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'SENSITIVITY, SPECIFICITY, AND PREDICTIVE VALUE OF THREE CLINICAL TESTS FOR MEASURING TRUNK MUSCLE STRENGTH AND ENDURANCE IN POSTPARTUM LUMBOPELVIC PAIN'

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Abstract

Aims & Objectives: To describe the sensitivity, specificity, and predictive value of three clinical tests used for measuring trunk muscle strength and endurance in postpartum lumbopelvic pain.

Methodology: The groups were divided into two (Group A: subjects without postpartum lumbopelvic pain and Group B: subjects with postpartum lumbopelvic pain) for measuring trunk muscle strength and endurance by using three clinical test (Sorensen test, Prone isometric chest raise test, and Supine double straight leg raise test).

Result: After using the three clinical test, the overall (total) reliability of all tests was very high with highest being of Sorensen test (ICC=0.957) followed by PICRT (ICC=0.928) and SDSLRT (ICC=0.893), the least. Further, the reliability all test were higher in without LBP as compared to with LBP.

Conclusion: The study concluded that Sorensen test is a reliable tool for measuring trunk muscle strength and endurance in patients with postpartum lumbopelvic pain.

Keywords: Postpartum Lumbopelvic pain (PPLP), Sorensen test, Prone isometric chest raise test (PICRT), and Supine double straight leg raise test (SDSRT)

Introduction

Lumbopelvic Pain (LPP) refers to self-reported pain 3 in areas of lower back, anterior pelvis, posterior pelvis, or any combination of these locations.[1] It is a common complaint for women after labour, and this is supported by a systematic review which found that 25% of newly delivered women experienced low back and/or pelvic pain[2]. Also, it has been reported by post partum follow-up studies that about 8–20% of women still have persistent non-specific LPP for 2–3 years after delivery.[3] The presence of LBP is often and confirmed by diagrammatic representations of self-reported pain location alone or in combination 13 with clinical tests ,[4] and most LBP is reported in and around the lumbar area, which is responsible for 15 supporting the majority of the upper body weight [5]. Factors associated with LBP occurrence in the post- natal period include maternal age, parity, obesity, smoking, oral

contraceptives, previous history of LPP, uncomfortable working conditions, and lack of Also, non-optimal stability which result from weakening or insufficient motor control of the trunk muscles, is proposed as the most common cause for postpartum LPP. More than 2,000 years ago, Hippocrates (c. 460–c. 377 B.C.) theorised that an irreversible relaxation and widening of the pelvis occurs with the first pregnancy, the resultant instability of the sacroiliac joints leading to symptomatic inflammation.[6] Laxity in the supporting tissues either pre-existing is the source of muscle strain during the actual birth. The lower back muscles are used, along with the pelvic muscles and abdominals during a vaginal birth. Low endurance of back and hip muscles has been reported postpartum in women with longstanding PGP and lumbar pain. [(7)] This study aimed to determine the sensitivity, specificity, and predictive value of three clinical tests for measuring trunk muscle strength and endurance in postpartum women with lumbopelvic pain.

Methodology

Participants: A total of 60 postpartum women with PLPP were recruited from outpatient clinics specializing in women's health. Trunk Flexor Endurance Test: Participants performed repeated trunk flexion movements until exhaustion while lying supine with knees flexed to 90 degrees. Trunk Extensor Endurance Test: Participants performed repeated trunk extension movements until exhaustion while prone on a treatment table. Trunk Flexor Strength Test: Participants performed a maximum voluntary contraction of trunk flexion against resistance in a seated position. Outcome Measures: Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of each clinical test were calculated using a reference standard, such as magnetic resonance imaging findings or clinical diagnosis by a specialist. Inclusion Criteria are as follows:1. Postpartum women within one year of childbirth, Presence of lumbopelvic pain persisting for at least four weeks postpartum, Age between 18 and 45 years, Ability to understand and perform the required clinical tests, Willingness to participate in the study and provide informed consent.

Exclusion Criteria are as follows : Current or prior history of spinal surgery, Known spinal or pelvic fracture, Neurological disorders affecting trunk muscle function (e.g., spinal cord injury, multiple sclerosis and Pregnancy or less than four weeks post.

Procedure

60 subjects fulfilling the inclusion and exclusion criteria will be taken for the study. An informed consent form was signed by all subjects before including in the study. All the subjects were assessed with 7 inclusion tests for SI joints for low back pain. 7test for the selection of the patients were done namely (Gaenslen test, Distraction test, Compression test, Patric's FABER test, Sacral thrust test, Thigh thrust test, Resisted hip abduction test). Out of these atleast 3-4 test should be positive and then patient is included in the study.

Trunk extensor strength will be measured by position holding time noted by use of three clinical tests Sorensen test, Prone isometric chest raise test, and Supine double straight leg raise test.

Trunk extensor endurance will be measured by test position was maintained and from this position repetitions are done by using three clinical tests Sorensen test, Prone isometric chest raise test, and Supine double straight leg raise test. All the subjects divided into two groups. Group A subjects without postpartum lumbopelvic pain. Group B: subjects with postpartum lumbopelvic pain. All subjects underwent a detailed orthopaedic assessment. A baseline measurement of dependent variables trunk extensor strength and trunk extensor endurance were taken on Sorensen test, Prone isometric chest raise test and Supine double straight leg raise test.

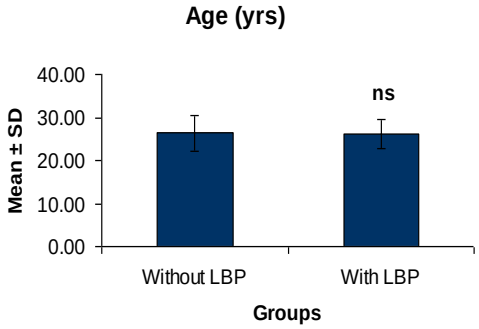
Result

A. Basic characteristics

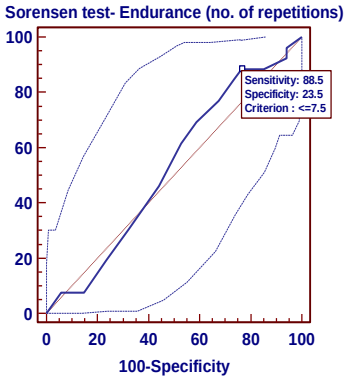
The present study evaluates the sensitivity, specificity and predictive value of the clinical muscle endurance and strength tests in postpartum lumbopelvic pain. A total of 60 convenient women were recruited and evaluated. Of total 34 were without LBP and 26 were with LBP. The basic age of two

groups at admission are summarized in Table 1 and also shown graphically in graph 1 and 2, respectively.

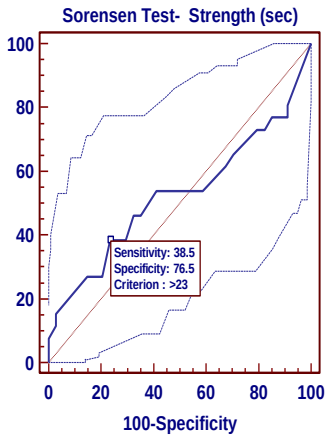
Data were summarized as Mean ± SD. Groups were compared by paired t test and independent Student's t test. Two independent groups were also compared by Mann-Whitney U test. Intraclass correlation coefficient (ICC) was done to assess intra-observer reliability. Receiver operating characteristic (ROC) curve analysis was done to assess sensitivity, specificity and predictive value of the clinical trunk muscle endurance and strength tests between without LBP and with LBP patients. A two-sided (α=2) p value less than 0.05 (p<0.05) was considered statistically significant.



Graph 2. Diagnostic ability of endurance using Sorensen test in postpartum lumbopelvic pain women using ROC curve analysis



Graph 3: Diagnostic ability strength using Sorensen test in postpartum lumbopelvic pain women using ROC curve analysis.



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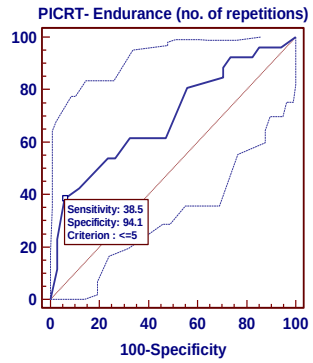

Graph 4: Diagnostic ability of endurance using PICRT in postpartum lumbopelvic pain women using ROC curve analysis.

To see the sensitivity, specificity, predictive value of performed clinical At cut-off value of 23, strength showed low sensitivity 38.46% (95% CI=20.3-59.4) but high specificity 76.47% (95% CI=58.8-89.2) (Graph 3). Further, the positive and negative predictive value of strength was found to be 55.6% and 61.9%, respectively. Table 2 showed that the overall (total) reliability of all tests was very high with highest being of Sorensen test (ICC=0.957) followed by PICRT (ICC=0.928) and SDSLRT (ICC=0.893), the least. Further, the reliability all these test were higher in without LBP as compared to with LBP.

Discussion

Postpartum lumbopelvic pain (PLPP) is a common issue among women following childbirth, often attributed to changes in biomechanics, hormonal fluctuations, and musculoskeletal adaptations during pregnancy and delivery.[8] Clinical assessment of trunk muscle strength and endurance plays a crucial role in diagnosing and managing PLPP. In this discussion, we'll delve into the sensitivity, specificity, and predictive value of three clinical tests commonly used for this purpose.[9] Straight Leg Raise Test (SLR): Sensitivity: The SLR test assesses the integrity of the lumbosacral nerve roots and the sciatic nerve[10]. However, its sensitivity in detecting PLPP may be limited as it primarily evaluates nerve irritation or compression rather than trunk muscle strength or endurance directly. Specificity While SLR can help identify nerve involvement contributing to PLPP, its specificity may be moderate, as positive findings can also occur in individuals without PLPP due to factors such as lumbar disc herniation.[11] Predictive Value: The predictive value of SLR for assessing trunk muscle strength and endurance in PLPP may be low, as it primarily focuses on neural factors rather than muscular function. Modified Sit-Up Test: Sensitivity: The modified sit-up test evaluates abdominal muscle strength and endurance, which are important for lumbar stability and pelvic support. Its sensitivity in detecting PLPP may be moderate, as weakness or fatigue in these muscles can contribute to lumbopelvic dysfunction. Specificity: This test's specificity may also be moderate, as reduced abdominal strength and endurance are not exclusive to PLPP and can be influenced by various factors such as prior abdominal surgery or generalized deconditioning[12]. Predictive Value: While the modified sit-up test provides valuable information about abdominal muscle function, its predictive value for PLPP may be limited when considered in isolation, as other factors such as pelvic floor muscle dysfunction also contribute to lumbopelvic pain.[13] Prone Bridge Test: Sensitivity: The prone bridge test primarily assesses the endurance and strength of the posterior trunk muscles, including the erector spinae and multifidus. Its sensitivity in detecting PLPP may be high, as weakness or fatigue in these muscles can contribute to lumbopelvic instability and pain. Specificity This test's specificity may also be high, as dysfunction in the posterior trunk muscles is closely related to PLPP and may not be commonly observed in individuals without this condition. Predictive Value: The prone bridge test demonstrates promising predictive value for PLPP, as it directly evaluates the strength and endurance of muscles implicated in lumbopelvic stability and support. Low back pain in pregnancy

is generally described to the many changes in load and body mechanics that occur during the carrying of a child. Radecki et al showed that the spines of pregnant women with low back pain compress more after activity than pregnant women without back pain and those who are not pregnant, 4.57, 4.23, and 3.99 mm respectively. It has been suggested that the hormone relaxing increases 10-fold in concentration during pregnancy[11] Marry T Moffroid, Larrry D Haugh et al concluded that the progression of loading through postural changes produced increase in endurance time of the back extensors as measured by the Sorensen test.[12] These postural progression increased the load moment on the spine and thereby stressed the erector spinae muscle more.[13] The erector spinae muscle is also involved in pregnancy due compression of spine so that during the Sorensen test, the multifidus and erector spinae muscles were probably more active muscles.[14] That's why the Sorensen test can be used to assess the endurance and strength of trunk extensors muscles in women with postpartum lumbopelvic pain.[15]

Conclusion

While each of these clinical tests provides valuable insights into trunk muscle strength and endurance in the context of PLPP, their sensitivity, specificity, and predictive value vary. Combining multiple tests and incorporating additional assessments such as imaging studies and functional movement analysis may enhance the diagnostic accuracy and inform tailored treatment approaches for individuals with postpartum lumbopelvic pain. Further research is warranted to validate the utility of these tests and optimize their integration into clinical practice.

Limitation

The limitations of the study on sensitivity, specificity, and predictive value of clinical tests for measuring trunk muscle strength and endurance in postpartum lumbopelvic pain include:

1. Sample Size: The study may have a small sample size, limiting the generalizability of the findings to a broader population of postpartum women with lumbopelvic pain.
2. Selection Bias: There may be a risk of selection bias if participants were recruited from a specific clinical setting or if certain demographic groups were overrepresented, potentially affecting the study's external validity.
3. Measurement Tools: The study's reliance on subjective clinical tests for assessing trunk muscle strength and endurance may introduce variability and subjectivity in the measurement.

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