

Research Article

Functional Impairments Among Postpartum Women After Childbirth: A Study Using the Barkin Index of Maternal Functioning

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A B S T R A C T

Introduction: Postpartum physical issues are often dismissed as temporary or minor; however, they significantly affect emotional and functional health, leading to a decline in women's quality of life due to persistent and escalating health problems.

Aim: To compare functional impairments experienced by postpartum women following vaginal delivery and cesarean section, using the Barkin Index of Maternal Functioning (BIMF).

Methods: This observational study recruited 114 postpartum women (62 vaginal delivery, 52 cesarean section) from NR Colony Government Maternity Hospital and Motherhood Hospital, Bangalore, based on pre-defined inclusion and exclusion criteria. Functional impairment was assessed using the self-reported BIMF questionnaire. Data were analyzed using an independent t-test (SPSS v29.0.1), with $p < 0.05$ considered statistically significant.

Results: Mothers who underwent cesarean section showed significantly greater functional impairment than those with vaginal delivery across nearly all BIMF domains ($t = 2.24$ to 6.40 , $p < 0.05$), with the strongest differences seen in feeding comfort and mother-infant interaction ($p < 0.001$). Overall, 65.4% of cesarean-delivery mothers had a BIMF score below 80 (indicating functional impairment), compared to 14.5% of vaginal-delivery mothers. These findings suggest cesarean delivery is associated with greater postpartum functional impairment, highlighting the need for tailored, delivery-mode-specific recovery interventions.

Keywords: Barkin Index of Maternal Functioning, Postpartum depression, Postoperative day

Introduction

Childbirth marks the beginning of the postpartum period (puerperium), during which a woman's body undergoes

significant physiological changes as it returns to its pre-pregnancy state.¹ This period is often accompanied by physical discomfort and reduced capacity to manage daily activities, and the mode of delivery vaginal or cesarean

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further influences the pace of recovery and the extent of functional limitation.²

The numbers around postpartum mental health are striking. Roughly one in seven women experience postpartum depression, and more than half report physical symptoms like headaches, nausea, or persistent fatigue in the weeks after birth.^{3,4} Cesarean deliveries, which account for close to a fifth of births worldwide, appear to carry a higher depression risk than vaginal births — 34.9% versus 27.6% in some large studies.⁵ Although these findings provide important insights into the association between mode of delivery and maternal mood and mental health outcomes, they do not fully capture the impact of delivery mode on maternal functional ability. Functional outcomes, including the ability to care for the newborn, perform activities of daily living, attend to personal needs, and manage household responsibilities during the postpartum recovery period, are also important indicators of maternal well-being and recovery.⁶

The Barkin Index of Maternal Functioning (BIMF) addresses an important gap in the assessment of postpartum recovery by focusing specifically on maternal functional status. The instrument was developed with direct input from postpartum women, thereby incorporating their perspectives on the functional challenges experienced following childbirth.⁷ The BIMF is a 20-item self-report measure that assesses multiple domains of maternal functioning, including self-care, infant care, maternal–infant interaction, social support, and maternal psychological well-being.⁸ By evaluating these domains comprehensively, the BIMF provides a broader assessment of postpartum recovery than symptom-focused measures alone.

Despite extensive research on postpartum pain and depression, comparatively limited evidence is available regarding functional impairment as a distinct postpartum outcome and its variation according to mode of delivery.⁹ This represents an important gap in the literature, as a clearer understanding of functional limitations following vaginal and cesarean delivery may assist healthcare professionals in developing more individualized postpartum rehabilitation and recovery strategies, rather than relying solely on generalized recommendations.

This concern is particularly relevant in the Indian context, where the prevalence of cesarean delivery has increased substantially over the past two decades. National survey data indicate that the cesarean delivery rate increased from 8.5% in 2005–2006 to 21.5% in 2019–2021.¹⁰ This increase has been particularly pronounced in southern states and among deliveries occurring in private-sector healthcare facilities, where cesarean rates exceeding 40% have been reported.¹¹ The increasing prevalence of cesarean delivery

highlights the need for greater attention to postpartum functional recovery, as women recovering from major abdominal surgery must simultaneously adapt to the physical, psychological, and caregiving demands associated with the postpartum period. However, conventional birth-related outcome measures provide limited information regarding women's ability to perform daily activities, care for their newborns, and manage their own recovery following discharge. Therefore, assessment of maternal functional status may provide important additional information for understanding postpartum recovery and informing individualized postpartum care.

Therefore, the present study aimed to compare functional impairment among postpartum women following vaginal delivery and cesarean section using the Barkin Index of Maternal Functioning (BIMF). Specifically, the study objectives were to: (1) compare overall BIMF scores between women who underwent vaginal delivery and those who underwent cesarean section; and (2) identify the functional domains demonstrating the greatest differences between the two delivery groups.

Need for the Study

While evidence indicates that postpartum pain and depression are common among mothers who have undergone both vaginal and cesarean deliveries, there is limited research addressing functional impairments following childbirth. Therefore, the aim of this study is to identify the functional impairments experienced by postpartum women who have had either vaginal or cesarean deliveries.

Methodology

Study Type: Observational study

Sample Size: 114 participants

Study Setting: Government maternity hospital, NR colony and Motherhood Bangalore

Study Duration: 3 months

Study Population: Post-partum mothers

Inclusion Criteria

Females aged around 18- 39, Postpartum mothers, within 1 to 10 days postpartum, were recruited, post-partum women including normal and vaginal delivery, both primiparous and multiparous mothers.

Exclusion Criteria

Participants who are not willing for the study, women with any psychological problems, women with any mental illness, women with any neurological condition and deficits, women with any autoimmune disorders

Sample Size Justification

The sample size was calculated using the formula for comparing means between two independent groups, assuming a medium effect size (Cohen's $d = 0.5$), 95% confidence level ($Z_{\alpha/2} = 1.96$), and 80% power ($Z_{\beta} = 0.84$), yielding a minimum requirement of approximately 63 participants per group (126 total). A total of 114 postpartum women (62 vaginal delivery, 52 cesarean section) who met the eligibility criteria were ultimately recruited.

Procedure

A total of 114 postpartum mothers, within 1 to 10 days of delivery, from NR Colony Government Maternity Hospital and Motherhood Hospital, Bangalore, were recruited for this study based on specific inclusion and exclusion criteria. The study's purpose and objectives were explained to each participant, and written informed consent was obtained from those willing to participate. Demographic and obstetric information, including mode of delivery, was collected from each individual, and participants were subsequently categorized into two groups — vaginal delivery ($n = 62$) and cesarean section ($n = 52$) — for comparison. The Barkin Index of Maternal Functioning (BIMF) Scale, a validated, self-administered 20-item questionnaire, was used to assess maternal functioning across multiple domains. Each participant completed the questionnaire independently under investigator supervision, with clarification provided where needed; a total BIMF score below 80 was considered indicative of functional impairment. Upon completion, the questionnaires were collected, checked for completeness, and the data were recorded and subjected to statistical analysis.

Statistical analysis

statistical analysis was performed by using the SPSS software (SPSS Inc; Chicago, IL) version 29.0.1.

Results

A total number of 114 post-partum mothers were included in the study and the data was analyzed by using the SPSS software (SPSS Inc; Chicago, IL) version 29.0.10.

This table 1 shows the demographic data (Figure 1) where the percentage of vaginal deliveries is 54.4% and the percentage for C-sections is 45.6%. The percentage of age groups according to the type of delivery. Vaginal deliveries account for 8.1% of births among women under 20 years of age, 35.5% of births between 20 and 24 years, 46.8% of births between 25 and 29 years, 8.1% of births between 30 and 34 years, and 1.6% of births between 35 and 39 years. In comparison, C-section deliveries make up 1.9% of births under 20 years, 55.8% for women aged 20 to 24, 28.8% for those aged 25 to 29, 11.5% for women aged 30 to 34, and 1.9% for those aged 35 to 39. *Age-group distribution between delivery modes was compared using the Chi-square test.*

Values are shown as percentages of each delivery-mode group; age-group distribution was compared using the Chi-square test (see Table 1).

Table 2 presents the p-values for functional impairments based on the type of delivery, as measured by the Barkin Index of Maternal Functioning (BIMF). Using an independent t-test, a statistically significant difference ($p < 0.05$) was found in functional impairments between vaginal deliveries and C-sections, except for the domain "I worry about how other people judge me," where no significant difference was observed.

This graph (Fig 2) shows the functional impairments under the domain of self-care, infant care, mother-child interaction, psychological well-being, social support, management, and adjustment.

Table 3 illustrates the percentage of functional impairments in both vaginal and C-section deliveries. For vaginal deliveries, 14.5% of women experienced functional impairments, while 85.5% did not. In contrast, 65.4% of women who underwent C-sections experienced functional impairments (Figure 3), with 34.5% reporting no impairments. Group differences in the proportion of functional impairment were compared using the Chi-square test.

Table 1. Demographic Data of Age according to types of delivery

Age Group / Type of Delivery	Vaginal Delivery, n	Vaginal Delivery, %	C-section, n	C-section, %
Type of delivery	-	-	-	-
Vaginal delivery	62	54.4	—	—
C-section	—	—	52	45.6
Age groups	-	-	-	-
<20 years	—	8.1	—	1.9
20–24 years	—	35.5	—	55.8
25–29 years	—	46.8	—	28.8
30–34 years	—	8.1	—	11.5
35–39 years	—	1.6	—	1.9

n: No of type of delivery; C-section: Cesarean delivery

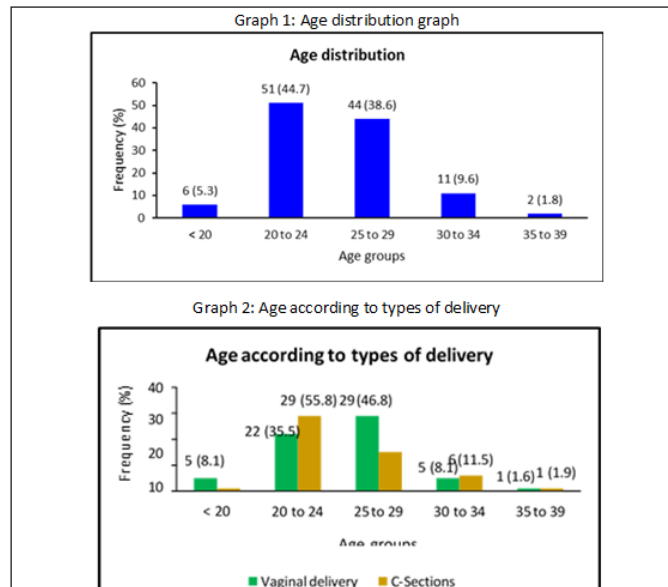


Figure 1. Demographic Data of Age according to types of delivery

Table 2. Comparison of the functional impairments using BIMF according to types of delivery

Statement	Type of delivery	Mean	S.D.	"t"	p value
I am a good mother	Vaginal delivery	5.29	0.69	5.85	< 0.001*
I am a good mother	C-Sections	4.5	0.75	-	-
I feel rested	Vaginal delivery	4.79	0.89	5.93	< 0.001*
I feel rested	C-Sections	3.71	1.05	-	-
I am comfortable with the way I have chosen to feed my baby	Vaginal delivery	4.9	1.04	6.40	< 0.001*
I am comfortable with the way I have chosen to feed my baby	C-Sections	3.67	1	-	-
My baby and i understand each other	Vaginal delivery	5.05	0.98	6.14	< 0.001*
My baby and i understand each other	C-Sections	3.92	0.97	-	-
I am able to relax and enjoy time with my baby	Vaginal delivery	5.08	0.82	6.32	< 0.001*
I am able to relax and enjoy time with my baby	C-Sections	4	1.01	-	-
There are people in my life that I can trust to care for my baby when I need a break	Vaginal delivery	4.85	0.81	4.95	< 0.001*
There are people in my life that I can trust to care for my baby when I need a break	C-Sections	3.98	1.08	-	-
I am comfortable allowing a trusted friend or relative to care for my baby (can include baby's father or partner)	Vaginal delivery	4.68	1.1	5.04	< 0.001*
I am comfortable allowing a trusted friend or relative to care for my baby (can include baby's father or partner)	C-Sections	3.6	1.19	-	-
I am getting enough adult interaction	Vaginal delivery	4.39	1.42	3.40	0.001*
I am getting enough adult interaction	C-Sections	3.54	1.21	-	-
I am getting enough encouragement from other people	Vaginal delivery	4.53	0.99	3.92	< 0.001*
I am getting enough encouragement from other people	C-Sections	3.79	1.04	-	-
I trust my own feelings (instincts) when it comes to taking care of my baby	Vaginal delivery	4.68	0.88	4.77	< 0.001*

I trust my own feelings (instincts) when it comes to taking care of my baby	C-Sections	3.79	1.11	-	-
I take a little time each week to do something for myself	Vaginal delivery	4.76	1.04	4.63	< 0.001*
I take a little time each week to do something for myself	C-Sections	3.81	1.16	-	-
I am taking good care for my baby's physical needs (feedings, changing diapers, doctor's appointments)	Vaginal delivery	4.66	1.1	3.71	< 0.001*
I am taking good care for my baby's physical needs (feedings, changing diapers, doctor's appointments)	C-Sections	3.88	1.13	-	-
I am taking good care of my physical needs (eating, showering, etc.)	Vaginal delivery	4.68	1.04	4.52	< 0.001*
I am taking good care of my physical needs (eating, showering, etc.)	C-Sections	3.75	1.15	-	-
I make good decision about my baby's health and wellbeing	Vaginal delivery	4.73	0.93	3.78	< 0.001*
I make good decision about my baby's health and wellbeing	C-Sections	3.98	1.18	-	-
My baby and i are getting into a routine	Vaginal delivery	4.6	1.03	2.97	0.004*
My baby and i are getting into a routine	C-Sections	3.98	1.18	-	-
I worry about how other people judge me (as a mother)	Vaginal delivery	2.55	1.75	1.74	0.084
I worry about how other people judge me (as a mother)	C-Sections	3.08	1.43	-	-
I am able to take care of my baby and my mother responsibilities	Vaginal delivery	4.35	1.29	2.24	0.027*
I am able to take care of my baby and my mother responsibilities	C-Sections	3.85	1.09	-	-
Anxiety or worry often interferes with my mothering abilities	Vaginal delivery	2.47	1.91	1.93	0.056
Anxiety or worry often interferes with my mothering abilities	C-Sections	3.1	1.5	-	-

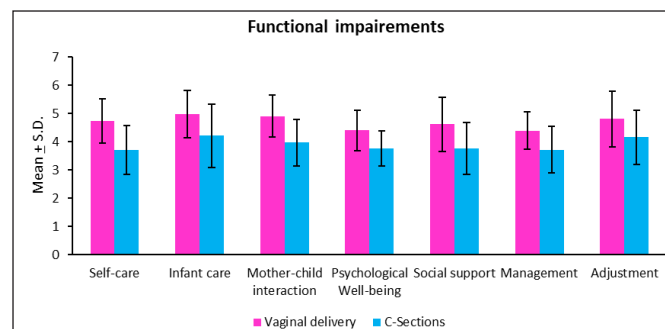


Figure 2. Comparison of the functional impairments using BIMF according to types of delivery

Table 3. Level of functional impairment according to types of delivery

	Vaginal delivery		C-Sections	
	n	%	n	%
Functional impairment (< 80)	9	14.5	34	65.4
No functional impairment (≥ 80)	53	85.5	18	34.6

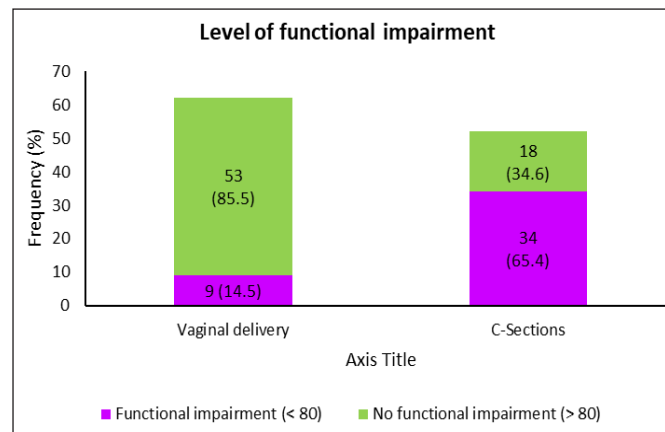


Figure 3. Level of functional impairment according to types of delivery

Discussion

The statistical analysis highlights the impact of vaginal and C-section deliveries on postpartum mothers and how these affect their daily activities. Across domains such as self-care, infant care, mother-child interaction, psychological well-being, social support, management, and adjustment, the findings indicate that functional impairments are a common outcome following both vaginal and cesarean deliveries. The objective of the study was to assess which group of postpartum women experienced greater functional impairments, using the Barkin Index of Maternal Functioning to measure daily limitations, where a normal score is 80. The results indicate that mothers who underwent C-sections experienced significantly more functional impairments compared to those who delivered vaginally.

In a 2017 study by Thalita R.C. Pereira, it was reported that postpartum women who underwent cesarean deliveries experienced symptoms such as edema, neck pain, and abdominal pain, while those who had vaginal deliveries commonly reported postpartum pelvic pain. Postpartum pain was found to be more intense following a C-section, particularly during movement, making activities like sitting, transitioning from sitting to standing, walking, lying down, and bathing more painful. Cesarean deliveries were associated with the highest number of complaints related to movement¹. Similarly, our research found that women who had cesarean sections experienced greater functional impairments compared to those who delivered vaginally.

More recent evidence supports this pattern. A 2024 cross-sectional study of over 1,000 mothers found that health-related quality of life, measured using the EQ-5D-5L, was significantly lower among women who had undergone cesarean section than among those who delivered vaginally, with emergency cesarean section associated with the lowest scores.¹² This is consistent with a 2022 systematic review and meta-analysis, which similarly reported that mode of delivery was associated with differences in postpartum health-related quality of life, reinforcing the rationale for

delivery-mode-specific functional assessment such as that used in the present study.¹³

A study by S.M. Miovech in 2013 on women who underwent cesarean deliveries found that two weeks postpartum, these women reported the highest number of physiological concerns, which decreased significantly by eight weeks. At the two-week mark, 70% of participants reported abdominal pain, 20% experienced incisional pain, and 7% had back pain. By eight weeks, incisional pain was the primary concern for 42% of participants. Additionally, psychological complaints and lifestyle issues, primarily related to changes in activity, were most common (40%) at two weeks. In contrast, our current study revealed that 65.4% of postpartum women following cesarean delivery experienced functional impairments across seven functional areas.¹⁴

In a study conducted by Anne Niyigena in 2023 on functional recovery following cesarean delivery, it was reported that poor functional status was observed on postoperative day (POD) 3, POD 11, and POD 30, with 54.0%, 25.9%, and 26.8% of respondents, respectively, indicating concerns. The two most frequently self-reported aspects of poor functionality at POD 30 were the inability to perform daily tasks (15.6%) and reporting poor or very poor overall health (48.1%).^{15,16} In contrast, our current study found that 65.4% of women experienced functional impairments following cesarean delivery within 1 to 10 days post-delivery, as measured by the Barkin Index of Maternal Functioning Assessment Scale.

Overall, this study using the Barkin Index of Maternal Functioning (BIMF) highlights that those functional impairments are common among postpartum women and are significantly more pronounced following cesarean delivery. These impairments extend beyond physical recovery, affecting mothers' psychological well-being, social functioning, and adjustment to motherhood; therefore, they warrant a comprehensive, delivery-mode-sensitive approach to postpartum care. Healthcare providers should consider individualized recovery plans— combining

physical rehabilitation, ergonomic guidance, structured health education, and mental health support—rather than uniform postpartum advice applied regardless of delivery mode. Strengthening collaboration between healthcare professionals, family members, and community-based support systems may further help mothers navigate this transition, particularly those recovering from cesarean delivery. Moreover, further studies could explore the long-term effects of functional impairments on maternal health and child development, as well as identify specific interventions that effectively address these issues. Investigating the role of peer support groups and mental health resources may also offer helpful perspectives on enhancing recovery and promoting resilience among postpartum women.

Conclusion

This study, using the Barkin Index of Maternal Functioning (BIMF), demonstrates that functional impairment is common among postpartum women and is significantly greater following cesarean delivery than vaginal delivery, with 65.4% of cesarean-delivery mothers showing impairment compared to 14.5% of vaginal-delivery mothers. These findings indicate that mode of delivery meaningfully shapes a mother's day-to-day recovery, not just her physical symptoms, and support the need for delivery-mode-specific postpartum care rather than uniform recovery advice. Incorporating structured health education, physical rehabilitation, and ergonomic guidance into routine postpartum care—particularly for women recovering from cesarean delivery—may meaningfully improve maternal functioning during this critical period.

Limitations

This study was confined to two hospitals, NR Colony Government Maternity Hospital and Motherhood Hospital, in South Bengaluru, and participants were recruited using a convenience sampling method, which may limit the generalizability of the findings to the wider postpartum population. The relatively modest sample size and cross-sectional observational design, with no long-term follow-up, also limit the ability to draw causal conclusions about delivery mode and functional recovery over time. Additionally, potential confounding variables—including parity, socioeconomic status, availability of social support, and pre-existing maternal physical or mental health conditions—were not statistically adjusted for and may have influenced the observed differences in functional impairment between the two delivery groups. Future studies using multi-site random sampling, larger samples, and adjustment for these confounders are needed to strengthen the generalizability and causal interpretation of these findings.

Clinical Implications

The findings of this study suggest that the Barkin Index of Maternal Functioning (BIMF) can be used by healthcare providers to systematically screen for postpartum functional impairment, with particular attention warranted for women recovering from cesarean delivery, who showed markedly higher rates of impairment in this study. By identifying specific domains of difficulty, such as infant care, mother-infant interaction, or self-care, early in the recovery period, clinicians can develop individualized care plans that combine physical rehabilitation, ergonomic guidance, and structured health education, rather than applying uniform postpartum advice regardless of delivery mode. Routine use of a functional screening tool such as the BIMF in postnatal follow-up visits may help healthcare teams identify at-risk mothers earlier and refer them to appropriate physiotherapy, counseling, or family support resources, ultimately improving maternal recovery and overall well-being.

Future Scope

- Future research should include larger, diverse populations to improve the generalizability of physiotherapy interventions in postpartum recovery.
- Long-term studies are needed to assess the impact of physiotherapy on maternal health, functional impairments, and child development.
- Investigating the effectiveness of targeted physical therapy interventions like pelvic floor rehab, core strengthening, and pain management is essential.
- The role of physiotherapy in providing mental health support, exercise programs, and postural guidance should be further explored.

These research areas will guide the development of tailored physiotherapy interventions to enhance postpartum recovery

Abbreviations

- BIMF- Barkin Index of Maternal Functioning
- C-section – caesarian section
- POD- Post operative day
- PP- Postpartum depression

Declaration

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Conflicts of interest: None

Ethics approval : Not Applicable

Authors' contributions

Dr. Janani Arul, as the sole author, took full responsibility for designing, analyzing, interpreting, and preparing the

manuscript. She served as the primary and corresponding author, offering essential guidance and actively engaging in every stage of the research process and manuscript revision.

Anitha Mariappan contributed as the second author, engaging fully in the writing the manuscript and execution alongside under the guidance of Dr. Janani Arul.

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