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Effect of Global Postural Re-education Versus Muscle Energy Technique on Periscapular and Upper Back Pain Along with Quality of Life Among Postpartum Women: A Randomized Controlled Trial

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Abstract: **Background: Postpartum women commonly experience upper back and periscapular pain due to hormonal changes, muscle weakness, and prolonged faulty postures during breastfeeding and infant care, leading to postural deviations, functional limitations, and reduced quality of life. However, evidence regarding the effectiveness of structured physiotherapy interventions such as GPR and MET in this population remains limited.**

Objective: To determine the impact of Global Postural Re-education (GPR), Muscle Energy Technique (MET), and conventional therapy on pain, posture, functional ability, and quality of life in postpartum women with upper back and periscapular pain.

Methods: A total of 84 females aged 20 – 40 years with postpartum duration of 6 weeks to 12 months were selected using convenient sampling method. Participants were randomly divided into three groups; Group A received GPR, Group B received MET, and Group C received conventional management, including ergonomic counseling and posture education, with 28 participants each. Outcome measures included NPRS, MAPP-QOL, NDI, SPADI, and CVA. All groups received treatment sessions 3 times per week for a duration of 4 weeks.

Results: All three groups showed significant improvement in NPRS, MAPP-QOL, NDI, SPADI, and CVA after interventions ($p < 0.001$). Between-group analysis showed no significant differences in pain and quality of life outcomes. However, significant differences were observed in disability, shoulder function, and postural alignment ($p < 0.001$), with Group A demonstrating greater improvement.

Conclusion: All three interventions were effective in managing postpartum upper back and periscapular pain. However, GPR was more beneficial in improving functional ability and postural alignment.

Keywords: **Postpartum women, Upper back pain, periscapular pain, Muscle energy technique, Global postural re-education, Quality of life.**

I. INTRODUCTION

The postpartum, also referred to as the postnatal period, is the time immediately following childbirth during which a woman's body adjusts to its non-pregnant state through hormonal, psychological, and physiological changes.[1] While this period begins with the birth of the newborn, its endpoint remains variably defined. Traditionally considered to last six to eight weeks, the American College of Obstetricians and Gynaecologists extend postpartum care to 12 weeks, referring to it as the "fourth trimester." Some authors further suggest that recovery may continue for up to 12 months after delivery.[2]

Postpartum musculoskeletal pain represents a prevalent yet often underrecognized component of maternal morbidity. Clinical attention has historically focused on obstetric complications, with comparatively limited emphasis on musculoskeletal dysfunction despite substantial biomechanical and physiological changes occurring during this period. Hormonal influences, particularly elevated progesterone and relaxin levels, contribute to ligamentous laxity, reduced joint stability, and altered load distribution across postural and upper extremity musculature.[3]

Pregnancy induces progressive postural adaptations, including anterior displacement of the center of gravity, increased lumbar lordosis, and thoracic hyperkyphosis. These changes alter scapular positioning and cervical alignment, frequently resulting in forward head posture and rounded shoulders, thereby increasing mechanical stress on the posterior cervical and periscapular musculature.[4] Persisting hormonal effects, particularly those of relaxin, further compromise passive joint stability by modifying collagen properties, necessitating increased reliance on dynamic muscular stabilization.[5]

Additionally, structural and functional changes in the thoracolumbar fascia impair efficient force transmission between the trunk and upper extremities. This leads to compensatory overactivity of superficial postural muscles and altered recruitment of deep stabilizers such as the multifidus and transverse abdominis.[6] Rib cage expansion during pregnancy further modifies respiratory mechanics and scapular positioning, often resulting in persistent thoracic kyphosis and scapular protraction postpartum, contributing to interscapular muscle fatigue and reduced functional capacity.[7]

Muscle imbalances commonly develop due to sustained caregiving postures. Shortening of the pectoralis major, pectoralis minor, and anterior deltoid is accompanied by weakening of the rhomboids, middle and lower trapezius, and serratus anterior. This imbalance produces features consistent with upper-crossed syndrome, exacerbated in postpartum women by hormonal laxity and fatigue.[6] Concurrently, core dysfunction, particularly diastasis recti abdominis, reduces lumbopelvic stability and increases compensatory loading on the thoracic and shoulder musculature.[8]

Breastfeeding further contributes to musculoskeletal strain through repetitive, prolonged postures characterized by cervical flexion, thoracic kyphosis, and shoulder protraction. Sustained slouched positioning, often maintained multiple times daily, imposes cumulative stress on the neck, shoulder, and upper back regions.[9,10] Hormonal influences associated with lactation, including prolactin and estrogen, lead to breast engorgement, further altering posture and increasing mechanical demand on the shoulder girdle.[11,12]

Daily caregiving activities such as lifting, carrying, and bathing infants impose repetitive mechanical loads on the upper extremities and trunk, frequently leading to pain in the neck, scapular region, shoulders, and upper limbs.[13] Despite its high prevalence, periscapular and upper back pain remains underreported compared to low back and pelvic girdle pain, even though studies indicate comparable occurrence rates during pregnancy and postpartum periods.[14,15]

Periscapular muscles—including the trapezius, rhomboids, levator scapulae, and serratus anterior—play a crucial role in scapular stabilization and upper limb function.[16] Postpartum postures increase the load on upper trapezius and levator scapulae, predisposing these muscles to overuse and fatigue.[17] Concurrent weakness of thoracic extensors and scapular stabilizers, along with tightness of anterior chest musculature, contributes to altered scapular kinematics and persistent upper back pain.[18,19]

Beyond physical impairments, postpartum musculoskeletal dysfunction significantly impacts quality of life (QoL), which is increasingly recognized as a critical outcome in maternal healthcare.[20,21] Factors such as fatigue, psychological stress, reduced support, and physical discomfort further compound this burden.[22]

Physiotherapy plays a vital role in addressing these multidimensional challenges through a combination of therapeutic exercise, manual therapy, and ergonomic education.[6,40] Among advanced interventions, Global Postural Re-education (GPR), developed by Philippe Souchard, emphasizes correction of global muscular chain dysfunction through sustained stretching, postural alignment, and breathing control.[23] GPR targets shortened anterior muscle chains and promotes activation of posterior stabilizers, thereby improving thoracic extension and scapular positioning.[24-26]

Muscle Energy Technique (MET), introduced by Fred Mitchell Sr. and Fred Mitchell Jr., is another effective manual therapy technique that utilizes voluntary isometric contractions to normalize muscle length, reduce hypertonicity, and improve joint mobility.[29-32] Its underlying mechanisms include post-isometric relaxation and reciprocal inhibition, facilitating neuromuscular re-education and pain reduction.[33-35]

Conventional physiotherapy interventions—including strengthening, stretching, breathing exercises, and postural correction—remain the cornerstone of postpartum rehabilitation.[6] Additionally, ergonomic strategies such as proper breastfeeding positioning, use of support devices, and activity modification are essential in minimizing cumulatie musculoskeletal strain.[36,37]

Despite the established benefits of individul physiotherapy approaches, there is limited evidence comparing effectiveness of advanced techniques such as GPR and MET in with periscapular and upper back pain. Furthermore, randomized controlled trials evaluating these interventions in this specific population are scarce.

Therefore, the present study aims to compare the effectiveness of Global Postural Re-education and Muscle Energy Technique with conventional physiotherapy in improving pain, posture, disability, and quality of life among postpartum women with upper back pain.

II. METHODOLOGY

Study Design: Randomized controlled trial (RCT)

Study Setting: Outpatient departments of various hospitals in Amritsar

Study Population: Postpartum women (6 weeks to 12 months after delivery) who presented with upper back and/or periscapular pain.

Sampling Method: Convenience sampling technique was used to recruit participants.

Sample Size: The required sample size was calculated using G*Power (version 3.1) for a one-way ANOVA with three groups. Considering an effect size of $f = 0.35$, significance level $\alpha = 0.05$, and desired power $(1 - \beta) = 0.80$, the minimum total sample size obtained was 82 participants (≈27 per group).[32] To ensure equal group allocation and maintain statistical power, the sample size was rounded to 84 participants (28 per group). The calculation was based on the nomenclature F distribution with numerator degrees of freedom = 2, denominator degrees of freedom = 81, and a non-centrality parameter $\lambda = 10.0$.

Inclusion criteria:

- Women aged 20–40 years.[31]
- 6 weeks to 12 months postpartum.[45]
- Complaints of periscapular and/or upper back pain ≥3 on the Numerical Pain Rating Scale (NPRS).
- Neck Disability Index: 5–24 (mild–moderate disability).[55]
- Shoulder Pain and Disability Index: 20–60 (mild–moderate disability).[56]

Exclusion criteria:

- History of major spinal deformities (e.g., scoliosis, kyphosis).[60]
- Neurological disorders affecting upper limb or spine.[61]
- Previous shoulder, cervical, or thoracic surgery.[62]
- Systemic illness or contraindication to exercise.[63]
- Severe postpartum complications (e.g., obstetric injury).[64]
- Non-breastfeeding mothers.[65]

Variables:

Independent Variables	**Dependent Variables**
Global Postural Re-education	Pain Intensity
Muscle Energy Technique	Maternal Quality of Life
Conventional Exercises	Functional Disability
	Postural Alignment

Instruments and tools:

- Numerical Pain Rating Scale (NPRS)—for pain intensity.[54]
- Maternal Postpartum Quality of Life (MAPP-QOL)—for quality of life.[58]
- Neck Disability Index (NDI)—for cervical disability.[55]
- Shoulder Pain and Disability Index (SPADI)—for periscapular function.[56]
- Postural analysis software/photogrammetry—for craniovertebral angle.[51]

Outcome measures:

1. **Primary outcome:** Pain intensity (NPRS), maternal quality of life (MAPP-QOL).
2. **Secondary outcomes:** Disability (NDI, SPADI), posture (craniovertebral angle).

Procedure:

Informed consent of all the participants was taken. Baseline assessment was carried out. The participants were randomly allocated into three groups:

Group A: Participants received Global Postural Re-education Exercises . (n=28)

Group B: Participants received Muscle Energy Technique targeting muscles including upper trapezius, levator scapulae, rhomboids, serratus anterior, splenius capitis, semispinalis capitis and suboccipital muscles. (n=28)

Group C: Participants received Conventional management in the form of ergonomic counseling and posture education related to breastfeeding and infant-care activities. (n=28)

Protocol:

A total of 12 treatment sessions were administered three times per week over a period of four weeks in all groups.

Group A (GPR):

Static global postures were used to address the scapulothoracic and cervical muscle chains. Each posture was held for around 15–20 minutes, along with guided breathing, as sustained positioning was found helpful in releasing tight muscle groups and improving overall alignment.[43]

Patient Position: The patient was placed in different positions such as sitting or standing, depending on the postural imbalance noted during assessment. The choice of position varied from patient to patient, mainly based on which muscle chains were tight and what kind of faulty posture was observed.

Therapist Position: The therapist usually stood beside or slightly behind the patient to get a clear view of overall posture. From this position, corrections were given to the scapula, thoracic spine, and cervical region as required. Verbal cues were repeated frequently, and light manual guidance was used whenever the patient was unable to maintain the corrected posture on their own. In the initial sessions, more frequent corrections were needed.

Technique	Patient Position	Therapist Position	Procedure	Duration
Sitting GPR (Anterior Chain)	Sitting on firm surface, hips & knees at 90°, feet flat, spine elongated	Beside/behind patient	Scapular retraction, thoracic extension, chin tuck, and stretching of pectoralis major/minor & upper trapezius with breathing control	15–20 min/posture
Standing GPR (Posterior Chain and Alignment)	Standing, feet shoulder-width, equal weight-bearing, pelvis neutral	Beside/behind patient	Axial elongation, scapular setting, thoracic extension, cervical alignment, and global postural correction	15–20 min/posture
Postural Integration	Functional positions (sitting/standing)	Supervising posture	Integration of corrected posture into daily activities with mirror feedback and awareness training	Included in session
Total Duration	—	—	3 sessions/week for 4 weeks	—

Home Exercise Program : Patients were advised to continue the following at home:

- Scapular setting exercises
- Thoracic extension movements
- Chin tuck for cervical alignment
- Slow, controlled breathing

They were also told to be mindful of their posture during daily routine activities.

Frequency and Dosage : The intervention was given three times per week for four weeks. In each session, postures were maintained for about 15–20 minutes. Along with supervised sessions, patients were encouraged to practice regularly at home for better carryover.

Group B (MET):

Post-isometric relaxation technique: 3–5 repetitions per muscle group, contraction held for 5–7 seconds followed by stretch.[59]

Patient Position: The patient was positioned in a supine position, lying on the treatment table, with the head supported comfortably using a pillow to maintain a neutral position. The Upper Limbs were kept relaxed by the side. Care was taken to ensure the body was aligned properly, as patients often tend to shift or compensate without realizing it.

Therapist Position: The therapist usually stood at the head end or on the side, depending on the muscle being treated. One hand was used to stabilize the proximal part, while the other guided the movement and applied gentle resistance. The amount of resistance was kept controlled and adjusted according to patient comfort.

General Procedure (Post-Isometric Relaxation Technique)

The muscle energy technique using post-isometric relaxation (PIR) was applied. The same basic sequence was followed for all muscles.

First, the therapist gently took the muscle to the point where resistance was first felt (not into pain). From there, the patient was asked to perform a mild isometric contraction—usually around 20–30% effort, as stronger contractions were not required and sometimes caused discomfort.

The contraction was held for about 5–7 seconds. After this, the patient was asked to completely relax for a few seconds. During this relaxation phase, the therapist slowly moved the muscle further into stretch till the new barrier was reached.

This process was repeated around 3–5 times for each muscle. Treatment was given on both sides, although in some patients one side required more attention than the other.

Technique (Muscle)	Patient Position	Therapist Position	Procedure	Duration
Upper Trapezius MET	Supine	Head end	Stretch via contralateral side flexion: isometric contraction (5–7 sec), relax, further stretch	3–5 reps
Levator Scapulae MET	Supine	Head end	Cervical flexion + contralateral rotation; isometric contraction, relax, stretch	3–5 reps
Rhomboids MET	Supine/Side-lying	Side	Scapular protraction, resisted retraction, relax, further stretch	3–5 reps
Serratus Anterior MET	Supine	Side	Scapular retraction stretch, resisted protraction, relax, stretch	3–5 reps
Splenius Capitis MET	Supine	Head end	Flexion + contralateral rotation, resisted extension/rotation, relax, stretch	3–5 reps
Semispinalis Capitis MET	Supine	Head end	Cervical flexion; resisted extension, relaxation, and stretch	3–5 reps
Suboccipital MET	Supine	Head end	Upper cervical flexion; resisted nod/extension, relax, deeper stretch	3–5 reps
Total Duration	—	—	Each contraction 5–7 sec + 5 sec relaxation	3 sessions/week for 4 weeks

Physiological Basis : The effect of MET is mainly due to autogenic inhibition. During the isometric contraction, Golgi tendon organs are stimulated, which leads to reflex relaxation of the muscle. Because of this, the muscle can be stretched further with less resistance. Clinically, this helps in reducing muscle tightness, improving range of motion, and also decreasing pain.

Frequency and Dosage : Each muscle was treated with around 3–5 repetitions. Contraction was held for 5–7 seconds, followed by relaxation and gentle stretching. The treatment was given three times per week for a duration of four weeks.

Group C (Control):

Participants will receive only ergonomic counseling and posture education relevant to breastfeeding and infant-care tasks.[33]

Patient Position: The participants were made to sit comfortably on a chair with proper back support during the session. Feet were kept flat on the floor, with hips and knees at about 90°. Arm support was provided when required, especially while demonstrating positions like breastfeeding, so that it felt as close to real-life situations as possible.

Therapist Position: The therapist stayed in front of or slightly to the side of the participant to demonstrate clearly and observe posture at the same time. Corrections were given as needed, and care was taken to make sure the participant actually understood and could repeat the posture correctly.

Procedure: The control group mainly received ergonomic advice and posture education related to common daily activities during the postpartum period. Focus was on activities like breastfeeding, sitting for long durations, and handling the baby, as these were the most reported aggravating factors.

Technique	Patient Position	Therapist Position	Procedure	Duration
Breastfeeding Posture Training	Sitting with support	In front/side	Neutral spine, pillow support, avoid forward flexion, maintain scapular alignment	Included in session
Sitting Posture Correction	Sitting	In front	Neutral pelvis, upright spine, chin tuck, scapular setting	Included in session
Infant Handling Training	Sitting/Standing	Supervising	Hip & knee bending, baby close to body, avoid trunk twisting	Included in session
Postural Education	Sitting	In front	Advice on posture, micro-breaks, supportive seating	Included in session
Lifestyle Modification	Sitting	In front	Ergonomic corrections in daily activities	Included in session
Total Duration	—	—	Single session + follow-up	15–20 min + weekly follow-up (4 weeks)

Follow-up and Reinforcement: One supervised session of about 15–20 minutes was conducted initially to explain and demonstrate everything. After that, weekly follow-ups (telephonic) were done to check compliance, clear doubts, and reinforce the instructions.

Frequency and Dosage: The intervention included one initial session of 15–20 minutes, followed by weekly follow-up for a period of four weeks.

III. STATISTICAL ANALYSIS

Data analysis was performed using IBM SPSS Statistics. Descriptive statistics, including mean and standard deviation, were used to summarize all outcome variables. Within group comparisons (pre- and post-intervention) for pain (NPRS), disability (NDI, SPADI), maternal quality of life (MAPP-QOL), and postural alignment (CVA) were performed using a paired t-test. Between-group comparisons of post-intervention values among the three groups (GPR, MET, and control) were analyzed using one-way analysis of variance (ANOVA).

When statistically significant differences were observed in ANOVA, post hoc analysis using Tukey's HSD test was applied to identify pairwise differences between groups (Group A vs Group B, Group A vs Group C, and Group B vs Group C).

Mean difference and standard error were calculated to assess the magnitude and variability of changes. The t-value and f-value were used to determine statistical significance for the paired t-test and ANOVA, respectively.

The level of significance was set at $p < 0.05$. A p-value less than 0.05 was considered statistically significant, while $p \geq 0.05$ was considered not statistically significant.

IV. RESULTS

The present study included 84 female participants who met the inclusion and exclusion criteria and were randomly allocated into three groups: Group A (GPR), Group B (MET), and Group C (Control), with 28 participants in each group. The outcome measures assessed were NPRS, MAPP-QOL, NDI, SPADI, and CVA. Baseline demographic and clinical characteristics of the participants are presented in Table 1. There was no statistically significant difference among groups for most variables ($p > 0.05$), indicating homogeneity. However, craniovertebral angle (CVA) showed a statistically significant difference at baseline ($p < 0.05$).

Table 1: Baseline characteristics of participants (Mean ± SD)

Variable	Group A (n=28): Mean ± SD	Group B (n=28): Mean ± SD	Group C (n=28): Mean ± SD
Age (years)	30.00 ± 4.23	29.86 ± 2.76	28.96 ± 3.11
Postpartum Duration (weeks)	25.36 ± 12.91	23.82 ± 11.06	22.21 ± 10.47
Height (cm)	160.86 ± 3.12	160.21 ± 2.27	159.07 ± 2.28
Weight (kg)	69.29 ± 9.30	68.96 ± 7.14	67.46 ± 7.09
BMI (kg/m^2)	26.66 ± 2.71	26.80 ± 2.21	26.48 ± 2.28
NPRS	6.61 ± 1.44	6.61 ± 1.16	5.89 ± 1.13
MAPP-QOL	3.02 ± 0.61	3.09 ± 0.41	3.31 ± 0.51
NDI	19.57 ± 3.76	20.00 ± 3.47	20.36 ± 3.69
SPADI	46.50 ± 10.60	51.86 ± 6.24	49.50 ± 10.60
CVA	41.68 ± 3.15	42.25 ± 2.11	43.46 ± 2.20

All three groups demonstrated statistically significant improvements in all outcome measures following the intervention ($p < 0.001$).

In group A (GPR), a marked reduction in pain was observed (NPRS: 6.61 ± 1.44 to 2.04 ± 1.10), along with improvements in disability (NDI, SPADI) and postural alignment (CVA). Group B (MET) also showed statistically significant improvements in all outcome measures. The control group demonstrated improvement as well. However, the magnitude of change was comparatively smaller. Within-group comparison of outcome measures before and after intervention is presented in Table 2.

Table 2: Within-group comparison of outcome measures (Pre vs Post) using paired t-test

Outcome	Group	Pre (Mean ± SD)	Post (Mean ± SD)	t-value	p-value
NPRS	A	6.61 ± 1.44	2.04 ± 1.10	19.664	<0.001*
	B	6.61 ± 1.16	2.18 ± 0.72	33.959	<0.001*
	C	5.89 ± 1.13	2.25 ± 1.29	31.016	<0.001*
MAPP-QOL	A	3.02 ± 0.61	4.93 ± 0.69	-14.423	<0.001*
	B	3.09 ± 0.41	4.81 ± 0.31	-28.282	<0.001*
	C	3.31 ± 0.51	4.65 ± 0.60	-20.360	<0.001*
NDI	A	19.57 ± 3.76	4.36 ± 2.18	25.908	<0.001*
	B	20.00 ± 3.47	7.43 ± 2.42	19.119	<0.001*
	C	20.36 ± 3.69	8.86 ± 4.68	21.977	<0.001*
SPADI	A	48.43 ± 9.29	13.11 ± 6.62	19.075	<0.001*
	B	51.86 ± 6.24	18.54 ± 5.11	31.204	<0.001*
	C	49.50 ± 10.60	23.71 ± 12.56	17.142	<0.001*
CVA	A	41.68 ± 3.15	49.39 ± 3.67	-10.428	<0.001*
	B	42.25 ± 2.11	48.39 ± 1.54	-28.376	<0.001*
	C	43.46 ± 2.20	46.82 ± 2.17	-21.502	<0.001*

(Note- * means p > 0.05)

Between-group comparisons of post-intervention values using one-way ANOVA are presented in Table 3, which revealed no statistically significant difference among groups for post-intervention NPRS and MAPP-QOL scores ($p > 0.05$). However, statistically significant differences were observed in NDI ($p < 0.001$), SPADI ($p < 0.001$), and CVA ($p < 0.002$).

Table 3: Between-group comparison of post-intervention values using one-way ANOVA

Outcome	GPR (Mean ± SD)	MET (Mean ± SD)	Control (Mean ± SD)	f-value	p-value
NPRS	2.04 ± 1.11	2.18 ± 0.72	2.25 ± 1.29	0.292	0.747
MAPP-QOL	4.93 ± 0.69	4.81 ± 0.31	4.65 ± 0.60	1.697	0.190
NDI	4.36 ± 2.18	7.43 ± 2.42	8.86 ± 4.68	13.616	<0.001*
SPADI	13.11 ± 6.62	18.54 ± 5.11	23.71 ± 12.55	10.379	<0.001*
CVA	49.39 ± 3.67	48.39 ± 1.54	46.82 ± 2.17	6.836	0.002*

(Note- * means p > 0.05)

Post hoc analysis using Tukey's test indicated that Group A (GPR) showed significantly greater improvement in NDI compared to Groups B and C ($p < 0.001$). No statistically significant difference was found between Group B and Group C for the selected variables ($p > 0.05$).

V. DISCUSSION

The present study aimed to evaluate and compare the effectiveness of three intervention protocols on pain intensity, maternal quality of life, functional disability, and postural alignment in postpartum women. The findings demonstrated that all three groups showed significant within-group improvements across all outcome measures. However, Group A (GPR) showed better outcomes, particularly in reducing neck disability and improving craniovertebral angle.

A significant reduction in pain intensity was observed in all groups, indicating that structured physiotherapy interventions, including exercise and ergonomic education, are effective in managing postpartum musculoskeletal pain. These findings are consistent with previous studies. Algabbani et al. reported that postpartum neck and shoulder pain responds well to conservative management.[54] Similarly, Mahmoud et al. highlighted the association between forward head posture and neck pain, emphasizing the importance of postural correction.[55] Hasanin et al. also noted that infant care activities contribute to cervical muscle stress and myofascial trigger points.[56] Furthermore, Takale et al. demonstrated that both conventional exercises and specialized techniques are effective in reducing pain in postpartum women.[29]

Maternal quality of life improved significantly within all groups, although no significant between-group differences were observed. This suggests that pain reduction and therapeutic interaction itself may play a crucial role in improving perceived well-being. Webb et al. reported that postpartum women experience significant physical stress due to hormonal and caregiving demands.[57] Additionally, Algabbani et al. (2025) emphasized that early pain management is essential for maintaining maternal health and quality of life.[44]

functional disability outcomes (NDI and SPADI) showed significant improvements, with Group A demonstrating superior results. These findings may be attributed to improved neuromuscular control and postural correction. Falla et al. reported reduced activation of deep cervical flexors in individuals with neck pain, which can be improved through targeted exercises.[58] Yang et al. highlighted that improved musculoskeletal function enhances overall functional ability.[59] Similarly, Sheikhhoseini et al. demonstrated that therapeutic exercises improve craniovertebral angle and reduce disability.[60]

Improvement in SPADI scores across all groups reflects enhanced shoulder function due to correction of postural deviations. Do et al. found that postural correction improves shoulder mechanics and reduces pain.[61] Camargo et al. also reported that scapular-focused exercises significantly improve shoulder function.[62]

A key finding was the significant improvement in craniovertebral angle, particularly in Group A. Postural correction restores normal muscle activation and reduces mechanical stress. These findings align with recent evidence. Chen et al. and Mastromarchi et al. reported that comprehensive postural and scapular stabilization programs are more effective than conventional approaches.[63,64] Elsayed and Alowa further supported the effectiveness of comprehensive spinal interventions.[65]

The superior outcomes observed in Group A may be due to its holistic approach targeting global muscle chains and postural alignment. This approach likely addressed underlying muscular imbalances associated with forward head posture and upper crossed syndrome, commonly observed in postpartum women.[29,63]

Overall, the findings suggest that physiotherapy interventions are effective in improving pain, function, posture, and quality of life in postpartum women, with GPR demonstrating superior benefits. These results highlight the importance of incorporating postural correction and neuromuscular training into postpartum rehabilitation programs.

The present study had certain limitations. Hand dominance of participants was not considered, which may have influenced functional outcomes. The sample size was relatively small, limiting generalizability. The study focused only on upper body, limiting applicability to overall functional status. Additionally, the scope was restricted to selected interventions and outcome measures.

Future studies should include larger sample sizes to improve generalizability. Long-term follow-up is recommended to evaluate sustained effects. Further research may include a comprehensive assessment of both upper and lower body function. Comparative studies involving additional physiotherapy techniques may help identify the most effective protocols for postpartum rehabilitation.

VI. CONCLUSION

The current study concluded that all three physiotherapy interventions were effective in reducing pain, decreasing disability, and improving postural alignment and quality of life in postpartum women with upper back and periscapular pain, as evidenced by significant improvements in NPRS, MAPP-QOL, NDI, SPADI, and CVA. However, the intervention utilized in Group A showed greater effectiveness, especially in terms of improving postural parameters and functional disability, indicating that methods combining neuromuscular control and postural correction are more successful than traditional or less focused interventions. The observed improvements could be explained by improved movement patterns, increased muscle activation, and better correction of biomechanical errors.

Declaration by Authors

Ethical Approval: The study was approved by the Ethics Committee of Khalsa College, Amritsar. It is registered in Clinical Trial Registry of India, CTRI/2026/02/103542.

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REFERENCES

[1] Fujii H, Miyamoto M, Saruta M, Miyake Y, Kiyomoto K, Hayasaki R. The relationship between postpartum neck-upper extremity pain and activities of daily living in Japanese women. Preventive Medicine Research. 2024 Dec 10;2(3):57-68.

[2] Berens P. Overview of the postpartum period: Normal physiology and routine maternal care. UptoDate. 2020;15:1-34.

[3] Sultana M, Nawaz M, Mubashra S, Fatima S, ul Huda N. Trigger Points in Shoulder in Correlation with Postpartum Pain. Journal of Health, Wellness, and Community Research. 2025 Jul 5: e423-.

[4] Dumas GA, Leger A, Plamondon A, Charpentier KM, Pinti A, McGrath M. Fatigability of back extensor muscles and low back pain during pregnancy. Clinical Biomechanics. 2010 Jan 1;25(1):1-5.

[5] Wang Y, et al. Role of relaxin in diastasis of the pubic symphysis peripartum. J Obstet Gynaecol Res. 2021; (review).

[6] Ratajczak M, Górnowicz R. The influence of breastfeeding factors on the prevalence of back and neck pain: data from an online survey. BMC Musculoskeletal Disorders. 2024 Aug 29;25(1):675.

[7] Kibler W. Implications of scapular dyskinesis in shoulder injury: the 2013 consensus statement from the 'Scapular Summit.' British journal of sports medicine. 2013 Sep 1;47(14):877-85.

[8] SANTOS FS, CORTEZ FC, PENHA BV, NASCIMENTO BA, MENDONÇA FJ, BARROS RJ, VILLARES SC, OLIVEIRA G, FERREIRA GJ, BRESCIANI K. Gestational musculoskeletal disorders and corelated discomforts. BIOMEDICAL RESEARCH. 2020;5(1).

[9] Yonus A, Muneer M, Anjum O. Association Between Upper Trapezius Myofascial Trigger Points and Postural Stress Among Lactating Mothers. Journal of Health, Wellness, and Community Research. 2025 Mar 26: e30.

[10] Situt GA, Philip S, Patil P. Prevalence of Scapular Dyskinesis in Breastfeeding Postnatal Women in Satara District—An Observational Study. Journal of Evolution of Medical and Dental Sciences. 2021 Aug 2;10(31):2401-6.

[11] Petronilla OC, Chinecherem EP, Sunday ES. Breast size, thoracic kyphosis, and thoracic spine pain: a correlational survey of Nigerian postpartum mothers. BMC Musculoskeletal Disorders. 2024 Nov 20;25(1):934.

[12] Firmino SS, Fagá CM, Basqueroto VP, do Nascimento Benitez A, Mendonça J, Ferreira JF, Stoppe CV, de Oliveira GP, Gomes JF, Bresciani KD. Gestational musculoskeletal disorders and correlated discomforts. Biomed Res. 2020;5:1-4.

[13] Anderson SE, Steinbach LS, De Monaco D, Bonel HM, Hurtienne Y, Voegelin E. "Baby wrist": MRI of an overuse syndrome in mothers. American Journal of Roentgenology. 2004 Mar;182(3):719-24.

[14] Wu WH, et al. Pregnancy-related pelvic girdle pain (PPP), I: Terminology, clinical presentation, and prevalence. Eur Spine J. 2004;13(7):575–89.

[15] Dunn G, Egger MJ, Shaw JM, Yang J, Bardsley T, Powers E, Nygaard IE. Trajectories of lower back, upper back, and pelvic girdle pain during pregnancy and early postpartum in primiparous women. Women's health. 2019 Apr;15:1745506519842757.

[16] Meeusen R. F. Struyf, J. Nijs, S. Mollekens, I. Jeurissen, S. Truijen, S. Mottram &. Clin Rheumatol. 2013;32:73-85.

[17] Kebaetse M, McClure P, Pratt NA. Thoracic position effect on shoulder range of motion, strength, and three-dimensional scapular kinematics. Archives of physical medicine and rehabilitation. 1999 Aug 1;80(8):945-50.

[18] Kang NY, Kim K. Effects of a combination of scapular stabilization and thoracic extension exercises on respiration, pain, craniovertebral angle and cervical range of motion in elementary school teachers with a forward head posture: A randomized controlled trial. Korean Society of Physical Medicine. 2022 May 31;17(2):29-40.

[19] Krishnakumar A, Dabholkar TA, Dabholkar A. Assessment of scapular stability in postpartum females: a longitudinal study. InErgonomics in Caring for People: Proceedings of the International Conference on Humanizing Work and Work Environment 2015 2017 Oct 6 (pp. 91-96). Singapore: Springer Singapore.

[20] Mokhtaryan-Gilani T, Kariman N, Nia HS, Doulabi MA, Nasiri M. The Maternal Postpartum Quality of Life Instrument (MPQOL-I): development and psychometric evaluation in an exploratory sequential mixed-method study. BMC pregnancy and childbirth. 2022 Jul 19;22(1):576.

[21] Al Rehaili BO, Al-Raddadi R, ALEnezi NK, ALYami AH. Postpartum quality of life and associated factors: a cross-sectional study. Quality of Life Research. 2023 Jul;32(7):2099-106.

[22] Fontenele de Oliveira Mi, Parker L, Ahn H, Lívia Oliveira Catunda H, Braga Rodrigues Bernardo E, Fontenele de Oliveira Ma, et al. Maternal Predictors for Quality of Life during the Postpartum in Brazilian Mothers. Health (Irvine Calif). 2015;7(7):371–80.

[23] Souchard P. Global Postural Re-education. Madrid: Elsevier Masson; 2006.

[24] Pillastrini P, de Lima e Sá Resende F, Banchelli F, Burioli A, Di Ciaccio E, Guccione AA, Villafañe JH, Vanti C. Effectiveness of global postural re-education in patients with chronic nonspecific neck pain: randomized controlled trial. Physical therapy. 2016 Sep 1;96(9):1408-16.

[25] Ferreira GE, Barreto RG, Robinson CC, Plentz RD, Silva MF. Global Postural Reeducation for patients with musculoskeletal conditions: a systematic review of randomized controlled trials. Brazilian journal of physical therapy. 2016 Apr 1;20(3):194-205.

[26] Martins NA, et al. GPR for postural correction in women with thoracic kyphosis: a randomized trial. Clin Biomech. 2022;95:105618.

[27] Martins NA, et al. GPR for postural correction in women with thoracic kyphosis: a randomized trial. Clin Biomech. 2022;95:105618.

[28] de Amorim CS, Gracitelli ME, Marques AP, dos Santos Alves VL. Effectiveness of global postural reeducation compared to segmental exercises on function, pain, and quality of life of patients with scapular dyskinesis associated with neck pain: a preliminary clinical trial. Journal of manipulative and physiological therapeutics. 2014 Jul 1;37(6):441-7.

[29] Rutuja Takale et.al. Short term effects of muscle energy technique with resistance band exercises and myofascial release technique with conventional exercises on pain, ROM and functional disability in postpartum women with trapezitis: a randomized clinical trial.

[30] El-Bandrawy AM, Mohamed MA, Mamdouh AM. Effect of muscle energy technique on pain perception and functional disability of women with postnatal low back pain.

[31] Greenman PE. Principles of Manual Medicine. 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 2003.

[32] Chaitow L. Muscle Energy Techniques. 4th ed. Elsevier; 2013.

[33] Ujwal LY, Raarequa MA, Pournima AP. Effect of Muscle Energy Technique Vs Effect of Neural Tissue Mobilization on Hamstring Tightness In Young Adults. International Journal of Current Research. 2017;9(12):62816-9.

[34] Thomas E, Cavallaro AR, Mani D, Bianco A, Palma A. The efficacy of muscle energy techniques in symptomatic and asymptomatic subjects: a systematic review. Chiropractic & manual therapies. 2019 Aug 27;27(1):35.

[35] Sachdeva S, Kalra S, Pawaria S. Effects of muscle energy technique versus mobilization on pain and disability in post-partum females with sacroiliac joint dysfunction. Indian Journal of Health Sciences and Care. 2018;5(1):11-7.

[36] Ambule K, Mahakarkar M. Protocol on the effects of postnatal exercises on musculoskeletal pain among postpartum women. Journal of Pharmaceutical Research International. 2021 Oct 23;33(47A):12-6.

[37] Afshariani R, Kiani M, Zamanian Z. The influence of ergonomic breastfeeding training on some health parameters in infants and mothers: a randomized controlled trial. Archives of Public Health. 2019 Nov 11;77(1):47.

[38] Saligheh M, McNamara B, Rooney R. Perceived barriers and enablers of physical activity in postpartum women: a qualitative approach. BMC pregnancy and childbirth. 2016 Jun 2;16(1):131.

[39] Vernon H, Mior S. The Neck Disability Index: a study of reliability and validity. J Manipulative Physiol Ther. 1991;14(7):409–15.

[40] Breckenridge JD, McAuley JH. Shoulder Pain and Disability Index (SPADI). Arthritis Care Res. 2011;63(S11):S214–S218.

[41] American Academy of Pediatrics. Spinal Deformities (Chapter 333). In: AAP Pediatric Care Online. 2021.

[42] Badau A, Badau D. Identifying the Differences in Symmetry of the Anthropometric Parameters of the Upper Limbs in Relation to Manual Laterality between Athletes Who Practice Sports with and without a Ball. Symmetry. 2024 May 4;16(5):558.

[43] Kholinne E, Kwak JM, Sun Y, Lee HJ, Koh KH, Jeon IH. Risk factors for persistent shoulder pain after cervical spine surgery. Orthopaedic surgery. 2019 Oct;11(5):845-9.

[44] Fletcher GF, Balady GJ, Amsterdam EA, Chaitman B, Eckel R, Fleg J, Froelicher VF, Leon AS, Piña IL, Rodney R, Simons-Morton DA. Exercise standards for testing and training: a statement for healthcare professionals from the American Heart Association. Circulation. 2001 Oct 2;104(14):1694-740.

[45] Darmody E, Bradshaw C. Women's experience of obstetric anal sphincter injury following childbirth: An integrated review. Midwifery. 2020 Dec 1;91:102820.

[46] Yadeta T, Belema D, Ahmad S, Sirage N, Ali AS, Ali K, Yimer A. Assessment of post-partum physical exercise practice and its associated factors among women in postpartum period, in West Wollega zone, Oromia, Ethiopia. Frontiers in Public Health. 2025 Jan 23;13:1505303.

[47] Bonney RA, Corlett EN. Head posture and loading of the cervical spine. Applied ergonomics. 2002 Sep 1;33(5):415-7.

[48] Hawker GA, Mian S, Kendzerska T, French M. Measures of adult pain: Visual Analog Scale (VAS), Numeric Rating Scale (NRS). Arthritis Care Res. 2011;63(S11):S240–S252.

[49] Kadu DV, Shetye JV. Reliability of “MB-ruler software” to measure craniovertebral angle using the photographic method. Journal of Health and Allied Sciences NU. 2022 Jul;12(03):307-11.

[50] Mylonas K, Chatzis G, Makrypidi V, Chrysanthopoulos G, Gkrilias P, Tsekoura M, Billis E, Tsepis E, Tsirogiannis G, Fousekis K. Reliability of photogrammetric evaluation of the craniovertebral angle, swayback posture, and knee hyperextension in university students. Journal of Physical Therapy Science. 2025;37(4):171-5.

[51] Hill PD, Aldag JC, Hekel B, Riner G, Bloomfield P. Maternal Postpartum Quality of Life Questionnaire. Journal of Nursing Measurement. 2006 Dec 1;14(3).

[52] Fernandes TM, Mendez-Sanchez R, Puente-Gonzalez AS, Martin-Vallejo FJ, Falla D, Vila-Chã C. A randomized controlled trial on the effects of "Global Postural Re-education" versus neck specific exercise on pain, disability, postural control, and neuromuscular features in women with chronic non-specific neck pain. European journal of physical and rehabilitation medicine. 2023 Jan 4;59(1):42.

[53] Phadke A, Bedekar N, Shyam A, Sancheti P. Effect of muscle energy technique and static stretching on pain and functional disability in patients with mechanical neck pain: A randomized controlled trial. Hong Kong Physiotherapy Journal. 2016 Dec 1;35:5-11.

[54] Algabbani MF, Alazmi AA, Alqabbani S, Almurdi MM, Abdelkader SM, Alruwaili M, Alhammad SA, AlHumaid LA, Alrushud A, Almuwais A, Shaheen AA. Prevalence and Risk Factors for Neck and Upper Limb Musculoskeletal Disabilities Among Postpartum Women. Clinical and Experimental Obstetrics & Gynecology. 2025 Feb 5;52(2):25833.

[55] Mahmoud NF, Hassan KA, Abdelmajeed SF, Moustafa IM, Silva AG. The relationship between forward head posture and neck pain: a systematic review and meta-analysis. Current reviews in musculoskeletal medicine. 2019 Dec;12(4):562-77.

[56] Hasanin ME, Mohamed RR, Hamda HA, Farag A. Effects of cervical myofascial trigger points release in post-natal females: A randomized controlled trial Efectos de la liberación de puntos gatillo miofasciales cervicales en mujeres después del parto: Un ensayo controlado aleatorizado.

[57] Webb DA, Bloch JR, Coyne JC, Chung EK, Bennett IM, Culhane JF. Postpartum physical symptoms in new mothers: Their relationship to functional limitations and emotional well-being. Birth. 2008 Sep;35(3):179-87.

[58] Jull GA, Falla D, Vicenzino B, Hodges PW. The effect of therapeutic exercise on activation of the deep cervical flexor muscles in people with chronic neck pain. Manual therapy. 2009 Dec 1;14(6):696-701.

[59] Yang S, Boudier-Révéret M, Yi YG, et al. Effect of interventions for chronic neck pain with forward head posture on pain and quality of life. *Healthcare (Basel)*. 2023;11(5):678.

[60] Sheikhhoseini R, Shahrbanian S, Sayyadi P, O'Sullivan K. Effectiveness of therapeutic exercise on forward head posture: a systematic review and meta-analysis. Journal of manipulative and physiological therapeutics. 2018 Jul 1;41(6):530-9.

[61] Do YL, Nam CW, Sung YB, Kim K, Lee HY. The effect of a corrective exercise program on forward head posture and rounded shoulder posture. *J Phys Ther Sci*. 2017;29(10):1824–1827.

[62] Camargo PR, Alburquerque-Sendín F, Avila MA, Haik MN, Vieira A, Salvini TF. Effects of stretching and strengthening exercises, focusing on the scapula, in patients with shoulder impingement syndrome: a randomized controlled trial. *J Rehabil Med*. 2015;47(5):427–432.

[63] Chen Y, Yang C, Nie K, Huang J, Qu Y, Wang T. Effects of scapular treatment on chronic neck pain: a systematic review and meta-analysis of randomized controlled trials. BMC Musculoskeletal Disorders. 2024 Apr 1;25(1):252.

[64] Mastromarchi, P., McLean, S., Ali, N., & May, S. (2024). Effects of matched vs. unmatched physical therapy interventions on pain or disability in patients with neck pain—a systematic review and meta-analysis. Physiotherapy Theory and Practice, 40(12), 3000–3019.

[65] Elsayed WH, Alowa ZA. Impact of forward head posture correction on craniovertebral angle, neck disability, and spinal electromyography: A randomized controlled trial. Journal of Back and Musculoskeletal Rehabilitation. 2025 Jan;38(1):83-92.