

## Effect of Different Types of Delivery on Postnatal Low Back Pain: Across-Sectional Study

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**Abstract:** *Aim:* To evaluate the effect of different types of delivery on pain sensitivity, intensity and functional disability in women having postnatal low back pain (LBP). *Materials and Methods:* Fifty postnatal women participated in this study. They were classified in accordance to type of delivery into two groups. Group (A) included postnatal women having normal vaginal delivery (n=25), while group (B) included postnatal women having cesarean section (n=25). Pressure pain threshold (PPT) at right and left Erector spinae (L3 & L5 levels), visual analogue scale (VAS) and Oswestry disability index (ODI) were assessed for all postnatal women in both groups. *Results:* Statistical analysis revealed that there were no significant ( $p>0.05$ ) differences between both groups regarding PPT at left Erector spinae (L3 level), as well as at right and left Erector spinae (L5 level), VAS and ODI. However, there was a significant reduction ( $p<0.05$ ) in PPT at right Erector spinae (L3 level) in group (B) compared to group (A). *Conclusion:* Postnatal women with LBP after cesarean section have more pain sensitivity at right Erector spinae (L3 level) than those with LBP after normal vaginal delivery, with no differences between them in pain intensity and functional disability.

**Key words:** Types of delivery • Postnatal low back pain • Pressure pain threshold

### INTRODUCTION

Postnatal low back pain (LBP) is common, with up to 75% of women experiencing back pain immediately following birth [1]. It is defined as axial or parasagittal discomfort or pain in the lower lumbar region and is musculoskeletal in nature due to combination of multiple factors like mechanical, physiological, hormonal, circulatory and psychosocial factors [2].

The predisposing factors of LBP in women after childbirth include greater weight and BMI [3], younger age [4], ethnicity [5], history of LBP during pregnancy [6], epidural anesthesia during childbirth [7], multiparity [8], pelvic floor dysfunction [9], joint hyper mobility [3], maternal workload [7] and psychological stress [10].

The pain can be moderately to severely debilitating to the new mom, affecting her daily living activities (e.g. caring for her new born, sleep patterns and other household activities) and delay or prevent her from returning to an active lifestyle, leading to substantial

health consequences [1, 11]. The World Health Organization considers musculoskeletal conditions to be the second greatest cause of years lived with disability (YLD), where LBP ranks number one of the top 10 leading causes of global YLD [12].

Previous research investigated the effect of different types of delivery on the incidence of postnatal LBP and reported a higher incidence of LBP following cesarean section as compared to normal vaginal delivery [2]. However, there is no study has examined the effect of different types of delivery on LBP severity in women having postnatal LBP. Therefore, this study was conducted to provide physiotherapists with a scientific updated knowledge, regarding the effect of different types of delivery on pain sensitivity, intensity and functional disability in women having postnatal LBP for designing appropriate rehabilitation and ergonomic interventions for them, aiming to prevent and treat LBP following different types of delivery. This study might expand the role of physiotherapy in woman's health and ergonomics.

## **MATERIALS AND METHODS**

**Study Design:** The study was an observational cross sectional design. Ethical approval was obtained from the institutional review board at Faculty of physical therapy, Cairo University before study commencement [No:P.T. REC/012/002382]. The study followed the Guidelines of Declaration of Helsinki on the conduct of human research. It was conducted between 15 September 2019 and 15 December 2019.

**Recruitment:** A sample of fifty postnatal women suffering from postnatal LBP was recruited from the Orthopedic and Obstetrics Outpatient Clinics, El Sheikh Zayed Central Hospital, Cairo, Egypt. An informed consent was obtained by each woman after explaining the nature, purpose and benefits of the study protocol informing them of their right to refuse or withdraw at any time and about the confidentiality of any obtained information.

**The Inclusion and Exclusion Criteria:** To be included in the study, participants were chosen sedentary, non-smoking, primipara women at their 1<sup>st</sup> to 6<sup>th</sup> months postpartum and had delivered a single, healthy, mature fetus with no complications. All of them suffered from postnatal LBP, which was diagnosed by an orthopedist. Their age ranged from 20 to 35 years old to exclude aging effect on lumbar spine configuration and their BMI ranged from 25 to 35 kg/m<sup>2</sup>. They were excluded from this study if they had history of back pain during or before pregnancy, any disc lesions, ankylosing spondylitis, rheumatoid arthritis, osteomalacia, abnormal spinal curvature (e.g. scoliosis), lumbar vertebrae fracture or surgeries, abdominal surgeries (except cesarean section), spinal or pelvic tumors and any gynecological or urologic diseases. Also, women having any spinal anesthesia during labour were excluded from the study. The postnatal women were divided into two groups according to type of delivery (group A and group B). Group (A) consisted of 25 postnatal women having LBP following normal vaginal delivery and Group (B) consisted of 25 postnatal women having LBP following cesarean section.

### **Outcome Measures**

**Assessment of Pain Sensitivity:** A pressure algometry (Force Dial model FD. 20 Push Pull Force Gage, Wagner Instruments, Greenwich CT, USA) was used to measure the pressure pain threshold (PPT) at right and left Erector spinae (L3 & L5 levels) to identify the level of pain sensitivity for all postnatal women in both groups

(A & B). All women were given the same full instructions about the assessment procedures to be done. Each woman was requested to lie down prone on the examination table with her arms beside her body. The researcher used an anthropologic pencil to mark the selected measuring points over right and left Erector spinae at L3 level (5 cm from the spinous process) and L5 level (4 cm from the spinous process). Then, PPT was measured, using a pressure algometry with a 1 cm<sup>2</sup> probe area, with a constant rate of pressure increase of 1 kg/cm<sup>2</sup>/second. Women were instructed to say “stop” as soon as the pressure sensation became painful and then that pressure level was recorded. The measured pressure ranged from 0 to 11 kg/cm<sup>2</sup> and was accurate to 0.1 kg/cm<sup>2</sup>. Three measurements were taken at each site with 10 seconds in between and the average of them was used for analysis. The zeroing knob returned the indicator needle to zero after each measurement. All measurements were taken bilaterally [13].

**Assessment of LBP Intensity:** The LBP intensity was assessed for each postnatal woman in both groups (A & B) through the VAS. It is a 10-cm horizontal line on which the patient’s pain intensity was represented by a point between the extremes of “no pain at all” and “worst pain imaginable”. Its simplicity, reliability and validity, as well as its ratio scale properties, make the VAS the optimal tool for describing pain intensity. It is the most frequently used scale to measure pain intensity in LBP trials. Each postnatal woman was asked to mark a point on the VAS line between the extremes that related to her LBP intensity. Then, the centimeters were measured in each time from the left end of the line to the marked point to obtain the VAS score for LBP intensity [14].

**Assessment of Functional Disability Level:** The functional disability level was assessed for each postnatal woman in both groups (A & B) through the ODI (version 2.1a). It included 10 sections relating to questions about pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life, social life and travelling. Each section, scored from 0 to 5 points, contained 6 statements that described an increasing pain severity associated with a particular activity with the lowest score represented better health status. Finally, the scores were summated, multiplied by 2 to provide a percentage of disability. The score of 0-20% indicated minimal disability, 21-40% indicated moderate disability, 41-60% indicated severe disability, 61-80% indicated crippled back pain and 81-100% indicated bed bound [15].

**Statistical Analysis:** Statistical analysis was conducted using Statistical package for social studies (SPSS) for windows, version 23 (SPSS, Inc., Chicago, IL). The current study involved one independent variable was the (tested group); between subject factor which had two levels (group A and group B). Group (A) had LBP following normal vaginal delivery, while group (B) had LBP following cesarean section. In addition, this test involved six tested dependent variables; (right and left PPT at Erector spinae L3 level, right and left PPT at Erector spinae L5 level, VAS and ODI). Preliminary assumption checking revealed that data was normally distributed, as assessed by Shapiro-Wilk test ( $p > 0.05$ ); there were no univariate or multi variate outliers, as assessed by boxplot and Mahalanobis distance ( $p > .001$ ), respectively; there were linear relationships, as assessed by scatterplot; no multi collinearity ( $|r| < .9$ ); and there was homogeneity of variance-covariance matrices, as assessed by Box's M test ( $p = 0.116$ ). Accordingly, Hotelling's  $T^2$  is a special case of the one-way multi variate analysis of variance (one-way MANOVA) where the independent variable has only two groups and an extension of the independent-samples t-test to incorporate two or more dependent variables was used to compare the tested variables of interest at both groups. The sample was examined with the alpha level 0.05.

## RESULTS

A total of 50 participants were included in the final data analysis. They were divided into two groups; group A consisted of 25 postnatal women and the group B consisted of 25 postnatal women. There were no significant differences ( $p > 0.05$ ) in the mean values of age, weight, height and BMI between both tested groups (Table 1).

Hotelling's  $T^2$  test revealed that there were no significant ( $p > 0.05$ ) differences between both groups regarding PPT at left Erector spinae (L3 level), as well as at right and left Erector spinae (L5 level), VAS and ODI. However, there was a significant reduction ( $p < 0.05$ ) in PPT at right erector spinae (L3 level) in group (B) compared to group (A) (Table 2).

Table 1: Demographic characteristics of postnatal women in both groups

Characteristics	Group (A) (n = 25)	Group (B) (n = 25)	P value
Age (yrs.)	25.66±2	27.1±2.84	0.085 <sup>NS</sup>
Weight (Kg)	73.86±7.76	73.96±7.72	0.966 <sup>NS</sup>
Height (Cm)	162.65±4.88	162.44±5.62	0.888 <sup>NS</sup>
BMI (Kg/m <sup>2</sup> )	27.9±2.53	28.07±2.49	0.818 <sup>NS</sup>

Data were expressed as mean ± standard deviation

<sup>NS</sup>P > 0.05 = non-significant, P = Probability.

Table 2: Hotelling's  $T^2$  test for the all dependent variables for both groups

Dependent variables	Group (A) (n = 25)	Group (B) (n = 25)	P value
PPT at right Erector spinae at L3 level (kg/cm <sup>2</sup> )	3.07 ± 1.06	2.46 ± 0.98	0.048 <sup>S</sup>
PPT at left Erector spinae at L3 level (kg/cm <sup>2</sup> )	3.06 ± 1.24	2.5 ± 0.88	0.081 <sup>NS</sup>
PPT at right Erector spinae at L5 level (kg/cm <sup>2</sup> )	2.83 ± 1	2.57 ± 0.78	0.339 <sup>NS</sup>
PPT at left Erector spinae at L5 level (kg/cm <sup>2</sup> )	2.96 ± 1.13	2.47 ± 0.72	0.293 <sup>NS</sup>
VAS	6.59 ± 1.7	6.88 ± 1.48	0.537 <sup>NS</sup>
ODI	24.27 ± 8.26	24.56 ± 6.25	0.893 <sup>NS</sup>

Data were expressed as mean ± standard deviation

<sup>NS</sup>P > 0.05 = non-significant, <sup>S</sup>P > 0.05 = significant, P = Probability

## DISCUSSION

Postnatal LBP is a common problem in the postpartum period and this condition can vary in intensity from being a mild annoyance to presenting as a severely disabling condition [16]. It represents a significant burden to postpartum women and can affect their mobility, ability to perform daily activities and quality of life [17]. Therefore, this cross-sectional study aimed to evaluate pain sensitivity, intensity and functional disability in women having postnatal LBP following different types of delivery (normal vaginal delivery in comparison to cesarean section).

Regarding the results of PPT, there were non-significant differences between both groups at left Erector spinae (L3 level), as well as at right and left Erector spinae (L5 level). However, there was a significant reduction ( $p < 0.05$ ) in PPT at right Erector spinae (L3 level) in group (B) compared to group (A), revealing increased pain sensitivity in women having cesarean section than in women having normal vaginal delivery.

The results of PPT at right Erector spinae (L3 level) could be interpreted by the combination of three factors. The first factor is the higher incidence of persistent pain reported following cesarean section than vaginal birth [18, 19]. The second factor involves the biomechanical property of the L3 level of the Erector spinae where the muscular tissue damage is probably most highly related to the level of maximal mechanical stress in the lumbar lordosis in an erect position, so PPT at the L3 level of the Erector spinae is highly correlated to LBP presence [20]. According to this factor, the PPT at the L3 level of the Erector spinae in cesarean section group should be affected at both right and left sides. However, the current study showed that cesarean section had a significant effect on PPT at the L3 level of the Erector spinae only at

right side. This finding could be more clarified by the third factor, which represents the left-side preference for carrying infants by the majority of mothers to facilitate the positive emotional relationship between the mother and her infant [21]. By considering carrying an infant identical to carrying a shoulder bag, the study of Motmans, *et al.* [22] found that carrying a shoulder bag at one side of the body caused increased EMG activity of contralateral Erector spinae and decreased EMG activity of ipsilateral Erector spinae. By the same way, the left-side preference for carrying infants by mothers could result in increased EMG activity of right Erector spinae, which could be manifested by reduced PPT at right Erector spinae (L3 level).

Regarding the results of pain intensity and functional disability, there were non-significant differences in VAS and ODI between both groups. The results of the present study were inconsistent with Joshi and Parikh [2] who found that pain intensity (measured by a numerical rating scale) and functional disability (measured by ODI) were higher in postnatal women having cesarean section than in women having normal vaginal delivery. However, the controversy between our findings and the findings of that previous study could be attributed to the differences in the studied sample characteristics, in terms of age, BMI and parity number. In addition, we studied only postnatal women having LBP following normal vaginal delivery or cesarean section, while that previous study included postnatal women having normal vaginal delivery or cesarean section regardless of having LBP or not.

The non-significant differences in VAS and ODI between normal vaginal delivery group and cesarean section group could be related to the negative impact of both types of delivery on the stability system of the spine, which is composed of the muscular, structural and neural subsystems that normally work in harmony and provide mechanical stability. The muscles responsible for the spine stability, surrounding the abdomen and spine as a capsule, work as a synergy. They include the diaphragm superiorly, pelvic floor muscles inferiorly, abdominal muscles anteriorly and deep lumbar extensors muscles posteriorly [23]. Studies reported that vaginal birth is associated with reduction in pelvic muscles strength [24], while cesarean section is accompanied by reduction in abdominal muscles strength [25]. Therefore, both types of delivery could negatively impact affect the spine stability system, producing LBP and a subsequent functional disability.

## CONCLUSION

In postnatal women with LBP, pain sensitivity at right Erector spinae (L3 level) is greater after cesarean section than after normal vaginal delivery, with no differences between both groups in pain intensity and functional disability.

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**Conflict of Interest:** Authors declare no potential conflicts of interest.

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