

Prevalence of Scapulothoracic Dysfunction in Primipara after One Year of Delivery

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ABSTRACT

Background: During pregnancy, there are various physiological, biomechanical, postural, and emotional changes taking place. The changes in posture which occurs during pregnancy are even maintained in postpartum period if they remain uncorrected. Due to the enlargement of breasts, size of the uterus, and mother's weight, there is increase in lumbar and cervical lordosis and there is compensatory thoracic kyphosis, the shoulder and upper back become rounded. There is scapular protraction and internal rotation of the upper extremity; these adaptations of posture may also persist in the postpartum period due to infant care demands. Pectoralis muscles tightness and weakness of the scapular stabilizers may be pre-existing to or may occur due to pregnancy postural changes. Hence, there is a need of evaluating the upper quadrant musculoskeletal involvement during the postpartum period and its correlation with changes that occur during pregnancy. **Objective:** The objective of this study was to study the prevalence of scapulothoracic dysfunction in primipara after 1 year of delivery. **Methods:** A total 150 primipara women who had completed 1 year of delivery were randomly selected from the Krishna Institute of Medical Sciences, Karad in this analytical observational study. Scapulothoracic dysfunction was assessed using postural examination chart in the anterior, lateral and posterior views by plumb line, manual muscle testing for muscle strength, and special tests for scapular dysfunction. **Results:** The result showed that 71% found to be positive for scapulothoracic dysfunction through YES/NO test, respectively. Majority of the subjects (45%) had type II scapular dyskinesis, while 18% subjects had type I, 11% had type III, and 22% had type IV. On postural examination, 27% had forward head posture, 55% had protracted shoulder, and 60% had kyphotic posture. The strength test showed that 57% subjects had weak trapezius, 60% had serratus anterior weak and significant amount of weakness with gradings in the range of -3 to +3 for 57% subjects in trapezius, 60% in serratus anterior, and 65% had weak rhomboid's major with gradings in the range of -3 to +3, respectively. **Conclusion:** The study concludes that, statistically, there was high prevalence of scapulothoracic dysfunction in primipara women after 1 year of delivery. This was due of the slouched posture that the women's adapted due to increase in breast size, increased size of the uterus, breast feeding positioning, and also infant care which demanded hunched back posture. It was also found that women had lack of knowledge about posture.

Keywords: Forward head posture, Kyphosis, Postural changes, Protracted shoulders, Scapular dysfunction, Scapulothoracic muscles
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INTRODUCTION

Pregnancy is a time period when physiological, biomechanical, and emotional changes take place.^[1,2] The physiological and physical changes that occur during antenatal and postnatal period require significant musculoskeletal adaptations.^[3] Poor posture is a faulty relationship of the various parts of the body that puts stress on the supporting.^[4]

There are many changes in posture in pregnancy.^[5] Body's center of gravity moves forward in sagittal plane due to increase in the weight of the pregnant uterus and also to bring the center of gravity to a more posterior position, weight shifts toward the heels.^[6] Due to the enlargement of the uterus and breast, there is shift in the center of gravity, that is, upward and forward. Lumbar and cervical lordosis increase for compensating the shift in the center of gravity. There is significant increase in thoracic curvature angle at the term of the pregnancy which happens to compensate for severe increase in lumbar lordosis to prevent her from falling to the front.^[7,8] These postural changes represent adaptations or compensations for maintaining the center of mass over the base of support.^[9]

Postural adaptations to the physiological changes occurring during the pregnancy are alteration in the loading and alignment of, and muscle forces along, the vertebral column and in the weight bearing joints.^[10-12] A study by Dumas *et al.* stated that the posture in the postnatal period was not much different from that measured at the term of pregnancy, the changes in postural curves measured during pregnancy were maintained even 3 months after delivery.^[13,14]

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During breastfeeding women have the tendency of hunching forward, which may lead to stress on the back, neck, and shoulders. Increased thoracic flexion can affect the scapulohumeral rhythm which results in decreased scapular plane shoulder abduction

range of motion and muscle force.^[15] Thus, the hunched back posture can lead to shoulder complex muscle weakness, also may limit the glenohumeral joint range of motion and lead to shoulder pain, and increased scapular superior translation also known to occur between 0° and 90° abduction that may place the upper trapezius muscle in a shortened position and decrease its ability to generate tension.^[16-18]

Scapula has an important role in uniform and harmonious movement of the shoulder joint. The scapular position in relation to the thorax is important as its abnormal position will disrupts the normal biomechanics of the shoulder joint which may lead to injury or abnormal posture.^[19] Scapulohumeral rhythm is the key for efficient working of shoulder function due to which scapular plane abduction.^[16,20]

For stabilization of scapula, integrated action of the upper trapezius, middle trapezius, lower trapezius, and rhomboid muscles along with serratus anterior muscle is needed.^[21] In kyphotic posture, there is scapular muscle weakness due to which there is altered scapulohumeral rhythm which may lead to scapulothoracic dysfunction.^[22] The scapulothoracic kinematics are also affected by abnormality in thoracic and cervical spine posture.^[23] These postural problems leads to weakness and fatigue of scapular musculature, tightness of pectoral muscles and upper back pain. Thus, to study, scapulothoracic motion is necessary in postpartum females.^[21]

METHODS

This was an analytical observational study with the total of 150 primipara women who completed 1 year of the delivery were randomly selected from the Krishna Institute of Medical Sciences, Karad in this study.

Subject Criteria

One hundred and fifty primipara women who had completed their 1 year of delivery period were involved in the study. Age group included was from 20 to 30 years old. The method of delivery was normal vaginal delivery and lower segment cesarean section (LSCS) were included in the study. All participated women were from various occupations. All women with any pathology or comorbidities causing kyphosis or scapular dyskinesia or any if having orthotic conditions, neurological conditions, congenital dysfunction and non-cooperative were not included in the study. Informed consent was taken in written format from the subjects those willing to participate. The detailed outcome assessment was done using postural examination, manual muscle testing, and by special tests.

Procedure

A detailed history and demographic data were taken from each primipara women before starting this study. After that, each primipara women was instructed about the assessment. The assessment was taken with the plumb line by the postural examination chart in the anterior, lateral, and posterior views. At that time, the subjects were asked to stand in normal anatomical position. Abnormalities such as protracted shoulders, kyphosis, and neck flexion were noted. The muscle strength was also measured with the help of grades of MMT to know the weakness of muscles after pregnancy such as trapezius and serratus

anterior. Special test was taken to conform the diagnosis. Scapular retraction test, scapular load test, lateral scapular slide test, and wall push-up these four tests were taken. YES/NO test (qualitative assessment) was taken with subjects standing straight with the upper extremities in relaxed and neutral position. The subjects were asked to hold 1 kg of weights in each hand and then abduct their hands to the maximum level possible. The subjects were asked to repeat it 3 times. The examiner stood behind the participant for observation of the motion. If there was scapular prominence, then it was noted as “yes” and if it was absent, then it was noted as “no.” The subjects were asked to repeat it 3 times. Type of dyskinesia observed was according to the type of border prominence which was seen in the test.

Statistical Analysis

The data were collected and statistically analyzed. The postural examination in anterior, posterior, and lateral view was analyzed by Chi-square test. Scapular dyskinesia and its type were assessed using YES/NO test and were analyzed with percentage. Furthermore, muscle strength test and special test were analyzed. Statistical significance was accepted if P values is $P < 0.05$ at 95% of confidence interval.

RESULTS

The present study was carried out among 150 primipara women who had completed 1 year of delivery. This study showed that there is significant prevalence of scapulothoracic dysfunction in primipara women after 1 year of delivery.

Tables 1-3 show result of assessment showed that 27% women had forward head posture, protracted shoulders were

Table 1: Postural examination of anterior view

| Anterior view | | P value | Chi-square value | Results | |
|---------------|----------------|--------------------|------------------|---------|-------------|
| Neck | 73% (Aligned) | 27% (Forward head) | <0.0001 | 24.369 | Significant |
| Shoulder | 45% (At level) | 55% (Protracted) | | | |

Table 2: Postural examination of lateral view

| Lateral view | | P value | Chi-square value | Result | |
|--------------|-------------------|--------------------|------------------|--------|-------------|
| Neck | 73% (Aligned) | 40% (Forward head) | <0.0001 | 37.603 | Significant |
| Shoulder | 45% (At level) | 55% (Protracted) | | | |
| Kyphosis | 40% (Not present) | 38% (Increased) | | | |

Table 3: Postural examination of posterior view

| Posterior view | | P value | Chi-square value | Result | |
|----------------|-------------------|--------------------|------------------|--------|-------------|
| Kyphosis | 40% (Not present) | 60% (Increased) | <0.0001 | 32.653 | Significant |
| Neck | 73% (Aligned) | 27% (Forward head) | | | |

seen in about 55% women, 14% had winging of scapula, and thoracic kyphosis was seen in 38% women.

Table 4 shows the strength of the scapulothoracic muscles assessed using manual muscle testing. Trapezius, serratus anterior, and rhomboid's major muscle were tested, which showed significant amount of weakness with maximum gradings in the range of 3- to 3+.

Table 5 shows result of special test done to confirm the scapulothoracic dysfunction. As the tests were positive in maximum participants, it showed significant amount scapulothoracic dysfunction in women.

Table 6 shows that among 150 subjects 18% had type I scapular dyskinesia, 45% had type II, 15% had type III, and 22% had type 4.

DISCUSSION

This study was conducted see the prevalence of scapulothoracic dysfunction in primipara after 1 year of delivery. Postpartum females after 1 year of delivery, who had undergone either full-term normal delivery or LSCS were included in the study.

One hundred and fifty subjects with age group of 20-30 years were selected for study. All women with orthotic conditions, neurological conditions, congenital dysfunction, and non-cooperative were not included in the study. Informed consent in written format was taken from the subjects those willing to participate.

This study showed that there is significant prevalence of postural impairments in primipara women after 1 year of delivery. This was confirmed using statistical analysis by "Chi-square test." The most prevalent changes noted on assessment were forward head posture (40%), rounded shoulders (55%), and kyphosis (38%). A study by Goyal *et al.* supports the above findings as it revealed poorer positioning among primipara (24.0 %) than multipara (8.9-12.5%) mothers and also parity was seen to be significantly associated with poor position.^[24]

In this study, the strength of the scapulothoracic muscles such as trapezius, serratus anterior, and rhomboids was assessed. The results showed that majority of the women had reduced strength in the scapulothoracic muscles. The muscles assessed were in the graded range of -3 and 3+. Study done by Moore K *et al.* supports the above result by stating that as there is enlargement of breasts, the shoulder, and upper back; they become rounded with scapular protraction and upper extremity internal rotation; these postural alterations persist in the postpartum period because of infant care demands. There is pectoral muscle tightness and weakness of the scapular stabilizers which may be pre-existing to or may occur due

to pregnancy postural changes.^[13] There may be increased kyphotic curve of thoracic spine due to pregnancy and breastfeeding may cause increased kyphotic curve of the thoracic spine. This kyphotic posture if remained uncorrected leads to weakness and fatigue of scapular musculature, tightness of pectoral muscles, and upper back pain.^[21]

In this study, special test was done for confirmatory diagnosis. Scapular retraction test, scapular load test, lateral scapular slide test, and wall push-ups test were taken. The results of the test were either positive or negative. The women with positive results were considered having scapulothoracic dysfunction and the negative results women were considered having normal scapulothoracic function. Out of 150 women, significant number of women had scapulothoracic dysfunction. A study done by Kibler and Sciascia supports that the above results by claiming that kyphosis, tightness of upper chest muscles, and weakness of upper back muscles are the causes for scapular dyskinesia.^[15]

The result showed that majority of the subjects (45%) had type II scapular dyskinesia present, while 18% had type I, 11% had type III, and rest 22% had type IV dyskinesia. This was based on the YES/NO test which according to Raikes and Kibler is a good screening tool for assessing scapular dyskinesia as it takes multiple plane asymmetries into consideration.

The analysis of a research stated that both lordosis and kyphosis increased significantly during pregnancy and these curves were maintained postnatally.^[25] Furthermore, subjects with rounded shoulders and kyphosis had increased incidence of cervical and intrascapular pain.^[21] Based on the researches included above, this study focused on evaluating the upper quadrant musculoskeletal involvement during postpartum period.

Before pregnancy postural adaptations are exaggerated during pregnancy. There is laxity of supporting tissues, either pre-existing or influenced by the hormone relaxin which increase as the posture become habitual.^[11] After childbirth the changes that happen in posture, they do not correct automatically and they adapt the pregnant posture. In addition, many child care activities contribute to persistent postural faults and asymmetry.^[2]

The study by Gaikwad and Shinde showed that there is significant prevalence of postural impairments in primipara women after 1 year of delivery. The study was carried out among 100 primipara women who had completed 1 year of delivery. In this study, head alignment changes with maximum showing forward head posture (46%). Rounded shoulders were seen with about 53% findings. Anterior pelvic tilt and lumbar lordosis were significantly noted in almost all women. Other component assessed was muscle length. The results of muscle length test showed varied distribution of tightness in different muscle groups.

Table 4: MMT

| Manual muscle testing | No. of Individuals with grades | | | | | | | | | | Result | |
|-----------------------|--------------------------------|----|----|----|-----|-----|-----|-----|----|-----|--------|----------------------------|
| | 1 | 2- | 2 | 2+ | 3- | 3 | 3+ | 4- | 4 | 4+ | | 5 |
| Trapezius | 0% | 0% | 0% | 8% | 11% | 30% | 16% | 7% | 9% | 10% | 8% | Trapezius weakness |
| Serratus anterior | 0% | 0% | 0% | 0% | 20% | 15% | 25% | 12% | 9% | 5% | 14% | Serratus anterior weakness |
| Rhomboid's major | 0% | 0% | 0% | 9% | 15% | 40% | 10% | 5% | 7% | 8% | 6% | Rhomboid's major weakness |

Table 5: Special test

| Test | Positive | Negative | P value | Chi-square test |
|-----------------------------|----------|----------|---------|-----------------|
| Scapular retraction test | 55% | 45% | <0.001 | 79.025 |
| Scapular load test | 70% | 30% | | |
| Lateral scapular slide test | 65% | 35% | | |
| Wall push-up test | 60% | 40% | | |

Table 6: Type of scapular dyskinesia

| Type | Frequency | Percentage |
|--------------------------------------|-----------|------------|
| Inferior border prominent (Type I) | 27 | 18 |
| Medial border prominent (Type II) | 63 | 45 |
| Superior border prominent (Type III) | 16 | 11 |
| Symmetrical (Type IV) | 44 | 22 |

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Thus, they concluded that there existed a disturbed muscle length and strength factor post pregnancy and these findings last up to a year even after the pregnancy.^[8]

Most of the women lack proper knowledge about the breastfeeding positions; therefore, they tend to practice breastfeeding in hunched back position and uncomfortable postures, putting a lot of stress on their back muscles, and weakening leading to scapular dyskinesia over period of time.^[26] A study done by Krishnakumar *et al.* on assessment of scapular stability in postpartum females concludes that there is increased pectoralis major muscle tightness and weakness of rhomboids and lower trapezius. Outcome measures used in this study showed statistically significant changes in scapular stability.

There is need of additional research on musculoskeletal complications occurring as a result of wrong ergonomic practice during and post-delivery. Number of pregnancies and its correlation with scapular dysfunction can be evaluated. Large population can be included in the study.

CONCLUSION

The study concludes that, statistically, there was high prevalence of scapulothoracic dysfunction in primipara women after 1 year of delivery. This was due of the slouched posture that the women's adapted because of increase in breast size, increased size of the uterus, breast feeding positioning, and also infant care which demanded hunched back posture.

AUTHOR CONTRIBUTION STATEMENT

Nayan Kadav conducted literature review for this manuscript, developed an introduction section of manuscript, conducted the discussion of the study, findings, collected data, and analyzed the data. Dr. Sandeep Shinde provided a description of the background information, collected data, and analyzed the data and participated in prescription of the manuscript, all the authors read and approved the final manuscript.

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ETHICAL COMMITTEE

The study was approved by the Institutional Ethical Committee of Krishna Institute of Medical Science Deemed to Be University, Karad, Maharashtra.

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