

Effect of Laser Acupuncture on Postnatal Pelvic Girdle Pain

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ABSTRACT

Background: Postnatal pelvic girdle pain (PGP) affects 23-65% of women globally, impacting obstetric, gynecological, musculoskeletal, and psychosocial domains. Despite limited evidence on non-pharmacological interventions, laser acupuncture (LA), which combines photobiomodulation and traditional acupuncture stimulation, may enhance tissue repair and pain modulation.

Objectives: The current study aimed to investigate the effect of laser acupuncture on postnatal pelvic girdle pain.

Patients and Methods: A clinical trial involving 54 postpartum women with pelvic girdle pain was conducted. The intervention group received bilateral LA in addition to conventional pelvic floor exercises, while the control group performed pelvic floor exercises only. Participants were evaluated before and after treatment using a pelvic girdle questionnaire (PGQ), posterior pelvic pain provocation test (PPPT), and morning salivary cortisol (SC) level.

Results: Statistically significant improvements were observed in PGQ scores, PPPT results, and morning SC levels in both groups after treatment compared to pretreatment values. When comparing the two groups, post-treatment analysis revealed significantly greater improvements ($p < 0.001$) in all outcome measures in the intervention group, as opposed to the control group.

Conclusion: The findings indicate that laser acupuncture combined with pelvic floor exercises leads to improvement in postnatal pelvic girdle pain, suggesting its potential as an effective non-pharmacological intervention.

Keywords: Laser acupuncture, Pelvic girdle questionnaire, Salivary cortisol level, postnatal Pelvic girdle pain, Pelvic floor exercise.

INTRODUCTION

Pelvic girdle pain (PGP) is defined as musculoskeletal pain localized between the posterior iliac crest and the inferior gluteal fold, typically around the sacroiliac joints, and may also occur at the pubic symphysis. In the early postpartum period, a subgroup of mothers continues to experience symptoms that limit daily activities. The prevalence of PGP is estimated to be 9–10% in the first days after birth, 16% at six weeks, 17% at three months, and 8.5% at two years postpartum ⁽¹⁾. Reported prevalence of postnatal PGP varies widely, ranging from 20% to 90%, depending on the study population and diagnostic criteria. A multinational study involving the United States, United Kingdom, Norway, and Sweden found prevalence rates of 70–86% during pregnancy and postpartum, with the UK showing the highest pain intensity and Norway the highest treatment rates. In some South Asian and Middle Eastern populations, rates may reach 80–90%, reflecting variations in healthcare systems, cultural factors, diagnostic criteria, and population characteristics ⁽¹⁾.

Postnatal PGP is a postpartum pain syndrome originating from the pelvis, most often around the sacroiliac joints or pubic symphysis, which restricts activities such as rolling, transfers, standing, and baby carrying ⁽²⁾.

It is distinct from nonspecific low back pain by its pain location, provocation pattern, and response to pelvic girdle tests ⁽³⁾. Persistent pain is attributed to ligamentous laxity, impaired deep core and pelvic floor muscle

coordination, and enhanced pain sensitivity due to stress, all of which contribute to functional limitation ⁽⁴⁾. The etiology of postnatal PGP remains multifactorial, involving hormonal, biomechanical, metabolic, genetic, and degenerative factors that lead to non-optimal pelvic stability through motor control impairment and maladaptive behavior ⁽³⁾. As pharmacological options are limited postpartum, safe non-drug approaches such as acupuncture have been prioritized, showing beneficial effects for pregnancy-related low back and pelvic girdle pain ⁽⁵⁾.

Laser acupuncture (LA) is a needle-free, painless form of acupoint stimulation that has demonstrated reductions in pain and functional disability in postpartum women ⁽⁶⁾. Within Traditional Chinese Medicine (TCM), low-level laser therapy (LLLT) stimulates acupuncture points as a non-invasive, low-cost modality that induces photobiological effects ⁽⁸⁾. Compared with needle acupuncture, laser acupoint biostimulation allows treatment of more acupoints with minimal discomfort and lower risks of infection, tissue trauma, and bleeding ⁽⁶⁾. These photobiological effects include modulation of peripheral and central neural activity, enhanced mitochondrial ATP synthesis, and improved microcirculation and oxygen metabolism ⁽⁸⁾. Laser acupuncture may alleviate pain by blocking peripheral nociception, modulating neurotransmitters, dampening central pain signaling, and relaxing skeletal muscles, leading to reduced musculoskeletal pain and disability

(9). In postpartum care, randomized data show that combining laser acupuncture with standard therapy decreases pain, disability, and perceived stress, along with favorable changes in salivary cortisol, supporting its early, needle-free use ⁽⁷⁾.

The current study aimed to investigate the effect of laser acupuncture on postnatal pelvic girdle pain.

MATERIALS & METHODS

This prospective randomized controlled trial (RCT) included fifty-four postpartum women suffering from postnatal pelvic girdle pain (PGP). Participants were recruited from the Outpatient Clinic of the Department of Gynecology, Mansoura International Hospital, Dakahlia Governorate, Egypt. The study was conducted from January 2024 to October 2024.

Inclusion Criteria:

Women suffering from postnatal pelvic girdle pain (PGP), clinically diagnosed by a gynecologist, aged 20–45 years, and the body mass index (BMI) ranged from 25 to 29.9 kg/m².

All women reported activity limitations as assessed by the Pelvic Girdle Questionnaire (PGQ), in which participants were instructed to answer every section and select the option that best described their current condition. The PGQ is scored from 0 to 100%, with higher scores indicating greater pain-related disability. Commonly used severity bands are 0–24 (mild), 25–49 (moderate), and 50–100 (severe).

In this study, PGQ scores ranged from 68% to 88%, indicating moderate to severe pain-related disability according to these severity bands. These values

demonstrate considerable variability in disability levels, reflecting the substantial impact of PGP on functional activity and quality of life.

All women were either primiparous or multiparous (para 1–3). Participants were required to have no neurological, musculoskeletal, or systemic disorders that could interfere with the intervention or outcome measures.

Exclusion Criteria:

Women had any musculoskeletal or neurological disorders, were currently pregnant, or had a history of malignancy, acute infection, psychiatric disorder, neurological problems, or uncontrolled metabolic diseases such as diabetes mellitus or thyroid disorders. Athletic females were also excluded.

Additionally, participants were excluded if they had received pharmacological pain management within one week prior to participation or had contraindications to laser therapy, including photosensitivity or active skin lesions.

Randomization and blinding

All eligible women with postnatal pelvic girdle pain were randomly allocated, using a manual sequence generation method, into two numerically equal groups (n = 27 per group). Each participant was assigned a unique identification number linked to a sequentially numbered index card placed in an opaque, sealed envelope. Envelopes were prepared in advance and opened sequentially by the researcher to determine group allocation, ensuring allocation concealment. **Figure 1.**

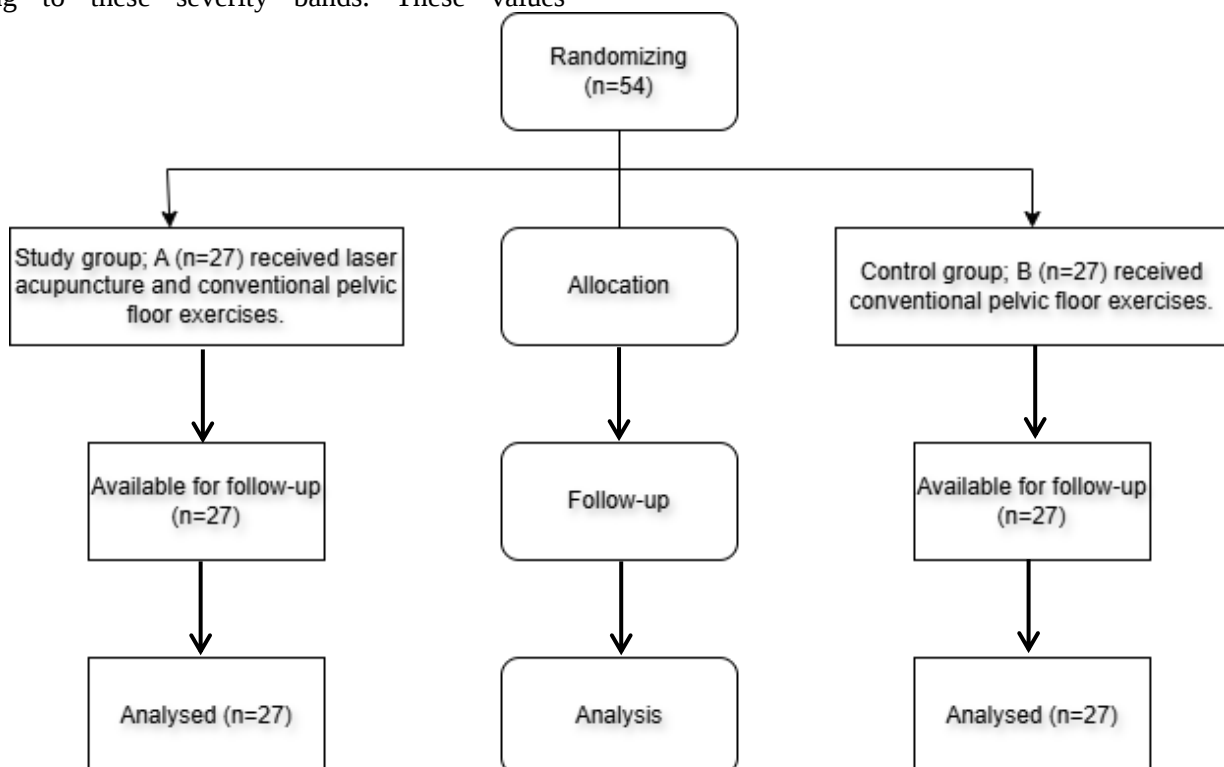


Figure 1: Participants Flow Chart.

Procedures:

All participants were instructed about the objectives of the study as well as benefits of LA and its efficacy in reducing postnatal pelvic girdle pain, physical activity restrictions and functional limitations and agreed to participate before signing a written informed consent form

Pelvic Girdle Questionnaire (PGQ) / Physical Activity Restrictions and Functional Limitations: PGQ is a validated outcome measure widely utilized to assess physical activity restrictions and functional limitations in women with postnatal pelvic girdle pain, before and after treatment. The PGQ contains 25 items (20 activity and 5 symptom items) scored on a 4-point scale and converted to a 0–100% score, where higher percentages indicate greater limitation⁽¹⁰⁾. PGQ outcomes were presented by groups: Activity and Symptom subscales and the Total score (0–100%). Ask the patient to answer every section and mark in each section only the one box that most closely describes the condition at this time. The Pelvic Girdle Questionnaire (PGQ) scores in this study ranged from 68 to 88%, indicating moderate to severe pain-related disability according to the severity bands where 0–24 represents mild, 25–49 moderate, and 50–100 severe disability. Posterior Pelvic Pain Provocation Test (PPPPT): This is a standardized clinical test used to evaluate the presence of posterior pelvic girdle pain in postnatal women⁽¹¹⁾. Salivary Cortisol Assessment: Salivary cortisol levels were assessed as an objective biomarker of stress related to pain complaints in participants with postnatal pelvic girdle pain⁽¹²⁾.

Interventions

All participants received the treatment protocol consisting of 12 sessions. Each session lasted for 18 minutes on the points. BL33, BL35, SP6, SP9, LR3, and LI4 bilaterally

Group A:

The device used was the Multi-Wave Locked System (MLS) Laser Pen (ASA Srl, Italy), at a wavelength of 904 nm with near-infrared laser type. Protective eyeglasses were used for both the researcher and the patient to avoid permanent eye damage resulting from direct or indirect exposure to the laser beam. The patient's position was supine for acupoints SP6, SP9, LR3, and LI4, and prone for BL33 and BL35. The laser probe was held firmly and pressed perpendicularly on the points BL33, BL35, SP6, SP9, LR3, and LI4 bilaterally. Each point received 90 seconds for a total of 18 minutes per session, 12 sessions for four weeks. The treatment was applied to three sessions per week for four weeks⁽¹³⁾. **FIGURES 2 :7** Plus, Conventional pelvic floor exercises were also performed consisting of supine, crock lying, and single leg hip extension positions for 40 minutes per session, 3 sessions per week for four weeks⁽¹⁴⁾. **FIGURES 8:10.**

Group B:

The patient was positioned supine, crock lying, and in single leg hip extension during exercises. The control group received only conventional pelvic floor exercises on the same points. Each session lasted 40 minutes, 3 sessions per week for four weeks. Each exercise was performed in 3-5 sets of 10 repetitions with 5 second hold followed by 5 seconds relaxation. Exercises were performed as follows: in supine lying, patients were instructed to contract pelvic floor muscles tightly lifting inside around the anus and vagina; in single leg hip extension, contraction was maintained while the pelvis is raised by extending the hip of the straight leg approximately 35 degrees, while the other leg remains in contact with the surface (plinth). The movement is repeated for both legs. and in crock lying, contraction was maintained with pelvis raised and both knees flexed.⁽¹⁴⁾. **FIGURES 8:10.**



Figure (2) Li4

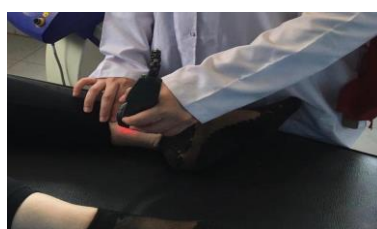


Figure (3) SP6



Figure (4) LR3



Figure (5) BL35



Figure (6) sp9

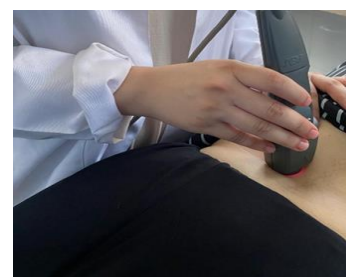


Figure (7) BL33



Figure (8) supine

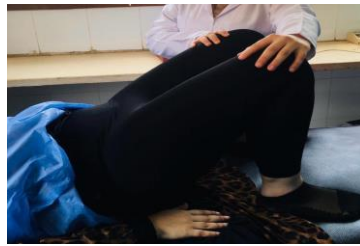


Figure (9) crock lying



Figure (10) single leg hip extension

Outcome Measures

All the measured outcomes were assessed before treatment and after treatment program, by those who were blinded to the allocation. The outcome measures used in this study included: Pelvic Girdle Questionnaire (PGQ): A validated tool used to evaluate Physical Activity Restrictions and Functional Limitations associated with pelvic girdle pain.

Physical Activity Restrictions and Functional Limitations/ Pelvic Girdle Questionnaire (PGQ)

The PGQ is a validated outcome measure widely utilized to assess physical activity restrictions and functional limitations in women with postnatal pelvic girdle pain, before and after treatment. The PGQ contains 25 items (20 activity and 5 symptom items) scored on a 4-point scale and converted to a 0–100% score, where higher percentages indicate greater limitation⁽¹⁰⁾. PGQ outcomes were presented by groups: Activity and Symptom subscales and the Total score (0–100%). Ask the patient to answer every section and mark in each section only the one box that most closely describes the condition at this time. The Pelvic Girdle Questionnaire (PGQ) scores in this study ranged from 68 to 88%, indicating moderate to severe pain-related disability according to the severity bands where 0–24 represents mild, 25–49 moderate, and 50–100 severe disability.

Sample size

For sample size calculation; G*Power software (ver.3.1.9.2) was used. The Pelvic Girdle Questionnaire was used as the primary measure for calculating the sample size, according to Nygaard *et al.*⁽¹⁵⁾ the study used the following assumptions: 80% power, α 0.05, an effect size of 0.5, and a dropping rate of 5%. The statistical analysis was conducted using the F-testing MANOVA. The total number of subjects in the sample is 54, with 27 individuals in each group.

Ethical Consideration:

This study was ethically approved by the Research Ethics Committee of the Faculty of Physical Therapy, Cairo University (Approval No.: P.T.REC/012/005566). The clinical trial registration number is NCT06715111. Written informed consent was obtained from all participants. The study

protocol conformed to the Helsinki Declaration, the ethical norm of the World Medical Association for human subjects.

Statistical analysis

Data are presented as mean $\pm$ standard deviation (SD). Between-group differences in baseline characteristics were examined using the unpaired t-test. Normality was evaluated with the Shapiro–Wilk test. For parametric outcomes, multivariate analysis of variance (MANOVA) was used to assess within- and between-group effects, while categorical variables were compared using the chi-square test. Data was analyzed with SPSS for Windows, version 20 (SPSS Inc., Chicago, IL, USA). A two-sided P value $\leq$ 0.05 was considered statistically significant.

RESULTS

Fifty-four women presenting with postnatal pelvic girdle pain participated in this trial and were randomized into two equal groups., twenty-seven in each group. Study Group (A) received laser acupuncture over specific acupoints in addition to conventional pelvic floor exercises; and Control group (B) received conventional pelvic floor exercises only.

Baseline characteristics, including age, weight, height, and BMI, did not differ significantly between groups ($P > 0.05$) (Table 1).

Table 1: Demographics data of participants

	Group A	Group B	MD	t-value	P value	Sig
	Mean $\pm$ SD	Mean $\pm$ SD				
Age (years)	35.81 $\pm$ 3.19	33.96 $\pm$ 4.58	1.85	1.72	0.09	NS
Weight (kg)	79.56 $\pm$ 6.96	77.7 $\pm$ 7.39	1.86	0.95	0.35	NS
Height (cm)	170.89 $\pm$ 2.1	169.89 $\pm$ 3.52	1	1.27	0.21	NS
BMI (kg/m ²)	27.23 $\pm$ 1.67	26.87 $\pm$ 1.65	0.46	0.36	0.43	NS

SD: Standard deviation

p value: Probability value

S: Significant, NS: Non-significant

Effect of treatment on PGQ values

Group A exhibited a significant decrease in PGQ scores ($P = 0.001$), while Group B showed no

significant pre-post difference ($P = 0.69$). The percentage change was 74% in Group A versus 41% in Group B. Post-intervention, PGQ scores were significantly lower in Group A than in Group B ($P = 0.001$). (Table 2).

Table (2): Comparison between mean values of PGQ for groups A and B before and after treatment

PGQ	Pre-treatment Mean ±SD	Post treatment Mean ±SD	MD	% of change	P-value	Sig
Group A	80.52 ± 4.73	20.81 ± 4.67	59.71	74%	0.001	S
Group B	80.96 ± 3.58	47.63 ± 6.81	33.33	41%	0.001	NS
MD	-0.44	-26.82				
P-value	0.69	0.001				
Sig	NS	S				

SD: Standard deviation, MD: Mean difference, p value: Probability value, S: Significant, NS: Non significant

Effect of treatment on Posterior Pelvic Pain Provocation Test (PPPPT):

The PPPPT, treated as a binary variable (positive/negative), was analyzed using chi-square tests for differences in proportions across groups and time points. At baseline, the proportion of positive PPPPT findings did not differ between Group A and Group B ($P = 1$). Following treatment, Group A demonstrated a significantly lower rate of positive PPPPT results compared with Group B ($P = 0.002$). (Table 3)

Table 3. Comparison of PPPPT pre and post treatment for groups A and B

PPPPT	Pre-treatment Number (%)	Post treatment Number (%)	X ² value	p-value	Sig
Group A	Positive 27 (100%)	Negative 27(100%)	54	0.001	S
Group B	Positive 27 (100%)	Positive 8 (29.6%) Negative 19 (70.4%)	29.31	0.001	S
X ² value	0	9.39			
p-value	1	0.002			
Sig	NS	S			

X²: chi square, S: significant, NS: non-significant.

Effect of treatment on salivary cortisol level

Table 3 shows that there were no significant baseline differences between the groups ($P = 0.70$). Post-intervention, a significant advantage was evident for Group A ($P = 0.001$), with percentage improvements of 52% (Group A) versus 18% (Group B).

Table 3. Comparison between mean values of salivary cortisol for groups A and B before and after treatment

Salivary Cortisol level (nmol/ L)	Pretreatment Mean ±SD	Post treatment Mean ±SD	MD	% of change	P- value	Sig
Group A	6.48 ± 0.25	3.13 ± 0.19	3.35	52%	0.001	S
Group B	6.51 ± 0.3	5.31 ± 0.21	1.2	18%	0.001	NS
MD	-0.03	-2.18				
P-value	0.70	0.001				
Sig	NS	S				

SD: Standard deviation, MD: Mean difference, p value: Probability value, S: Significant, NS: Non-significant

DISCUSSION

The observed improvement in postnatal pelvic girdle pain (PGP), physical activity restrictions, and functional limitations in this study was supported by Hung *et al.* ⁽⁹⁾, who reported that non-drug conservative modalities, such as laser acupuncture, photobiomodulation, and exercise, were effective in the treatment of postnatal lumbopelvic and pelvic girdle pain. They found that laser acupuncture was more effective in pain reduction and activity-related functional gains through endorphin-mediated descending inhibition, anti-inflammatory effects, and enhanced local blood flow, which facilitated tissue repair. Therefore, it could be used as an alternative conservative therapy rather than pharmacological treatments, which have numerous side effects.

The current results were consistent with those of Cheng *et al.* ⁽⁶⁾, who found that adding laser acupuncture to standard postpartum care produced significantly greater improvements in physical activity restrictions, functional pain reduction, and marked decreases in salivary cortisol and perceived stress compared to standard care alone.

Similarly, Li *et al.* ⁽⁵⁾ reported that acupuncture for pregnancy-related low back and pelvic girdle pain significantly relieved pain and improved functional status with minimal adverse events, supporting its safety and efficacy as a conservative modality in perinatal care.

Further support was provided by Yeum *et al.* ⁽¹⁶⁾, who investigated the efficacy of laser acupuncture (LA) for nonspecific chronic low back pain and demonstrated that LA was a safe procedure that improved functional limitations and alleviated pain by reducing inflammation and decreasing prostaglandin synthesis.

Pai *et al.* ⁽¹⁷⁾ also found that laser acupuncture effectively reduced postnatal low back and pelvic pain, improved mobility, and enhanced quality of life in postpartum women. Moreover, Zhang *et al.* ⁽⁷⁾, through a randomized controlled trial, showed that laser acupuncture significantly decreased pain intensity and improved functional outcomes in postpartum pelvic

girdle pain patients by modulating inflammatory markers and promoting tissue healing.

The present findings were also in agreement with **Andersson *et al.*** ⁽¹⁸⁾, who reported that combining laser acupuncture with pelvic floor exercises yielded superior pain relief and functional recovery in postpartum women compared to exercises alone, reinforcing the synergistic effect of these interventions. Likewise, **Shin *et al.*** ⁽¹⁹⁾ investigated the short-term effects of laser acupuncture on lower back pain and concluded that it was a potentially effective treatment for pain alleviation. Similarly, **Hu *et al.*** ⁽²⁰⁾ found that laser acupuncture was a safe and beneficial procedure that improved pain and functional disability in patients with chronic low back pain by reducing inflammation and modulating pain pathways.

The findings of this study were further supported by **Wang *et al.*** ⁽²¹⁾, who demonstrated that laser acupuncture combined with pelvic floor exercises not only reduced pain intensity but also improved quality of life by modulating inflammatory cytokines. By reducing pro-inflammatory markers, this treatment promoted healing and reduced tissue irritation, which helped restore pelvic stability and function. Additionally, **Garcia *et al.*** ⁽²²⁾ reported that laser acupuncture accelerated postpartum recovery by improving microcirculation and reducing oxidative stress in pelvic tissues. Enhanced blood flow facilitated oxygen and nutrient delivery to damaged tissues, accelerating repair, while lower oxidative stress protected cells from further damage.

This study was also consistent with **Ekdahl *et al.*** ⁽²³⁾, who emphasized acupuncture as an effective non-pharmacological treatment that helped maintain physical activity and functional capacity in women with pelvic girdle pain. Their findings suggested that acupuncture supported sustained improvements without the side effects commonly associated with medications.

By contrast, a meta-analysis by **Gam *et al.*** ⁽²⁴⁾ concluded that low-level laser therapy (LLLT) did not reduce musculoskeletal pain, although it was conducted more than two decades ago, during the early developmental phase of the modality. Similarly, **Ay *et al.*** ⁽²⁵⁾ reported no between-group differences for chronic pain when comparing LLLT with placebo, findings consistent with **Kingsley *et al.*** ⁽²⁶⁾. **Glazov *et al.*** ⁽²⁷⁾ also observed no significant between-group differences for laser acupuncture in chronic non-specific low back pain and inferred that improvements were independent of laser-specific effects.

Some negative outcomes were reported; however, these were largely attributed to suboptimal or non-optimized photobiomodulation therapy (PBMT) parameters, including wavelength, irradiance, fluence, treatment duration, and dosing schedule, all of which critically influence efficacy ⁽²⁸⁾.

The improvement observed in the control group (Group B) was primarily attributed to the pelvic floor exercises performed by the participants. Pelvic floor

exercises have been shown to enhance pelvic stability, improve muscle strength, and reduce mechanical stress on the pelvic girdle, thereby alleviating pain and improving physical function ⁽²⁹⁾. These exercises also promote neuromuscular coordination and enhance pelvic support, which can significantly reduce postpartum pelvic girdle pain symptoms ⁽³⁰⁾. Moreover, regular pelvic floor training may aid in the restoration of normal pelvic alignment and prevent further injury, thereby facilitating faster recovery and improving quality of life ⁽³¹⁾. Therefore, even without laser acupuncture, the pelvic floor exercise regimen alone provided significant therapeutic benefits in pain relief and functional improvement among postpartum women.

STRENGTHS AND LIMITATIONS OF THE STUDY

Strengths:

- The study was a randomized controlled clinical trial, which is a strong study design.
- Use of validated outcome measures such as the Pelvic Girdle Questionnaire (PGQ) to assess pain related disability, physical activity restrictions and functional limitations.
- Blinded assessments were conducted to reduce bias.
- The intervention combined laser acupuncture with pelvic floor exercises, allowing evaluation of additive therapeutic effects.
- Statistical analysis was rigorous, including MANOVA and appropriate normality tests.
- The sample size was adequately calculated to ensure sufficient power.

LIMITATIONS

- The study was conducted in a one hospital, which may limit the generalizability of findings to other populations.
- The follow-up period was relatively short (four weeks), so long-term efficacy and effects were not assessed.
- The study excluded women with certain comorbidities, limiting applicability to a broader patient population.

The study shows the combined effect of laser acupuncture plus exercises, but it does not clarify how effective laser acupuncture is by itself without exercises.

CONCLUSION

It could be concluded that laser acupuncture is a valuable therapeutic modality for the management of postnatal pelvic girdle pain, as evidenced by significant improvements recorded in the Pelvic Girdle Questionnaire, Posterior Pelvic Pain Provocation test, and morning salivary cortisol levels as outcome measures. In addition, we observe that laser acupuncture demonstrates significant therapeutic efficacy, based on the improvements reported throughout the current study.

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