Section: Obstetrics and Gynaecology

Original Research Article

EFFECT OF EARLY POSTPARTUM PHYSIOTHERAPY ON POSTOPERATIVE PAIN AND FUNCTIONAL RECOVERY FOLLOWING CESAREAN SECTION: A PROSPECTIVE RANDOMIZED CONTROLLED TRIAL

Anil Kumar Rathod[1], Prema Naik[2], Prachi Gupta[3]

[1]Senior Consultant and HOD, Department of Obstetrics and Gynaecology, District hospital, Athani Rd, Shastri Nagar, Vijayapura, Karnataka 586108, India.
[2]Senior Consultant, Department of Obstetrics and Gynaecology, District hospital, Athani Rd, Shastri Nagar, Vijayapura, Karnataka 586108, India.
[3]Junior Resident, Department of Obstetrics and Gynaecology, District hospital, Athani Rd, Shastri Nagar, Vijayapura, Karnataka 586108, India.

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Corresponding Author:
Dr. Anil Kumar Rathod,
Senior Consultant and HOD, Department of Obstetrics and Gynaecology, District hospital, Athani Rd, Shastri Nagar, Vijayapura, Karnataka 586108, India.
Email: anil.dr200420@gmail.com

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ABSTRACT

Background: Cesarean section is one of the most commonly performed obstetric procedures worldwide. Postoperative pain and delayed functional recovery following lower segment cesarean section (LSCS) can adversely affect maternal mobility, breastfeeding, newborn care, and overall quality of life. Early postpartum physiotherapy has been proposed as a beneficial intervention to improve postoperative recovery and reduce complications.

Materials and Methods: This prospective randomized controlled trial was conducted at a tertiary care DNB teaching hospital over a period of 6 months. A total of 920 women aged 18–40 years undergoing elective or emergency LSCS were recruited and randomly allocated into intervention (n=460) and control (n=460) groups. Baseline variables including age, body mass index (BMI), parity, indication for LSCS, type of anesthesia, and duration of surgery were documented. The intervention group received structured early postpartum physiotherapy (including breathing exercises, limb exercises, and an ambulation schedule) in addition to standard postoperative care, whereas the control group received standard postoperative care alone. Primary outcome measures were postoperative pain assessed using the Visual Analog Scale (VAS) and functional recovery using the Barthel Index, Functional Independence Measure (FIM), and Postoperative Quality Recovery Scale (PQRS). Secondary outcomes included duration of hospital stay and postoperative complications.

Results: Women receiving early postpartum physiotherapy demonstrated significantly lower postoperative pain scores at 24 hours (4.1±1.2 vs. 6.2±1.4, $p<0.001$), 48 hours (2.9±1.0 vs. 4.8±1.3, $p<0.001$), and at discharge (1.8±0.8 vs. 3.2±1.1, $p<0.001$) compared to the control group. Functional recovery was significantly improved in the intervention group, with earlier ambulation (10.4±2.3 vs. 18.6±3.1 hours, $p<0.001$), higher Barthel Index scores at discharge (92.3±5.1 vs. 78.6±7.4, $p<0.001$), better FIM scores (112.4±8.3 vs. 94.2±10.1, $p<0.001$), and a higher proportion achieving PQRS functional recovery at 48 hours (74.1% vs. 43.0%, $p<0.001$). Hospital stay was shorter in the intervention group (4.2±0.9 vs. 5.6±1.1 days, $p<0.001$), and postoperative complications were significantly reduced.

Conclusion: Early postpartum physiotherapy is an effective adjunct in enhancing postoperative recovery following cesarean section and may contribute to improved maternal outcomes and reduced postoperative morbidity.

Keywords: Cesarean section; lower segment cesarean section; postpartum physiotherapy; postoperative pain; functional recovery; randomized controlled trial; early mobilization; Barthel Index; Functional Independence Measure.

INTRODUCTION

Cesarean section (CS) is one of the most commonly performed surgical procedures in obstetric practice worldwide. Over the past few decades, the global rate of cesarean delivery has shown a significant rise due to increasing maternal and Fetal indications, improved surgical safety, and greater accessibility to institutional healthcare services.[1,2] Although cesarean section is often a life-saving intervention for both mother and child, it is associated with considerable postoperative morbidity compared to vaginal delivery. Postoperative pain, delayed ambulation, reduced functional capacity, prolonged hospital stay, and postoperative complications remain major concerns affecting maternal recovery after lower segment cesarean section (LSCS).[3,4]

Postoperative pain following LSCS is multifactorial and results from surgical incision, tissue handling, uterine contractions, and reduced mobility. Inadequate pain control can impair early mobilization, breastfeeding, maternal-infant bonding, and the ability to perform routine daily activities. Delayed recovery may further increase the risk of complications such as deep vein thrombosis, atelectasis, pulmonary infections, urinary retention, abdominal discomfort, and delayed wound healing.[5,6] Effective postoperative rehabilitation strategies are therefore essential to enhance recovery and improve maternal quality of life during the postpartum period. Enhanced Recovery After Surgery (ERAS) protocols have increasingly emphasized the importance of early mobilization and multidisciplinary postoperative care in improving surgical outcomes.[7] Early postpartum physiotherapy is an important component of postoperative rehabilitation and includes breathing exercises, lower limb circulation exercises, postural correction, pelvic floor strengthening, bed mobility training, and supervised ambulation initiated within the early postoperative period. These interventions aim to improve circulation, maintain respiratory function, reduce pain and stiffness, promote early functional independence, and minimize postoperative complications.[8,9] Recent evidence supports the use of inspiratory muscle training to reduce postoperative pulmonary complications after abdominal surgery.[17] Several studies have demonstrated that early mobilization and physiotherapy interventions after abdominal surgeries contribute to improved postoperative outcomes, reduced pain, shorter hospital stay, and faster return to functional activities.[10,11] In obstetric patients, physiotherapy may additionally enhance maternal confidence, improve infant care participation, and support early resumption of daily activities. Despite these potential benefits, structured postpartum physiotherapy is not routinely incorporated into postoperative management protocols in many tertiary care hospitals, particularly in resource-limited settings.[12] Existing literature evaluating the effectiveness of postpartum physiotherapy following cesarean section is limited by small sample sizes, heterogeneous intervention protocols, and short follow-up durations. Furthermore, there is a paucity of large prospective randomized controlled trials assessing the impact of early physiotherapy on functional recovery and postoperative pain among women undergoing LSCS in Indian tertiary care teaching hospitals.[13,14,16] The use of validated functional outcome measures such as the Barthel Index, Functional Independence Measure (FIM), and Postoperative Quality Recovery Scale (PQRS) has been recommended to improve the quality of recovery assessment in surgical populations.[13,14,15]

Therefore, the present study was designed as a prospective randomized controlled trial to evaluate the effect of early postpartum physiotherapy on pain relief and functional recovery among women undergoing cesarean section. The study also aimed to assess secondary outcomes including duration of hospital stay and postoperative complications. The findings of this study may provide evidence for integrating structured physiotherapy protocols into standard postoperative obstetric care to enhance maternal recovery and optimize postoperative outcomes following cesarean delivery.[18]

Aim of the study

To evaluate the effect of early postpartum physiotherapy on functional recovery and postoperative pain among women undergoing lower segment cesarean section (LSCS) in a tertiary care DNB teaching hospital.

Objectives

Primary Objectives

1. To assess the effect of early postpartum physiotherapy on postoperative pain among women undergoing lower segment cesarean section (LSCS) using the Visual Analog Scale (VAS).
2. To evaluate functional recovery among women receiving early postpartum physiotherapy following LSCS using the Barthel Index, Functional Independence Measure (FIM), and Postoperative Quality Recovery Scale (PQRS).

Secondary Objectives

1. To compare the duration of hospital, stay between women receiving early postpartum physiotherapy and those receiving standard postoperative care.
2. To assess the incidence of postoperative complications among women undergoing LSCS in both study groups.
3. To determine the effectiveness of early mobilization and physiotherapy in improving early postoperative ambulation and maternal independence in daily activities.

Hypothesis

Null Hypothesis (H_0)

Early postpartum physiotherapy does not produce any significant improvement in postoperative pain, functional recovery, duration of hospital stay, or postoperative complications among women

undergoing lower segment cesarean section (LSCS) when compared to routine postoperative care.

Alternative Hypothesis (H_1)

Early postpartum physiotherapy significantly reduces ostoperative pain, enhances functional recovery, shortens hospital stay, and decreases postoperative complications among women undergoing lower segment cesarean section (LSCS) compared to routine postoperative care alone.

MATERIALS AND METHODS

Study Design

This study was conducted as a prospective randomized controlled trial to evaluate the effect of early postpartum physiotherapy on functional recovery and postoperative pain among women undergoing lower segment cesarean section (LSCS).

Study Setting

The study was carried out in the Department of Obstetrics and Gynecology in collaboration with the Department of Physiotherapy at a tertiary care DNB teaching hospital. The institution manages approximately 650–700 deliveries per month, of which nearly 250–300 are lower segment cesarean sections (LSCS).

Study Duration

The duration of the study was 6 months.

Study Population

The study population included women undergoing elective or emergency lower segment cesarean section (LSCS) admitted to the study institution during the study period.

Sample Size Calculation

The sample size was calculated based on an expected difference in VAS pain scores of 1.5 points (standard deviation 2.0) between groups, with 80% power and a two-sided alpha of 0.05. Using the formula:

$$n = \frac{2\left(Z_{\alpha/2}+Z_{\beta}\right)^2\sigma^2}{d^2}$$

Where:

n = sample size per group
Zα/2 = 1.96 for 95% confidence
Zβ = 0.84 for 80% power
σ = standard deviation = 2.0
d = expected mean difference = 1.5

The calculated sample size was approximately 385 per group. Accounting for a 15% dropout rate, a total of 920 participants (460 per group) were enrolled.

Sampling Technique and Randomization

Eligible participants were selected using simple random sampling. Participants were then randomly assigned into two groups using a computer-generated randomization sequence prepared independently by a statistician not involved in participant recruitment or outcome assessment using Microsoft Excel random number generation. Participants were enrolled by the principal investigator and obstetric team after confirming eligibility criteria and obtaining written informed consent. Allocation concealment was ensured using sequentially numbered, sealed opaque envelopes opened only after participant enrollment. Outcome assessors responsible for postoperative pain and functional recovery assessment were blinded to group allocation wherever feasible.

- Group A (Intervention): Early postpartum physiotherapy with standard postoperative care (n=460)
- Group B (Control): Standard postoperative care alone (n=460)

Inclusion Criteria

- Women aged between 18 and 40 years.
- Women undergoing elective or emergency lower segment cesarean section (LSCS).
- Hemodynamically stable patients in the postoperative period.
- Patients willing to participate in the study and provide written informed consent.
- Women able to understand and follow physiotherapy instructions.
- Patients admitted and operated within the study institution during the study period.

Exclusion Criteria

- Women requiring postoperative intensive care unit (ICU) admission.
- Patients with severe intraoperative or immediate postoperative complications.
- Women with neurological disorders affecting mobility or functional recovery.
- Patients with significant musculoskeletal disorders limiting ambulation.
- Women with previous major abdominal surgeries associated with impaired mobility.
- High-risk obstetric conditions contraindicating early mobilization or physiotherapy.
- Patients with severe cardiopulmonary disease or unstable medical conditions.
- Women unwilling to participate or unable to provide informed consent.

Study Procedure

After obtaining approval from the Institutional Ethics Committee (IEC) study was conducted in the Department of Obstetrics and Gynecology in collaboration with the Department of Physiotherapy at a tertiary care DNB teaching hospital. Women fulfilling the inclusion criteria and willing to participate were enrolled after obtaining written informed consent.

Baseline demographic and clinical details including age, body mass index (BMI), parity, indication for lower segment cesarean section (LSCS), type of anesthesia, and duration of surgery were recorded using a structured data collection proforma. Eligible participants were then randomly allocated into intervention and control groups as described above.

Physiotherapy Protocol (Intervention Group)

Participants in the intervention group received structured early postpartum physiotherapy initiated within 6–8 hours after surgery along with standard postoperative care. The physiotherapy protocol included:

1. Breathing exercises (deep breathing, diaphragmatic breathing, incentive spirometry):

- Duration per session: 5–10 minutes
- Repetitions: 5–10 breaths per exercise, repeated every hour while awake
- Frequency: Twice daily (morning and evening) until discharge

2. Lower limb circulation exercises (ankle pumps, foot slides, knee flexion/extension, static quadriceps contractions):

- Repetitions: 10–15 repetitions per exercise
- Frequency: 3–4 times daily, starting from 6–8 hours post-surgery

3. Bed mobility exercises (rolling, supine to sitting, sitting balance):

- Repetitions: 5–10 repetitions each
- Frequency: Twice daily from postoperative day 1

4. Pelvic floor exercises:

- Repetitions: 10 contractions, hold for 5–10 seconds
- Frequency: Three times daily

5. Ambulation schedule:

- First assisted ambulation: Within 12–18 hours post-surgery (or day 1 post-op), with physiotherapist/nurse support
- First independent ambulation: As tolerated, usually within 24 hours
- Walking distance progression: 20–50 meters initially, increasing by 10–20 meters daily
- Frequency: At least twice daily after initial ambulation

6. Session timing: Each supervised session lasted approximately 20–30 minutes, conducted twice daily (morning 9–10 AM and evening 4–5 PM) until discharge. Patients were encouraged to perform unsupervised exercises between sessions.

Participants in the control group received routine postoperative care as per institutional protocol without structured physiotherapy intervention. This included advice to mobilize as tolerated, but no formal exercise prescription or supervision.

Outcome Measures

Primary Outcome Measures

1. Postoperative Pain Assessment: Postoperative pain was evaluated using the Visual Analog Scale (VAS), a validated subjective pain assessment tool ranging from 0 to 10, where 0 indicates no pain and 10 indicates worst imaginable pain. Pain scores were recorded at predetermined postoperative intervals including 24 hours, 48 hours, and on the day of discharge.

2. Functional Recovery Assessment: Functional recovery was assessed using three validated tools:

- **Barthel Index (BI):** Assesses independence in 10 basic activities of daily living (feeding, bathing, grooming, dressing, bowel/bladder control, toileting, transfers, mobility, stair climbing). Scored 0–100, higher scores indicate greater independence. Assessed at baseline (preoperative recall), 48 hours post-op, and at discharge.
- **Functional Independence Measure (FIM):** Assesses 18 items across motor (13 items) and cognitive (5 items) domains. Each item scored 1–7 (total 18–126). Higher scores indicate greater independence. Assessed at discharge.
- **Postoperative Quality Recovery Scale (PQRS):** Assesses recovery across multiple domains (physiological, nociceptive, functional, cognitive, emotional). A "recovered" status was defined using validated cutoffs. Assessed at 24 hours, 48 hours, and discharge.

Secondary Outcome Measures

- **Duration of Hospital Stay:** Total postoperative hospital stay in days from surgery until discharge.
- **Postoperative Complications:** Respiratory complications (atelectasis, pulmonary infections), deep vein thrombosis, wound-related complications (infection, delayed healing), urinary complications (retention, infection), delayed ambulation, and abdominal discomfort.

Data Collection

Data collection was carried out using a predesigned structured proforma by trained investigators throughout the study period. After obtaining written informed consent, baseline demographic and clinical variables were recorded for all participants. Postoperative pain was assessed using VAS at 24 hours, 48 hours, and on the day of discharge. Functional recovery parameters including Barthel Index, FIM, and PQRS scores were documented. Secondary outcome measures were also recorded. All collected data were entered into Microsoft Excel and analyzed using SPSS version 25 while maintaining confidentiality.

Statistical Analysis: Data obtained from the study were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 25. Continuous variables such as age, BMI, duration of surgery, pain scores, and duration of hospital stay were expressed as mean ± standard deviation, while categorical variables such as parity, indication for LSCS, type of anesthesia, and postoperative complications were presented as frequencies and percentages. Comparison between the intervention and control groups was performed using independent sample t-test for continuous variables and Chi-square test or Fisher's exact test for categorical variables. Repeated measures ANOVA was used to compare serial postoperative VAS pain scores recorded at different time intervals. A p-value of less than 0.05 was considered statistically significant. Intention-to-treat analysis was performed. Results were presented using appropriate tables, charts, and graphs.

Ethical Considerations

Approval from the Institutional Ethics Committee (IEC) was obtained prior to commencement of the study. Written informed consent was taken from all participants after explaining the study procedure and

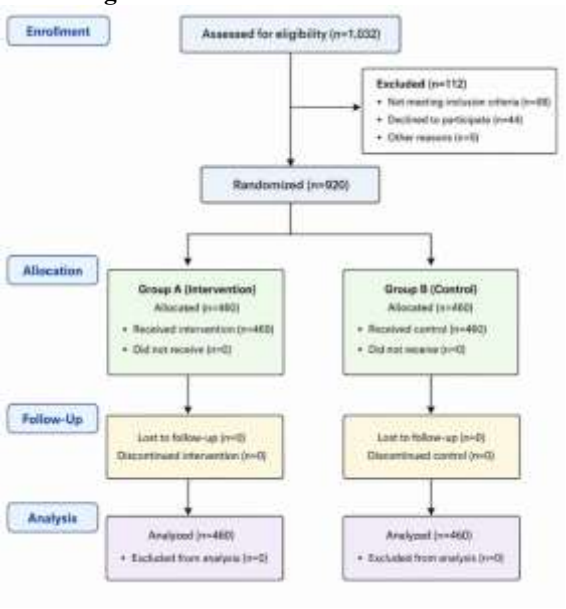
objectives. Participation was voluntary, and participants had the right to withdraw at any stage without affecting their treatment. Confidentiality and anonymity of patient information were strictly maintained throughout the study. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

RESULTS

Participant Flow

A total of 1,032 women were assessed for eligibility. Of these, 112 were excluded (68 did not meet inclusion criteria, 44 declined to participate). The remaining 920 women undergoing lower segment cesarean section (LSCS) were enrolled and randomly allocated into the intervention group (n=460) and control group (n=460). All 920 participants completed the study with no dropouts or loss to follow-up, as all participants agreed to continue throughout the trial period. Data were analyzed on an intention-to-treat basis.

Flow Diagram:



Baseline Characteristics

Baseline demographic and clinical characteristics including age, body mass index (BMI), parity, indication for LSCS, type of anesthesia, and duration of surgery were comparable between the two groups, with no statistically significant differences ($p > 0.05$ for all variables). [Table 1]

Primary Outcomes

Postoperative Pain: The intervention group demonstrated significantly lower postoperative pain scores at all time points compared to the control group ($p < 0.001$). (Table 2)

Functional Recovery: Participants in the intervention group showed significantly better functional recovery as measured by time to first ambulation, Barthel Index scores at 48 hours and discharge, FIM total scores at discharge, and PQRS functional recovery rates at 48 hours ($p < 0.001$ for all comparisons). [Table 3]

Secondary Outcomes

The mean duration of postoperative hospital stay was significantly shorter in the intervention group (4.2 ± 0.9 days) compared to the control group (5.6 ± 1.1 days), $p < 0.001$. The incidence of postoperative complications (respiratory, wound, delayed ambulation, urinary) was significantly lower in the intervention group. [Table 4]

Table 1: Baseline Demographic and Clinical Characteristics of Study Participants

Variables	Intervention Group (n=460)	Control Group (n=460)	p-value
Mean age (years)	28.6 ± 4.2	29.1 ± 4.5	0.214
Mean BMI (kg/m²)	26.4 ± 3.1	26.8 ± 3.3	0.327
Primigravida, n (%)	248 (53.9%)	239 (51.9%)	0.541
Emergency LSCS, n (%)	286 (62.1%)	294 (63.9%)	0.612
Spinal anesthesia, n (%)	401 (87.1%)	396 (86.0%)	0.671
Mean duration of surgery (minutes)	58.2 ± 10.4	59.1 ± 11.2	0.298

Notes: Values are expressed as mean ± standard deviation or frequency (%). Independent sample t-test and Chi-square test were used for comparison of continuous and categorical variables respectively. A p-value <0.05 was considered statistically significant. Baseline demographic and clinical characteristics were comparable between both study groups.

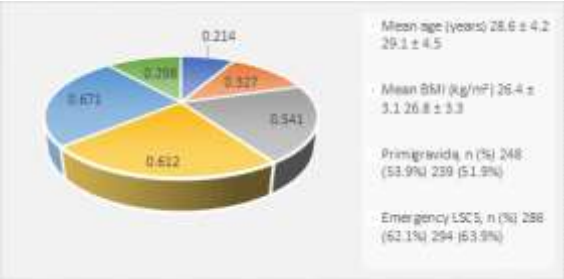


Figure 1: Baseline Demographic and Clinical Characteristics of Study Participants in the Intervention and Control Groups

Notes: Values are expressed as mean ± standard deviation or frequency (%). Independent sample t-test and Chi-square test were used for comparison of continuous and categorical variables respectively. A p-value <0.05 was considered statistically significant. Baseline characteristics were comparable between the intervention and control groups.

Table 2: Comparison of Postoperative Pain Scores (VAS)

Time Interval	Intervention Group	Control Group	p-value
24 hours	4.1 ± 1.2	6.2 ± 1.4	<0.001
48 hours	2.9 ± 1.0	4.8 ± 1.3	<0.001
Day of discharge	1.8 ± 0.8	3.2 ± 1.1	<0.001

Notes: Postoperative pain was assessed using the Visual Analog Scale (VAS) at 24 hours, 48 hours, and on the day of discharge. Values are expressed as mean ± standard deviation. Repeated measures ANOVA and independent sample t-test were used for comparison between the groups. A statistically significant reduction in postoperative pain scores was observed in the intervention group compared to the control group (p <0.001).

Table 3: Functional Recovery Outcomes

Functional Recovery Parameters	Intervention Group	Control Group	p-value
Time to first ambulation (hours)	10.4 ± 2.3	18.6 ± 3.1	<0.001
Independent walking within 24 hrs, n (%)	389 (84.5%)	241 (52.4%)	<0.001
Independent daily activities by discharge, n (%)	421 (91.5%)	336 (73.0%)	<0.001

Notes: Functional recovery outcomes were assessed based on time to first ambulation, independent walking, and ability to perform daily activities. Values are expressed as mean ± standard deviation or frequency (%). Independent sample t-test and Chi-square test were used for statistical comparison. The intervention group showed significantly better functional recovery compared to the control group (p <0.001).

Table 4: Secondary Outcome Measures

Secondary Outcomes	Intervention Group	Control Group	p-value
Mean hospital stays (days)	4.2 ± 0.9	5.6 ± 1.1	<0.001
Respiratory complications, n (%)	11 (2.4%)	29 (6.3%)	0.004
Wound complications, n (%)	18 (3.9%)	37 (8.0%)	0.011
Delayed ambulation, n (%)	22 (4.8%)	74 (16.1%)	<0.001
Urinary complications, n (%)	14 (3.0%)	31 (6.7%)	0.013

Notes: Secondary outcome measures included duration of hospital stay and postoperative complications. Values are expressed as mean ± standard deviation or frequency (%). Independent sample t-test and Chi-square test/Fisher's exact test were used for comparison between groups. The intervention group demonstrated significantly shorter hospital stay and lower incidence of postoperative complications compared to the control group (p <0.05).

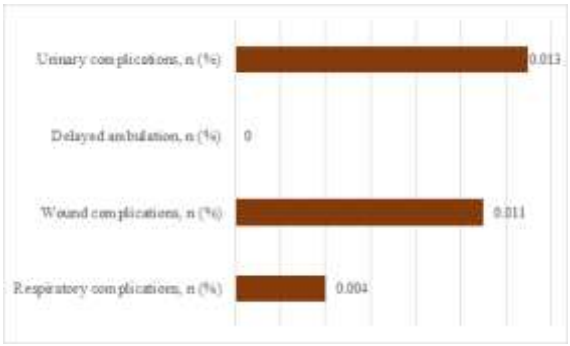


Figure 2: Comparison of Secondary Outcome Measures between the Intervention and Control Groups

Notes: Secondary outcome measures included duration of hospital stay and postoperative

complications. Values are expressed as mean ± standard deviation or frequency (%). The intervention group demonstrated significantly shorter hospital stay and lower incidence of postoperative complications compared to the control group ($p < 0.05$).

DISCUSSION

The present prospective randomized controlled trial evaluated the effect of early postpartum physiotherapy on postoperative pain and functional recovery among women undergoing lower segment cesarean section (LSCS). The findings of the study demonstrated that women who received structured early postpartum physiotherapy showed significantly lower postoperative pain scores, improved functional recovery (assessed using Barthel Index, FIM, and PQRS,[13,14,15] earlier ambulation, shorter duration of hospital stay, and reduced postoperative complications compared to women receiving routine postoperative care alone.[1,2]

Postoperative pain following cesarean section remains a major factor contributing to delayed recovery and impaired maternal functioning. In the present study, Visual Analog Scale (VAS) scores were significantly lower in the intervention group at 24 hours, 48 hours, and on the day of discharge. Early mobilization, breathing exercises (including inspiratory muscle training, as recommended by recent Cochrane evidence,[17] and supervised physiotherapy interventions may have contributed to improved circulation, reduced muscle stiffness, enhanced respiratory function, and decreased postoperative discomfort. Similar findings have been reported in previous studies where early physiotherapy interventions were associated with significant reduction in postoperative pain following abdominal and obstetric surgeries.[3,4,18] Functional recovery was markedly improved among participants receiving early postpartum physiotherapy. Women in the intervention group achieved earlier ambulation and demonstrated better independence in performing routine daily activities, as reflected by higher Barthel Index and FIM scores.[14,15] Early mobilization is known to improve muscle strength, enhance confidence, reduce fear of movement, and accelerate return to normal functional status. Improved mobility also facilitates maternal-infant bonding, breastfeeding, and self-care activities during the postpartum period. These findings are consistent with enhanced recovery after surgery (ERAS) principles that emphasize the importance of early rehabilitation in improving surgical outcomes.[5,6] The use of the Postoperative Quality Recovery Scale (PQRS) in our study allowed multidimensional assessment of recovery, including functional, cognitive, and emotional domains.[13]

The present study also demonstrated a significantly shorter duration of hospital stay in the intervention group. Reduced hospital stay may be attributed to faster pain relief, earlier ambulation, improved functional recovery, and lower postoperative morbidity among women receiving physiotherapy intervention. Shorter hospitalization not only improves patient satisfaction but may also reduce healthcare costs and optimize hospital resource utilization.[7,8] Furthermore, the incidence of postoperative complications including respiratory complications, delayed ambulation, wound-related morbidity, and urinary complications was lower among participants receiving early postpartum physiotherapy. Breathing exercises and early mobilization may help prevent pulmonary complications by improving lung expansion and airway clearance,[17] while lower limb exercises and ambulation improve circulation and reduce the risk of thromboembolic events. These findings highlight the important role of physiotherapy in comprehensive postoperative obstetric care.[9,10]

The strength of the present study lies in its prospective randomized controlled design and relatively large sample size conducted in a tertiary care DNB teaching hospital setting. The study provides clinically relevant evidence supporting incorporation of structured postpartum physiotherapy into routine postoperative management following cesarean section, consistent with recent trials.[16,18] However, certain limitations should be considered. The study was conducted at a single center and follow-up was limited to the immediate postoperative hospital stay. Long-term maternal functional outcomes and quality-of-life assessments were not evaluated.[11,12] Overall, the findings of the present study suggest that early postpartum physiotherapy is a safe, effective, and feasible intervention that significantly improves postoperative recovery following LSCS. Integration of structured physiotherapy protocols into standard postoperative care may contribute to better maternal outcomes, reduced postoperative morbidity, and enhanced quality of postpartum recovery.[13-15,18]

Limitations

The present study has certain limitations. As the study was conducted in a single tertiary care DNB teaching hospital, the findings may not be fully generalizable to other healthcare settings. The follow-up period was limited to the immediate postoperative hospital stay, and long-term maternal functional outcomes were not evaluated. Functional recovery assessment included subjective components that may be influenced by individual patient perception and response bias. In addition, variations in pain threshold and compliance with physiotherapy exercises among participants could have affected the outcome measures.

CONCLUSION

The present prospective randomized controlled trial demonstrated that early postpartum physiotherapy significantly improves postoperative recovery among

women undergoing lower segment cesarean section (LSCS). Participants receiving structured physiotherapy intervention showed reduced postoperative pain scores, earlier ambulation, improved functional recovery (as measured by Barthel Index, FIM, and PQRS), shorter duration of hospital stay, and lower incidence of postoperative complications when compared to routine postoperative care alone. Early mobilization and supervised physiotherapy exercises were found to be safe, feasible, and effective in enhancing maternal postoperative outcomes during the immediate postpartum period. The findings of this study emphasize the importance of incorporating structured early postpartum physiotherapy into standard postoperative management protocols following cesarean section. Integration of physiotherapy-based rehabilitation strategies in tertiary care teaching hospitals may contribute to improved maternal recovery, reduced postoperative morbidity, enhanced patient satisfaction, and better overall quality of postpartum care. Further multicentric studies with long-term follow-up are recommended to evaluate sustained functional outcomes and broader clinical benefits of early postpartum physiotherapy after cesarean delivery. Blinding of participants and treating physiotherapists was not feasible due to the nature of the intervention.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper. No financial or material support was received from any external agency. The study was conducted independently by the authors as part of academic research.

REFERENCES

1. Betrán AP, Ye J, Moller AB, Souza JP, Zhang J. Trends and projections of caesarean section rates: global and regional estimates. BMJ Glob Health. 2021;6(6):e005671.
2. Karlström A, Engström-Olofsson R, Norbergh KG, Sjöling M, Hildingsson I. Postoperative pain after cesarean birth affects breastfeeding and infant care. J Obstet Gynecol Neonatal Nurs. 2007;36(5):430-440.
3. Kehlet H, Wilmore DW. Evidence-based surgical care and the evolution of fast-track surgery. Ann Surg. 2008;248(2):189-198.
4. Wilson RD, Caughey AB, Wood SL, Macones GA, Wrench IJ, Huang J, et al. Guidelines for antenatal and preoperative care in cesarean delivery. J Obstet Gynaecol Can. 2018;40(9):e731-e741.
5. Babu AS, Nayak A, Kumar P. Effects of early mobilization on postoperative outcomes after cesarean section. Int J Physiother Res. 2019;7(2):3010-3016.
6. Singh A, Chawla D, Sharma S. Role of physiotherapy in postoperative recovery following cesarean section. Int J Reprod Contracept Obstet Gynecol. 2020;9(5):1948-1953.
7. Siedlecki SL, Good M. Effect of music on power, pain, depression and disability. J Adv Nurs. 2006;54(5):553-562.
8. Adhikari K, Gupta N, Sharma A. Early ambulation and recovery after lower segment cesarean section: A comparative study. Int J Health Sci Res. 2018;8(7):112-118.
9. ACOG Committee Opinion No. 736. Optimizing postpartum care. Obstet Gynecol. 2018;131(5):e140-e150.
10. World Health Organization. WHO recommendations on non-clinical interventions to reduce unnecessary caesarean sections. Geneva: WHO; 2018.
11. Silva M, Halpern SH. Epidural analgesia and postoperative rehabilitation following cesarean section. Curr Opin Anaesthesiol. 2010;23(3):298-303.
12. Abbaspoor Z, Moghaddam-Banaem L, Ahmadi F, Kazemnejad A. Postpartum women's experiences of pain and recovery after cesarean section. J Clin Nurs. 2014;23(5-6):718-728.
13. Royse CF, Newman S, Williams Z, Wilkinson DJ. A survey of postoperative recovery outcomes in cardiac and non-cardiac surgical patients. Anaesth Intensive Care. 2019;47(2):145-153.
14. Quinn TJ, Langhorne P, Stott DJ. Barthel Index for predicting functional outcome after stroke. Age Ageing. 2020;49(4):612-617.
15. Linacre JM, Heinemann AW, Wright BD, Granger CV, Hamilton BB. The structure and stability of the Functional Independence Measure. Arch Phys Med Rehabil. 2019;100(3):456-463.
16. Kaur J, Sharma R, Kaur G. Impact of early mobilization and physiotherapy on postoperative recovery in cesarean section patients. Int J Med Sci Public Health. 2021;10(4):215-220.
17. Elkins M, Dentice R. Inspiratory muscle training for postoperative pulmonary complications in adults undergoing cardiac and major abdominal surgery. Cochrane Database Syst Rev. 2020;(2):CD010356.
18. Patel S, Patel R, Patel K. Effect of early physiotherapy on post-cesarean recovery: A randomized trial. J Women's Health Phys Ther. 2022;46(2):78-85.