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RESEARCH ARTICLE

QUANTITATIVE ASSESMENT OF TRUNK PROPRIOCEPTION IN RELATION TO LOW BACK PAIN IN POSTNATAL PERIOD

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ABSTRACT

Background: Back pain is one of the most common problems that occur after pregnancy in postpartum period that affects quality of life. According to a lot of studies women's which complain of low back pain in postpartum period reporting disorders in the trunk. **Objective:** the main objective of the study was to find the correlation between low back pain and trunk proprioception in postpartum period. **Methodology:** 20 participants suffered from low back pain in postpartum period and 20 normal participants as a control group their ages ranged from 25 to 35 years old and their body mass index less than 30. Trunk proprioception at 30 degree and at 60 degree. **Results:** There was a significant effect of low back pain on trunk proprioception at 30 degree and 60 degree flexion (p = 0.0001) and (p= 0.0001)) respectively. There was a positive significant correlation between score of visual analogue scale and degree of angular error in 30 degree flexion and 60 degree flexion (p=0.002) and (p=0.003) respectively. **Conclusion:** There is a correlation between low back pain and trunk proprioception defect. The proportional between trunk proprioception angular error with VAS was direct.

INTRODUCTION

Low back pain (LBP) is a frequent condition found in all categories of adult population, Epidemiological studies have shown that 50%–80% of the population is affected by LBP (Holm *et al*., 2002). During pregnancy, the uterus expands 150 times in size and contributing to half of the overall weight increase .By assessing patients' ability to perform sit-ups, abdominal muscles were significantly weakened due to over-stretching of the abdomen with uterine growth. This places extra strain on lumbar muscles, which compensates for abdominal weakness, causing pain throughout pregnancy (Darryl *et al*., 2007). Low back pain that persist during pregnancy and continues in postpartum period may take more than 3 months of pain so it is defined as chronic low back pain as, chronic pain is the pain that continues at 3 months and 6 months since its onset (Turk *et al*., 2001). The postpartum period is a crucial time for the new mother, newborn and the entire family, it begins after birth and extends to 6 months and sometimes it extends to 12 months and it is called delayed postpartum period (Tavares *et al*., 2020). Chronic pain affects muscle memory and proprioception of the joint, Proprioception is important for sensory motor control, regulation of muscle stiffness, movement acuity, joint stability, coordination and balance (Suner-keklik *et al*. 2017). Proprioception is "the sense of position and movement of one's own limbs and body without using vision. There are two sub-modalities of proprioception: the sense of the stationary position of the limbs (limb-position sense) and the sense of limb movement (kinaesthesia).The ability to sense stationary position and movement is an important aspect of executing body motion (Reeves *et al*., 2007).

Purpose of the study: The purpose of this study was to investigate the relation between low back pain and trunk proprioception in postnatal period.

MATERIALS AND METHODES

Studydesign: Observational study. The study was conducted on 40 women:

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Patients' selection: The study conducted on forty women: 20 women with chronic low back pain postpartum and the other 20 were matched normal individuals. Participants were in postpartum period from first day of delivery to 6 months post partum, they were selected from EL KASR EL EINY Hospital & WADY NiLE Hospital.

Study groups: The subjects divided randomly into two groups equal in number, study group (group A) and control group (group B)

Study group (A): This Group included of 20 multipara women have low back pain according to Visual analog scale (VAS)

Control group (B): This Group included of 20 multipara women don't have low back pain according to VAS. All participants had a full explanation of the protocol of the study and signed a consent form before participating in this study.

Inclusion Criteria

- The Number of parity Ranged from 2-3 times.
- Their age ranged from 25 -35 years. (Bellieni 2016)
- Their body mass index ranged from 25 to 30 kg/m^2

Exclusion Criteria

- All participants were free from(Chronic uterine prolapse. ,Chronic pelvic pain , Lumber disc prolapse., Heart diseases, Hypertension ,Tumor in lumbar spine, Lumbar spondylosis Spondylolisthesis, Pelvic tumor, Anygynaeocological cause of low back pain).
- Women had undergone one surgery or more in Spine or in the back region .
- Women with body mass index more than 30 kg/m2.
- Women with history of hormonal medications .

Instrumentation

Bubble Inclinometer: Bubble inclinometer has a 360° rotating dial with fluid indicator with Precise results for flexion and extension; abduction and adduction; and rotation in the neck, shoulder, elbow, wrist, hip, knee, ankle, and spine and also in trunk motion (Inclinometer standards are codified in the AMA Guide to the Evaluation of Permanent Impairment, Third Edition) (figure 1) (Vaza 2014)

Figure 1. bubble inclinometer (White plains, New York 10602 U.S.A)

Visual analogue scale (VAS): It is a scale that allows continuous data analysis . It is 10-cm line, oriented vertically or horizontally. It is formed of one end representing “no pain” and the other end representing “pain as bad as it can be”. The patient is asked to mark a point on the line corresponding to the current pain intensity. The distance from a point of no pain to the point the patient made is measured .The distance measured representing the intensity of pain of the patient (Van *et al*., 2007).

Evaluation Methods and Procedures: All participants were evaluated by using the same procedures and completed the following form of evaluation and detailed personal and medical history Would be taken from each women before starting the study to confirm there are no any contraindications that interfere the study .
Pain assessment: Assessment of pain through using VAS was performed before and after treatment. Each patient was asked to place a mark along the line to denote their level of pain.

Proprioception assessment: Proprioception assessment done for the control group and for the study group by using bubble inclinometer to measure trunk repositioning angle error (TRE).

Bubble inclinometer testing procedure: The trunk position sense was assessed with the Bubble Inclinometer,which is a device that can be used to measure joint range of motion and position sense.(Salamh *et al*., 2013), Participants were stabilized in sitting position and the inclinometer with precision to 1° was placed on skin over the spinous process from first to second thoracic vertebra (T1-T2) and secured with double-sided tape.(figure 2) (Woo-Nam C *et al*.,2013)

(Figure 2) starting position sitting position with inclinometer placed on skin over the spinous process from first to second thoracic vertebra (T1-T2)

Active Reproduction of joint position test applied for all participants to detect trunk repositioning angle error (TRE).In the current study, the (TRE) was measured to indicate the sense of position for trunk region, Before applying the Active Reproduction Test (ART) , participant was stabilized in sitting position with their eyes blindfolded. The starting position of the trunk was in neutral position with 0° trunk flexion (figure 2).

Firstly, we arranged to move each subject passively to a specific angle called an absolute reference angle. During the procedure, there were two different absolute reference angles; 30° of trunk flexion and 60° trunk flexion (Shenouda *et al*., 2011), relative to trunk starting position mentioned above(Clark *et al*., 2015). Each participant was allowed to sense the reference angles 30°of trunk flexion first for six seconds before returning the trunk passively to the starting position**.** Then, the participant moved his trunk actively towards each reference position of the trunk flexion range, and participants indicated verbally when she felt that she would be reached the angle. (Figure 3) (Figure 4)Finally, the absolute error in degrees between the indicated and reference positions represented the measure of TRE for trunk flexion range in the present work (Kılınç *et al*. 2018)

Figure 3. The participant moved his trunk actively towardsthe reference angles 30° of trunk flexion

- This procedure was repeated three times for trunk flexion 30°. Same procedure was repeated to calculate the TRE for trunk flexion 60°range (Descarreaux *et al*., 2005)

Figure 4) The participant moved his trunk actively towards the reference angles 60° of trunk flexion

- The test was applied for both angles on each movement and then the scores were averaged for analysis.

Statistical analysis

- Descriptive statistics and unpaired t-test were conducted for comparison of the mean age, weight, height and BMI between both groups.
- Unpaired t test was conducted for comparison of trunk repositioning errors between groups.
- Pearson Correlation Coefficient was conducted to investigate the correlation between VAS and repositioning error.
- The level of significance for all statistical tests was set at $p < 0.05$.
- All statistical measures were performed through the statistical package for social studies (SPSS) version 19 for windows.

RESULTS

The purpose of this study was to investigate the relation between low back pain and trunk proprioception in postnatal period. Twenty postnatal women who suffered from low back pain 6 weeks from delivery were compared with twenty postnatal women without low back pain. Data obtained from both groups regarding trunk repositioning errors at 30 and 60 degrees were statistically analyzed and compared.

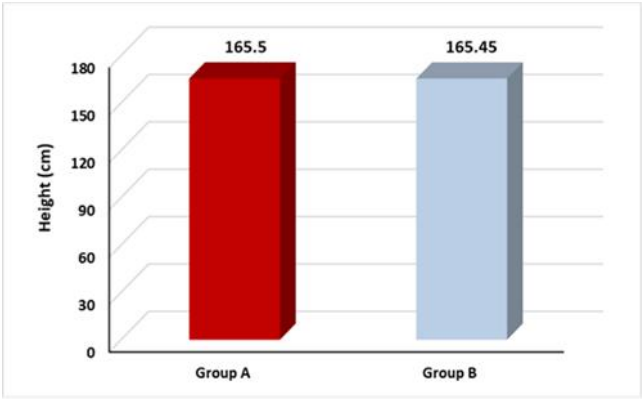

Figure 1. Mean height of both groups (A and B)

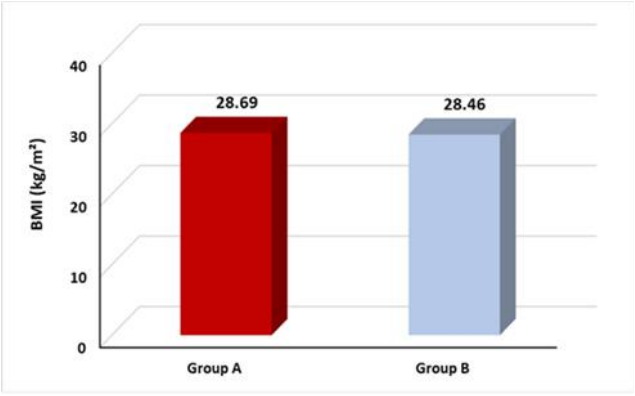

Figure 2. Mean BMI of both groups (A and B).

General characteristics of the subjects

Group A: Twenty postnatal women with low back pain 6 weeks from delivery were included in this group.

Their mean ± SD age, weight, height and BMI were 29.55 ± 3.18 years, 78.95 ± 7.35 kg, 165.5 ± 5.23 cm and 28.69 ± 1.67 kg/m² respectively as shown in table (1) and figure (1-4).

Group B: Twenty postnatal women without back pain were included in this group. Their mean ± SD age, weight, height and BMI were 30.35 ± 2.9 years, 78.25 ± 7.43 kg, 165.45 ± 5.43 cm and 28.46 ± 1.73 kg/m² respectively as shown in table (1) and figure (1-4). Comparing the general characteristics of the subjects of both groups revealed that there was no significance difference between both groups in the mean age, weight, height, or BMI ($p > 0.05$).

Comparison of trunk repositioning errors at 30 degrees between group A and B: The mean ± SD trunk repositioning errors at 30 degrees of group A was 7.5 ± 1.82 degrees while in group B was 2.23 ± 1.23 degrees. The mean difference between both groups was 5.27 degrees. There was a significant increase in trunk repositioning errors at 30 degrees of group A compared with that of group B ($p = 0.0001$) (Figure 6).

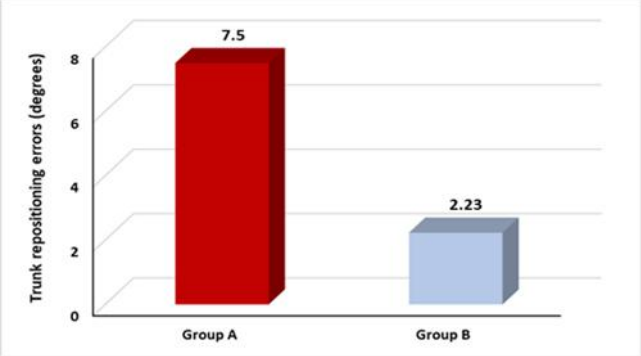

Figure 3. Mean trunk repositioning errors at 30 degrees of both groups (A and B)

Comparison of trunk repositioning errors at 60 degrees between group A and B: The mean ± SD trunk repositioning errors at 60 degrees of group A was 4.61 ± 2.31 degrees while in group B was 2.12 ± 1.43 degrees. The mean difference between both groups was 2.49 degrees. There was a significant increase in trunk repositioning errors at 30 degrees of group A compared with that of group B ($p = 0.0001$) (Figure 7)

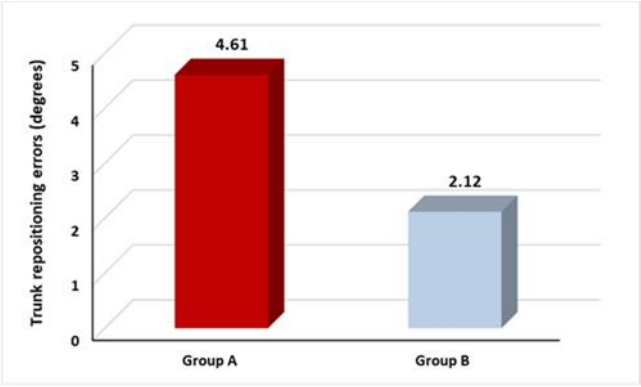

Figure (4). Mean trunk repositioning errors at 60 degrees of both groups (A and B)

Relationship between VAS and trunk repositioning errors: The correlation between VAS and trunk repositioning errors at 30 degrees was moderate positive significant correlation ($r = 0.649$, $p = 0.002$) (Figure 8).

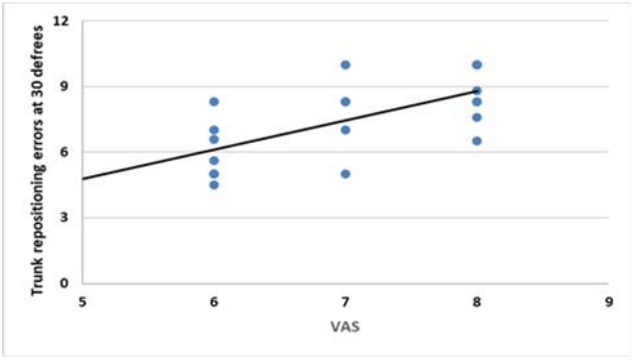

Figure 8. Correlation between

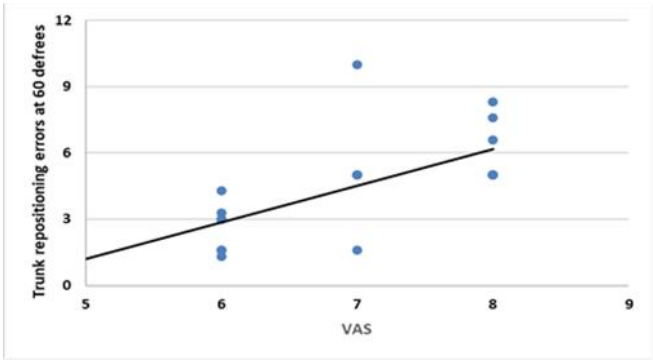

Figure 9. Correlation between VAS and trunk repositioning errors at 60 degrees

The correlation between VAS and trunk repositioning errors at 60 degrees was moderate positive significant correlation ($r = 0.635$, $p = 0.003$) (Figure 9)

DISCUSSION

The main purpose of this study was to investigate the relation of trunk proprioception in women with low back pain in postpartum period to a matched normal group. The correlation between low back pain and trunk proprioception was also examined in the current work. The subjects will be divided randomly into two groups equal in number Group (A&B), study group (group A) and control group (group B) .Group (A) consisted of 20 multipara 6 weeks from delivery postnatal women had low back pain according to Visual analog scale (VAS), Group (B) consisted of 20 multipara 6 weeks from delivery postnatal women didn't have low back pain according to VAS. This study was conducted in WADI ELNEIL hospital at the duration from august 2020 to march 2021. Data obtained from both groups regarding trunk repositioning errors at 30 and 60 degrees were statistically analyzed and compared. Study group was Twenty postnatal women with low back pain 6 weeks from delivery were included in this group. Their mean ± SD age, weight, height and BMI were 29.55 ± 3.18 years, 78.95 ± 7.35 kg, 165.5 ± 5.23 cm and 28.69 ± 1.67 kg/m² .control group was Twenty postnatal women without back pain were included in this group. Their mean ± SD age, weight, height and BMI were 30.35 ± 2.9 years, 78.25 ± 7.43 kg, 165.45 ± 5.43 cm and 28.46 ± 1.73 kg/m² Comparing the general characteristics of the subjects of both groups revealed that there was no significance difference between both groups in the mean age, weight, height, or BMI ($p > 0.05$). Also, the current study revealed that there is acorrelation between score of VAS and trunk repositioning errors at 30 degrees was moderate positive significant correlation ($p = 0.002$), and at 60

degrees was moderate positive significant correlation (p = 0.003). The results of the current work can be supported by those obtained byMagdolin and colleagues in 2011 in which they found a direct effect of weakness of the abdominal and back muscles increased proprioceptive error in patients with lumbar disc prolapse ,otherwise the propriceptive error decrease in normal healthy group (Shenouda *et al*., 2011)) Furthermore, an alteration of trunk alignment and proprioception was found in patient with insidious onset lower back pain and lumbar spondylosis disorder(Tadashi, *et al*. 2011). Also the correlation between degree of low back pain and Proprioception defect also measured in this study and we found that:

The correlation between VAS and trunk repositioning errors at 30degrees was moderate positive significant correlation (r = 0.649, p = 0.002). The correlation between VAS and trunk repositioning errors at 60 degrees was moderate positive significant correlation (r = 0.635, p = 0.003). Up to our knowledge there is no study studied the relation between the degree of the pain and the increasing of Proprioception deficit. To & Wong (2003) reported that During the postpartum period, 30-45% of women experience low back pain. At one year after birth, about half of women who had back pain during pregnancy will have back pain symptoms.

Bellieni (2016) found that the safest age for given a birth is under 35 years old, as women over 35 years old are more likely to have complications, premature deliveries, and birth procedures, as well as an elevated risk of serious foetal anomalies, such as structural and chromosomal abnormalities. Gutke (2007) reported that the cause of this pain comes from many factors as postural chamgesand hormonal changes like relaxinhormone **,**Also this study supported by Lee *et al*., (2010) Who stated that Low back pain also has a great impact on changing motor control of the body, LBP patients always have difference in motor control such as longer muscle reflex latency and poor postural control , these difference in motor control would be caused by defect in Proprioception Roy *et al*., (2017) revealed that the Proprioception is based on sensory signals given to the brain by muscle, joint, and skin receptors as part of neuromuscular regulation of the body, As the nervous reflex is compromised, this neuromuscular regulation can become dysfunctional, resulting in impaired proprioception.

While Solomonow *et al*., (2006) concluded that the muscle spindle density is high in deep paraspinal muscles than joint structure , while the joint afferent information alters muscle activation, furthermore. The Endurance of trunk extensors are more than trunk flexors which result in Proprioception deficits in trunk flexors more than trunk extensors muscles. Thus, the current study revealed that low back pain in postpartum period has an effect on trunk Proprioception as there was a significant difference in trunk Proprioception between study group and control group at 30 degree and 60 degree of trunk flexion.

Limitations of the study: Psychosocial status and motivation might influence patients performance (eg: anxiety or stress) during assessing their proprioception. Furthermore, inability to quantify participant fatigue level could also influence performance of the participants, Postpartum pain may influence some results during my practical assessment**.**

Conclusion

Based on the findings of the current study, it can be concluded that there is significant difference in the level of trunk proprioception in patients with postpartum low back pain when compared with normal women.

Recommendations

The effect of low back pain on trunk Proprioception in postpartum period still needs further studiestoexplain and clarify this relation.

The present study gives rise to some additional research topics as follows: Studying the effect of trunk proprioception training in improving trunk stability in patient with low back pain in postpartum period. Studying the effect of postural correction exercise and stabilization training of lumbar region on improving alignment and proprioception of trunk. Studying the relation between lumbar pain and trunk function in patients with low back pain in postpartum period. Studying the effect of back exercise in pregnancy period on trunk Proprioception in postpartum period. Studying the effect of low back pain on muscle firing of trunk region in postpartum period.

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