercise was used to strengthen the deep cervical flexor muscles, which play an important role in maintaining proper head posture.

Patient Position:

Initially performed in supine lying position. Participants were instructed to gently tuck the chin toward the throat without lifting the head from the table.

Dosage:

• 10 repetitions × 3 sets The exercise was progressed from supine to sitting and standing positions as the patient improved.

Scapular Stabilization Exercises

These exercises aimed to strengthen the scapular stabilizing muscles, which help maintain correct shoulder and neck posture. Patient Position: Performed in sitting or standing position.

Exercise:

Scapular retraction and depression using resistance bands.

Dosage:

• 10 repetitions × 3 sets

Ergonomic Education

Participants were instructed regarding proper ergonomic habits, including:

• Correct sitting posture during work

• Proper mobile phone usage

• Appropriate sleeping posture and pillow support

Monitoring and Safety

Pain levels were monitored before and after each treatment session using the Visual Analogue Scale (VAS). Exercise intensity and treatment techniques were adjusted according to participant tolerance and clinical response. Participants were advised to report any discomfort during treatment. No serious adverse events were observed during the study period.

Weekly Progression of Intervention

Week	Manual Therapy (Group A)	Conventional Physiotherapy Protocol (Group B)	Monitoring Parameters
Week 1 (Sessions 1–3)	Grade I–II PA mobilization; gentle suboccipital release; light soft tissue work to upper trapezius and SCM	Low-load isometric chin tuck in supine; pain-free pectoral and upper trapezius stretching; ergonomic education	Pain response; VAS; adverse reactions; attendance
Week 2 (Sessions 4–6)	Grade II–III mobilization; thoracic PA mobilization introduced; increased soft tissue pressure; MET commenced	Seated chin tuck progression; resistance band scapular retraction introduced; stretching duration increased	Patient-reported comfort; exercise tolerance; compliance with home advice
Week 3 (Sessions 7–9)	Sustained Grade III mobilization; myofascial release techniques; MET to cervical rotators	Standing chin tuck; progressive resistance band load; postural correction with functional tasks; balance challenge added	Functional improvement; VAS trend; posture self-correction during activity

All data were entered and analyzed using IBM SPSS Statistics version 25.0. The Shapiro–Wilk test was used to assess normality of distribution for all continuous outcome variables; results confirmed normal distribution ($p > 0.05$) for all measures in both groups, permitting use of parametric statistical tests. 31 Descriptive statistics — including mean, standard deviation, and percentage change — were computed for all outcome variables at baseline and at four weeks. Within-group changes (pre-test to post-test) were evaluated using the paired samples t-test. Betweengroup differences in post-intervention scores were evaluated using the independent samples t-test, with baseline scores included as covariates. Effect size was calculated using Cohen's d (d = mean difference / pooled standard deviation) for all within-group and between-group comparisons. The level of statistical significance was set at $p < 0.05$, with a 95% confidence interval applied throughout.

RESULTS OF THE STUDY:-

A. Participant Flow and Compliance

A total of 36 individuals were screened for eligibility. Of these, six were excluded: three did not meet the CVA criterion (CVA ≥ 50°), two had concurrent cervical radiculopathy, and one declined to participate. The remaining 30 eligible participants were enrolled and randomly allocated — 15 to Group A (Manual Therapy) and 15 to Group B (Conventional Physiotherapy Protocol). All 30 participants completed the full fourweek intervention period and both pre-test and post-test assessments. No dropouts, protocol deviations, or adverse events were recorded. The study compliance rate was 100%.

A. Baseline Characteristics of Participants

At baseline, both groups were compared on all demographic and clinical variables using independent t-teststo confirm homogeneity of the sample prior to intervention. As shown in Table 5.1, no statistically significant differences were found between groups for any variable ($p > 0.05$), confirming successful randomization and equivalence of groups at study commencement.

Table 1: Baseline Demographic and Clinical Characteristics of Study Participants

Variable	Group A (n=15) Mean ± SD	Group B (n=15) Mean ± SD	Mean Difference	t-value	p-value	Interpretation
Age (years)	32.4 ± 5.2	33.1 ± 4.8	0.7	0.38	0.71	Not significant
Pre-test VAS (0–10)	6.47 ± 1.12	6.33 ± 1.05	0.14	0.42	0.68	Not significant
Pre-test CVA (°)	44.2 ± 2.8	44.5 ± 2.6	0.3	0.32	0.74	Not significant
Pre-test NDI (0 50)	24.6 ± 4.3	23.9 ± 4.0	0.7	0.49	0.62	Not significant

Note. Independent t-test used for between-group baseline comparisons. $p > 0.05$ for all variables confirms baseline equivalence. SD = Standard Deviation.

Pain Intensity — Visual Analog Scale (VAS)

1. Within-Group Analysis — Group A (Manual Therapy)

Group A demonstrated a highly statistically significant reduction in VAS pain scores following the four-week intervention. The mean VAS decreased from 6.47 ± 1.12 at baseline to 2.13 ± 0.91 post-intervention, representing a mean reduction of 4.34 points (67% reduction). This reduction was associated with a very large effect size (Cohen's d = 2.8) and exceeded the established MCID of 2.0 points, confirming both statistical and clinical significance.

Table.2: Within-Group VAS Comparison — Group A (Manual Therapy)

Assessment	Mean ± SD	Mean Difference	SD of Difference	t (df=14)	p-value	Cohen's d	% Change
Pre-test	6.47 ± 1.12	—	—	—	—	—	—
Post-test	2.13 ± 0.91	4.34	1.32	12.76	< 0.001***	2.8 (Very Large)	↓ 67%

Note. ***p < 0.001. Paired t-test. Mean difference = Pre − Post. MCID for VAS = 2.0 points; this improvement exceeds MCID threshold, indicating clinical significance.

Within-Group Analysis — Group B (Conventional Physiotherapy Protocol)

Group B demonstrated a statistically significant reduction in VAS scores following the four-week exercise programme. The mean VAS decreased from 6.33 ± 1.05 at baseline to 4.18 ± 0.97 post-intervention, representing a mean reduction of 2.15 points (34% reduction), with a moderate-to-large effect size (Cohen's d = 1.1).

Table 3: Within-Group VAS Comparison — Group B (Conventional Physiotherapy Protocol)

Assessment	Mean ± SD	Mean Difference	SD of Difference	t (df=14)	p-value	Cohen's d	% Change
Pre-test	6.33 ± 1.05	—	—	—	—	—	—
Post-test	4.18 ± 0.97	2.15	1.30	6.42	< 0.05*	1.1 (Moderate–Large)	↓ 34%

Note. *p < 0.05. Paired t-test. Group B also exceeded the MCID threshold (2.15 > 2.0); however, the magnitude of improvement was substantially smaller than Group A.

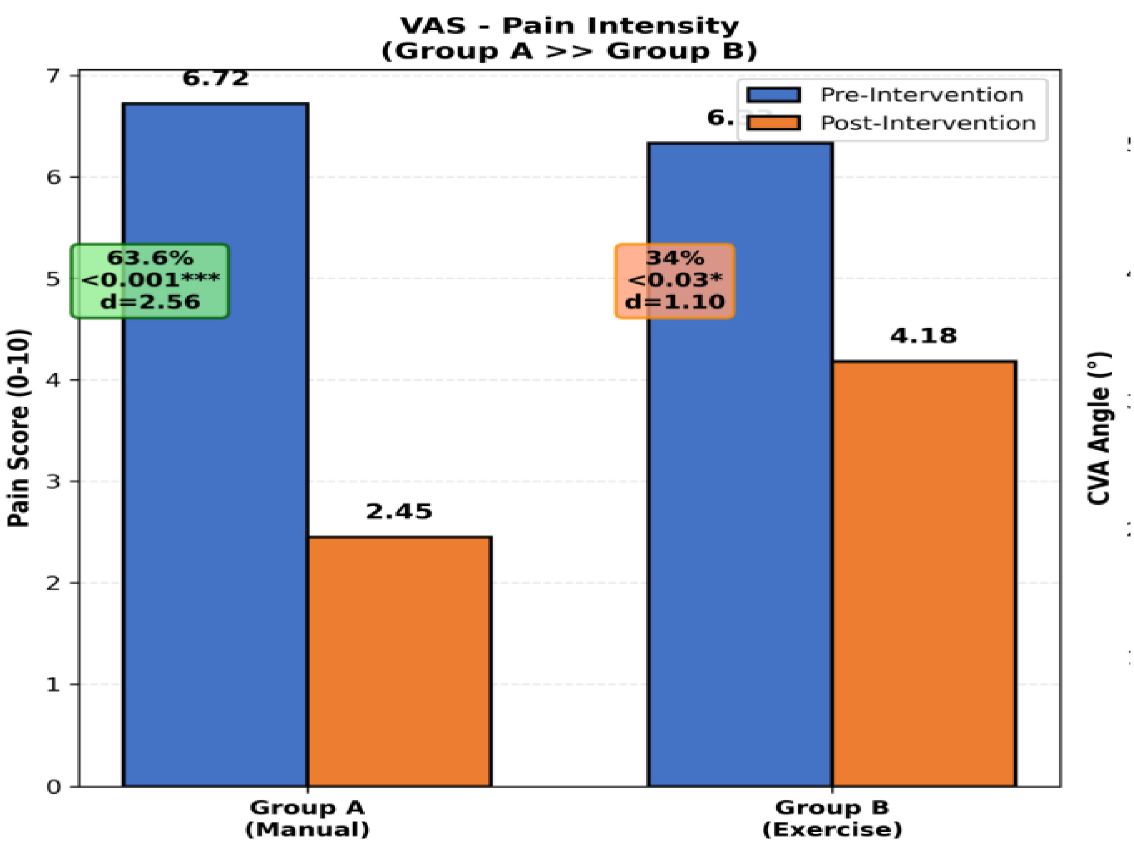
Between-Group Post-Intervention VAS Comparison

The between-group comparison of post-intervention VAS scores using the independent t-test revealed a highly significant difference favouring Group A. Group A recorded a mean post-test VAS of 2.13 ± 0.91 compared to 4.18 ± 0.97 in Group B — a betweengroup difference of 2.05 points.

Table – 4 Between-Group Post-Intervention CVA Comparison

Group	Post-test Mean ± SD	Between-Group Mean Difference	95% CI	t (df=28)	p-value	Favours
Group A (Manual Therapy)	2.13 ± 0.91	2.05	[1.36 – 2.74]	6.18	< 0.001***	Group A
Group B (Conventional Exercise Protocol)	4.18 ± 0.97	—	—	—	—	—

Note. ***p <0.001. Independent t-test. 95% CI = 95% Confidence Interval for betweengroup difference. The between-group difference of 2.05 points substantially exceeds the MCID, confirming clinical significance.



Comprehensive Results Summary

Table-5 Comprehensive Results Summary — All Outcome Measures

Outcome	Group A Pre (Mean ± SD)	Group A Post (Mean ± SD)	Group A Change	Group B Pre (Mean ± SD)	Group B Post (Mean ± SD)	Group B Change	Between-Group p
VAS (0–10)	6.47 ± 1.12	2.13 ± 0.91	↓ 4.34 (67%)	6.33 ± 1.05	4.18 ± 0.97	↓ 2.15 (34%)	< 0.001***
CVA (°)	44.2 ± 2.8	51.6 ± 3.1	↑ 7.4° (16.7%)	44.5 ± 2.6	47.2 ± 2.9	↑ 2.7° (6.1%)	< 0.001***
NDI (0–50)	24.6 ± 4.3	10.8 ± 3.2	↓ 13.8 (56%)	23.9 ± 4.0	17.4 ± 3.6	↓ 6.5 (27%)	< 0.001***

Note. ***p < 0.001 for all between-group comparisons. Both groups demonstrated significant within-group improvement; however, Group A (Manual Therapy) consistently demonstrated superior improvement across all three outcome domains.

Hypothesis Testing

Table 6: Hypothesis Testing Results

Outcome	Between-Group t-value	p-value	Decision	Conclusion
VAS	6.18	< 0.001	Reject H_0	Significant difference exists
CVA	5.32	< 0.001	Reject H_0	Significant difference exists
NDI	5.91	< 0.001	Reject H_0	Significant difference exists

Note. Since $p < 0.001$ for all three between-group comparisons, the null hypothesis (H_0) is rejected for all outcome measures. The alternate hypothesis (H_1) — that manual therapy combined with exercise produces significantly greater improvement than exercise therapy alone — is accepted.

Clinical Significance of Findings

Table 7: Clinical Significance — MCID Analysis

Outcome	MCID Threshold	Group A Mean Change	Exceeds MCID?	Group B Mean Change	Exceeds MCID?
VAS	≥ 2.0 points	4.34 points	YES ✓ (2.17× MCID)	2.15 points	YES ✓ (just meets)
CVA	≥ 5.0°	7.4°	YES ✓ (1.48× MCID)	2.7°	NO ✗ (below MCID)
NDI	≥ 5 points	13.8 points	YES ✓ (2.76× MCID)	6.5 points	YES ✓ (meets lower bound)

Note. MCID = Minimal Clinically Important Difference. Group A exceeded the MCID on all three outcomes, with particularly strong clinical superiority on CVA (Group B failed to reach MCID) and NDI. This confirms that Group A improvements are not merely statistically significant but represent meaningful clinical benefit to patients.

Conclusion:-

The present randomized controlled trial examined the effectiveness of manual therapy combined with a conventional exercise program compared with exercise therapy alone in adults presenting with forward head posture (FHP) and mechanical neck pain. The intervention was implemented over a four-week supervised treatment period, and outcomes were assessed using validated measures of pain intensity (VAS), postural alignment (CVA), and functional disability (NDI).

Both intervention strategies generated clinically meaningful improvements, confirming exercise-based rehabilitation as viable conservative management. However, combined manual therapy with exercise demonstrated consistently superior outcome trajectories across all assessed domains. The multimodal approach—integrating cervical and thoracic mobilization, soft tissue techniques, suboccipital release, and muscle energy work with conventional strengthening and postural training—yielded significantly enhanced pain reduction, postural normalization, and functional recovery relative to exercise-only intervention. Statistical analysis revealed highly significant between-group differences ($p < 0.001$) with very large treatment effect magnitudes.

The principal findings of the study can be summarized as follows:

• Participants in Group A (Manual Therapy) demonstrated approximately 67% reduction in pain intensity, whereas Group B (Conventional Physiotherapy Protocol) showed about 34% reduction in VAS scores.

• Group A showed a 7.4° improvement in craniovertebral angle, increasing beyond the commonly accepted 50° threshold for normal head posture, while Group B demonstrated only a 2.7° increase, which remained within the forward head posture range.

• Functional disability measured by the Neck Disability Index improved by 56% (13.8 points) in Group A, shifting participants from the moderate disability category to mild disability, whereas Group B showed a 27% improvement (6.5 points) with participants remaining within the moderate disability classification.

• The calculated effect sizes for Group A ranged from 2.3 to 2.8, indicating a very large magnitude of treatment effect associated with the combined intervention.

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