

Effectiveness of Proximal Stability Training on Forward Head Posture in Post-Pregnant Women

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ABSTRACT

Background: The individual's posture was an important component. Post-pregnant women were more prone to postural abnormalities, especially forward head posture. The baby will be below the mother's field of vision, so for feeding and other purposes, she must tilt her head forward for an extended period, which causes a forward head posture, resulting in biomechanical alterations and changes in the length-tension relationship of the surrounding musculature. Such a posture will be a risk factor for other secondary conditions. Proximal stability training has been proposed as a useful intervention to correct forward head posture in post-pregnant women, although the extent of its effectiveness remains unknown.

Objectives: To find the effectiveness of proximal stability training on forward head posture in post-pregnant women.

Methods: The experimental study was conducted on 26 Post-Pregnant Women aged 20-40 who were divided into two groups. Craniovertebral Angle and Occipital Wall Distance were taken from both groups to assess forward head posture; in addition, cervical range of motion was also measured as a pre-test. The Experimental Group received proximal stability training, while the Control Group received no exercises. The intervention protocol was applied three times a week for 8 weeks with 45 minutes per session. After 8 weeks, a post-test will be taken for both groups.

Results: The statistical analysis showed that the experimental group showed a significant difference between the pre-test and post-test values

Conclusion: The study concluded that proximal stability training has a significant effect on improving forward head posture among post-pregnant women.

Keywords: Forward Head Posture, Post-Pregnant Women, Proximal Stability Training.

INTRODUCTION

The position or attitude of the body is known as posture [1]. Maintaining the ideal posture is necessary for the proper structural integrity and alignment of the kinetic chain's components. The articular system, myofascial system, and neural system are the components of the kinetic chain. If one

system goes out of alignment, the other system also collapses [2].

Nowadays, because of a sedentary lifestyle, many of them face postural problems, especially post-pregnant women. Due to their daily activities of carrying and feeding the baby, they experience forward head posture in post-pregnant women. This increases the anterior curve in lower cervical

vertebrae and increases the curve in posterior upper thoracic vertebrae to maintain balance. This is known as the forward head posture as well as the turtle-neck posture [3].

The forward head posture causes changes in articular structure that put more pressure on the intervertebral disc around the neck. The forward head posture in the long term causes rounded shoulders. The muscles of the movement group of the shoulder girdle, including pectoralis major, pectoralis minor, upper trapezius, levator scapulae, and anterior deltoid, are tight and possess decreased flexibility in individuals with forward head and rounded shoulder posture. The muscles of the stabilization group of the shoulder girdle, including rhomboids, serratus anterior, lower trapezius, posterior deltoid, infraspinatus, and teres minor, are lengthened and possess decreased strength in individuals with forward and rounded shoulder posture [2]. The prevalence of forward head posture in persons aged 20-40 is 66% [4]. Posture issues are brought on by repetitive tasks and prolonged incorrect postures [5].

The ability of the muscles surrounding the cervical spine and other areas, such as the shoulders and upper back, to offer a secure base for movement is known as proximal stability. This stability is essential for supporting the head, facilitating smooth cervical motion, and maintaining proper posture. Dysfunction or weakness in these stabilizing muscles can lead to compensatory movement patterns, overloading of cervical structures, and an increased risk of pain and injury. This posture problem may also be a risk factor for respiratory disorders, glenohumeral joint range of motion (ROM) limitation, increased thoracic kyphosis, thoracic outlet syndrome, nerve entrapments, biceps or rotator cuff tendonitis or impingement, and reduced subacromial space [6].

Aims and objectives

- **Aim:** To find the effectiveness of proximal stability training on forward head posture in post-pregnant women.

- **Objectives:** To reduce the forward head posture by proximal stability training (PST) and to increase cervical range of motion (CROM)

MATERIALS & METHODS

- Tools used: Goniometer, inch tape, wand, ladder fixed on the wall, shoulder pulley, paper, and pen
- Outcome Measures: Cranio vertebral Angle (CVA), Occiput Wall Distance (OWD), Cervical Range of Motion (CROM)
- Craniovertebral Angle (CVA) - This CVA angle is a reliable and valid evaluation tool. A goniometer measures CVA in the sagittal plane ⁽¹⁾. The fulcrum was a C7 spinous process. The moving arm passed through the tragus of the ear, while the stationary arm was parallel to the floor. The angle formed between the stationary arm and moving arm is CVA ⁽⁷⁻⁹⁾. CVA is mentioned in degrees (°).



- Occiput Wall Distance (OWD): OWD was taken by inch tape, the distance between the wall and occipital when the patient is standing erect with stretched knee and back against the wall ⁽¹⁰⁾. OWD was measured in centimetres (cm).



- Cervical Range of Motion (CROM): CROM was measured by a Goniometer and mentioned in degrees (°) ⁽¹¹⁾.

| S. No | CROM | fulcrum | Stationary arm | Moving arm |
|-------|-----------------|--|---|------------------------|
| 1 | flexion | external auditory meatus | Parallel to the floor | base of nares |
| 2 | extension | external auditory meatus | Parallel to the floor | base of nares |
| 3 | rotation | center of the cranial aspect of the head | Between the right and left acromion process | a tip of the nose |
| 4 | Lateral flexion | spinous process of the C7 vertebrae | Perpendicular to the ground | dorsal mid of the head |

METHODS

This is an experimental study. Mother who are all coming for therapy for their children in NIEPMD are the subjects of this study. Subjects were checked for inclusion criteria (Age 20 to 40 years, Post-pregnant women at least 1 year after delivery, Woman with Craniovertebral Angle (CVA) <50°), and exclusion criteria (Traumatic neck injury, Surgery in the cervical spine, Fibromyalgia, Neurologic or vascular diseases, Herniated intervertebral disc, Degenerative and inflammatory disorders of cervical spine, Psychiatric comorbidity, Complains of dizziness, Visual impairment irreparable through glasses) and will be assessed completely. Patient history and demographic data were collected. This study involves pre-evaluation, intervention, and post-evaluation. In pre-evaluation, the measures of CVA, OWD, and ROM were taken from the subjects. 26 Subjects were selected and divided into two groups by a convenience sampling method. An Experimental group and a control group, each comprising 13 subjects. The Experimental Group received proximal stability training, while the Control Group received no exercises. Then, Patients were taught and explained about the intervention. After 8 weeks, the post-test was taken.

EXERCISE PROTOCOL:

WARM-UP EXERCISE: This exercise is to prepare our muscles and mind for the upcoming exercises. This includes breathing exercises and neck stretches.

1. BREATHING EXERCISE: ask the subject to maintain both hands on the

occiput. Breathe deeply through the nose. The elbow should bend back and remain there for 5 seconds while inhaling. Then exhale through pursed lips- 10 Reiterations.



2. NECK STRETCH: ask the subject to lateral flex the neck by touching the ear to the shoulder. Give little pressure on the head with the hand, on which side the subject flexes her neck. Hold for 15 seconds – 5 Reiterations (each side).



3. CHIN TUCKS: ask the subject to move their chin up to their neck. Hold for 5 seconds – 10 Reiterations.



4. SHOULDER SHRUGGING: ask the subject to raise the shoulder upward and hold for 5 seconds, then relax-10 Reiterations.



5. SHOULDER BACKWARD ROTATION: ask the subject to stand with the shoulder adducted, elbow flexed 90°, forearm pronated, fist of the hand. Do shoulder backward rotation with elbow flexion 90° - 10 Reiterations.



6. OVERHEAD EXERCISE

a) WAND EXERCISE: Ask the subject to move the wand backward as much as possible without pain. After reaching the end range, hold for 5 seconds - 10 Reiterations.



b) WALL ANGELS: ask the subject to stand close to the wall with feet together, shoulders & buttocks, and lower back resting against the wall. Ask the Subject to touch the wall with their head, which will prevent the forward positioning of the head. Ask the subject to take the arm from the 'W' position to the 'V' position by dragging the arm on the wall. Hold for 5 seconds. Return to W position- 10 Reiterations.



c) HANGING: ask the subject to stand and hold the bar, which were at a higher height. After getting a grip, ask the patient to lift their feet from the ground. Maintain for 30 seconds or 1 minute, then take 5 seconds of rest- 5 Reiterations.



d) **PULLEY EXERCISE:** Ask the subject to pull the pulley backward with shoulder abduction 90° and elbow flexion 90°. Hold for 5 seconds- 10 Reiterations.



extended elbow. Ask the subject to do push-ups by flexing the elbows- 10 push-ups, Rest for 5 seconds, 10 push-ups.



7. WALL BACK PUSH - ask the subject to stand 1 foot away from the wall with hands on the wall. Ask the subject to push the wall backward and, with the push, hold for 5 seconds- 10 Reiterations.



COOL DOWN EXERCISE: This exercise cools down our body after exercise.

Breathing exercise - ask the subject to maintain both hands on the occiput. Breathe deeply through the nose. The elbow should bend back and remain there for 5 seconds while inhaling. Then exhale through pursed lips- 10 Reiterations.

STATISTICAL ANALYSIS

All the data analysis in the present study was performed using the Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM, Chicago, IL, USA). To find the mean of CVA, OWD, and Cervical Range of Motion, a sample paired t-test was used. A paired sample t-test was used to examine the changes in outcome variables before and after the intervention in each group. The level of significance was fixed at $p < 0.05$.

8. WALL PUSH UP - ask the subject to stand 2 feet away from the wall. Keep your hand on the wall at shoulder level with an

Table 1. Statistical Analysis within the Experimental Group

| Outcome measures of Experimental group | Mean | | Standard deviation | | t-value | p-value |
|--|---------|----------|--------------------|----------|---------|---------|
| | pretest | Posttest | pretest | Posttest | | |
| CVA | 43.8462 | 46.3077 | 2.37508 | 2.05688 | 10.119 | 0.000 |
| OWD | 3.5538 | 3.3154 | 0.64371 | 0.66313 | 9.886 | 0.000 |
| CF | 35.5385 | 36.9231 | 2.60177 | 2.17798 | 7.675 | 0.000 |
| CE | 55.3846 | 57.1538 | 8.97718 | 9.12730 | 6.299 | 0.000 |
| CR-R | 44.6154 | 46.0769 | 3.33013 | 3.37791 | 6.789 | 0.000 |
| CR-L | 45.6154 | 45.8462 | 5.07508 | 2.44425 | 0.226 | 0.825 |
| CLF-R | 15.6154 | 16.3846 | 3.37980 | 2.93083 | 4.629 | 0.001 |
| CLF-L | 14.9231 | 16.7692 | 2.59684 | 2.08782 | 5.482 | 0.000 |

Table 1 shows that there is a significant difference between the pretest and post-test of CVA, OWD, and cervical range of motion

for the experimental group, except for cervical rotation on the left.

Table 2. Statistical Analysis within the Control Group

| Outcome measures of the control group | Mean | | Standard deviation | | t-value | p-value |
|---------------------------------------|---------|-----------|--------------------|-----------|---------|---------|
| | pretest | Post-test | pretest | Post-test | | |
| CVA | 44.3846 | 44.3077 | 2.02231 | 2.01596 | 1.000 | 0.337 |
| OWD | 3.4231 | 3.4077 | 0.46396 | 0.46630 | 1.477 | 0.165 |
| CF | 36.1538 | 36.3846 | 1.81871 | 1.98068 | 0.762 | 0.461 |
| CE | 47.7692 | 47.7692 | 5.97430 | 5.91825 | 0.000 | 1.000 |
| CR-R | 43.9231 | 44.1538 | 3.63917 | 3.78255 | 1.897 | 0.082 |
| CR-L | 43.7692 | 43.9231 | 3.19254 | 3.35315 | 1.000 | 0.337 |
| CLF-R | 13.6154 | 13.6923 | 3.33013 | 3.06552 | 0.322 | 0.753 |
| CLF-L | 14.6154 | 14.8462 | 1.70970 | 1.72463 | 1.897 | 0.082 |

Table 2 shows that there is no significant difference between the pretest and post-test of CVA, OWD, and cervical range of motion for the control group.

Independent T-Test for Group Comparison

Table -3: Comparison between the Experimental Group and the Control Group

| Outcome measure | Mean | | Standard deviation | | t-value | | p-value | |
|-----------------|--------------------|---------------|--------------------|---------------|--------------------|---------------|--------------------|---------------|
| | Experimental group | Control group |
| CVA | 2.4615 | 0.0769 | 0.87706 | 0.27735 | 9.950 | 9.950 | 0.000 | 0.000 |
| OWD | 0.5462 | 0.0154 | 1.07053 | 0.03755 | 1.787 | 1.787 | 0.087 | 0.099 |
| CF | 1.3846 | 0.2308 | 0.65044 | 1.09193 | 3.273 | 3.273 | 0.003 | 0.004 |
| CE | 1.7692 | 0.0000 | 1.01274 | 0.40825 | 5.842 | 5.842 | 0.000 | 0.000 |
| CR-R | 1.4615 | 0.2308 | 0.77625 | 0.43853 | 4.977 | 4.977 | 0.000 | 0.000 |
| CR-L | 2.3846 | 0.1538 | 2.72453 | 0.55470 | 2.893 | 2.893 | 0.008 | 0.013 |
| CLF-R | 0.7692 | 0.0769 | 0.59914 | 0.86232 | 2.377 | 2.377 | 0.026 | 0.027 |
| CLF-L | 1.8462 | 0.2308 | 1.21423 | 0.43853 | 4.512 | 4.512 | 0.000 | 0.000 |

Table 3 shows that there is a significant difference in CVA between the two groups. CROM is also significantly improved. There is no significant difference in OWD.

RESULT

From the statistical analysis of the experimental group, CVA, OWD, and cervical range of motion (including cervical flexion, cervical extension, cervical rotation, and cervical lateral flexion) show a significant difference between the pre-test and post-test values with a p-value < 0.05, except for cervical rotation on the left with a p-value of 0.825, which is not significant.

Statistical analysis of the control group, CVA, OWD, and cervical range of motion shows there is no significant difference between the pre-test and post-test with a p-value >0.05.

Statistical analysis between groups is done. CVA shows a significant difference between the experimental group and the control group with a p-value < 0.01. There is no significant difference between groups for OWD with a p-value of 0.087. There is a considerable difference between the experimental group and the control group for the CROM, with a p-value < 0.05.

DISCUSSION

The study is conducted to improve forward head posture by proximal stability training in post-pregnant women. This study was supported by Sajad Roshani et al. (2021), who compared proximal stability exercises with other interventions and found it to be more effective in improving overall posture due to its focus on strengthening the deep stabilizing muscles ⁽¹²⁾. The study of Yaowaluk Jaroenrungsup et al. (2021) proved that self-exercise for 8 weeks can correct forward head posture ⁽¹³⁾. The current research reinforces the idea that proximal stability exercises, when done correctly, can have a lasting impact on postural correction, and our results align with this growing body of evidence. Our findings suggest that there is a significant improvement in forward head posture with proximal stability training in

postpartum women. The results of this study supported the hypothesis that there is a significant improvement in forward head posture in post-pregnant women through proximal stability training.

Limitations And Recommendations

Limitations

- The duration of the study was shorter (8 weeks)
- Intervention for the number of days per week is less
- It was performed only on the NIEPMD campus

Recommendations

- This study can be done for a longer period
- This study can be done by increasing the number of days per week and by increasing the intervention period.
- This study can be done over a larger population.
- This study can be done for a different population other than post-pregnant women.

CONCLUSION

Finally, our study suggests proximal stability training improves the forward head posture in post-pregnant women. The craniovertebral angle and range of motion showed a beneficial change in posture and cervical movements. Proximal stability training is a valid protocol for improving forward head posture in post-pregnant women.

Declaration by Authors

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Conflict of Interest: The authors declare no conflict of interest.

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