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ASSOCIATION BETWEEN CESAREAN SCAR AND PELVIC FLOOR MUSCLE TONE AT 6-8 WEEKS POSTPARTUM

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Abstract

Background: *Pregnancy and childbirth are major contributors to pelvic floor dysfunction (PFD), with mode of delivery influencing postpartum pelvic floor muscle (PFM) strength. While caesarean section (CS) may preserve pelvic floor function compared with normal vaginal delivery (NVD), the influence of CS scar characteristics on early postpartum PFMS remains poorly understood. This study evaluated the association between CS scar type and PFMS at 6–8 weeks postpartum and compared PFMS between women undergoing CS and NVD.*

Methods: *A prospective observational study was conducted at the Department of Obstetrics and Gynaecology, Ayub Teaching Hospital, Abbottabad, from September 2025 to January 2026. A total of 132 women aged 18-45 years, 6-8 weeks postpartum after singleton pregnancies, were enrolled using consecutive sampling. Participants comprised 66 women with NVD and 66 with CS, including 44 with normal scars and 22 with hypertrophic scars. PFMS was assessed using the Modified Oxford Grading Scale, while scar morphology was evaluated clinically.*

Results: *Women who underwent CS had significantly higher PFM Strength than those with NVD (median score 4.0 vs. 3.0; $p<0.001$). PFMS differed significantly according to scar type ($p<0.001$), with women having normal CS scars demonstrating the highest strength, whereas hypertrophic scars were associated with reduced PFMS and significantly higher rates of vaginal bulge, pelvic pressure, urinary incontinence, and sexual dysfunction (all $p<0.05$). Multivariable analysis showed that increasing body mass index (adjusted OR=0.89, 95% CI: 0.80–1.00; $p=0.049$) and NVD (adjusted OR=0.36, 95% CI: 0.13–0.99; $p=0.049$) were independently associated with lower PFM Strength, whereas multiparity was associated with higher PFM Strength compared with grand multiparity (adjusted OR=3.17, 95% CI: 1.02–9.91; $p=0.047$).*

Conclusions: *Caesarean delivery was associated with better preservation of PFM Strength during the early postpartum period than NVD. However, hypertrophic CS scars were associated with poorer pelvic floor function and a greater burden of PFD symptoms than normal scars. Early postpartum assessment*

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should include evaluation of both pelvic floor function and scar characteristics to facilitate timely rehabilitation and optimise maternal recovery.

INTRODUCTION

The pelvic floor plays a crucial role in supporting pelvic organs, maintaining continence, and contributing to sexual and reproductive function. Pelvic floor muscle strength (PFMS) is affected by pregnancy, child birth, mode of delivery. This can lead to pelvic floor disorders (PFDs) such as urinary incontinence (UI), fecal incontinence, and sexual dysfunction affecting 25- 32% of women worldwide.[1,2]. This leads to long-term morbidity and poor quality of life in at least one in every four women globally.[3] The prevalence of PFDs is associated with advancing age and parity, approximately affecting 10% of women aged 20-39 years and almost 50% of women elder than 80 years.[4] In Japan, 46.5% of adult females suffers from at least one PFD.[5]

Pregnancy and child birth a principle contributors to the pelvic floor injury as pregnancy induces hormonal, connective tissue and biomechanical changes whereas child birth causes overstretching of the pelvic musculature, perineal and fascial trauma and pudendal nerve injury.[2,6] Obstetric factors such as normal vaginal delivery (NVD), prolonged second stage of labor, fetal macrosomia, multiparity and obstetric anal sphincter injury have been associated with PFDs. [2,7,8] High quality evidence from large cohort studies and meta-analyses have reported significant association of PFDs with NVD compared with CS.[1,7,9] However, this effect remains controversial as another meta-analysis of 1,726 women found no difference in the short term pelvic floor muscle strength (PFMS) between NVD and CS.[10]

These conflicting findings are not able to fully explain the clinical features associated with PFD and suggest additional factors influencing the pelvic floor muscles (PFM). One such factor may be the healing characteristics of CS scar. Abnormal scar may alter the abdominal wall biomechanics and influence neuromuscular function of the PFM through myofascial continuity. [11] Early postpartum is a critical period of PFM recovery because muscle remodelling, scar maturation and pelvic floor rehabilitation interventions are initiated.[7] There is limited literature investigating the relationship of Cesearan section (CS) scar characteristics with PFM function. However, a prospective study of 604 post-partum women reported significantly higher PFM tone in patients with hypertrophic CS Scar compared with normal or no scar.[11]

Worldwide CS rates has increased from approximately 7.1% in 1990 to 21.1% in 2021 and are projected to reach nearly 28.5% by 2030.[12] Literature also shows that CS scar related adhesions and scar contracture may contribute to chronic pelvic pain and impaired mobility.[11] PFM strength is a dynamic parameter involving both muscular and connective tissue responses.[13] Early postpartum (6 to 8 weeks period) is a critical period when pelvic floor recovery and rehabilitation interventions are initiated.[14, 15] Identifying associations between scar presence and muscle strength during this period could inform targeted rehabilitation strategies and scar management approaches. To our knowledge, no study has evaluated this association in South Asian women, where obstetric practices, wound healing characteristics, and postpartum rehabilitation differ substantially from those reported in existing literature. Therefore, this study aimed to investigate the association of PFMS with CS scar type and comparative PFM Strength analysis of CS cases with NVD cases at early postpartum.

MATERIAL AND METHODS

This Prospective observational study was conducted at the department of Obstetrics and Gynecology, Gynae C ward of Ayub Teaching Hospital, Abbottabad. Women aged 18-45 years who have undergone either exclusively CS or NVD for singleton pregnancies and are currently within 6-8 weeks postpartum period from the latest pregnancy were included using Non-probability consecutive sampling technique. Women with significant comorbidities that would preclude participation in the study (e.g., severe cardiovascular or neurological conditions) and those with a history of previous pelvic floor

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reconstructive surgery, episiotomy or other relevant surgeries that could interfere with pelvic floor assessments were excluded from the study.

Data was collected from 132 eligible participants after obtaining ethical approval from the institutional medical ethics committee (RC-EA-2025/263). Data was entered to and analyzed using SPSS V.27. The sample size for this study was calculated considering desired power of 80%, significance level (alpha) of 0.05, and the effect size was assumed to be medium (Cohen's d = 0.5), which is consistent with similar studies investigating differences in pelvic floor muscle tone between cesarean and vaginal delivery groups.[11] Using these assumptions, the required sample size per group was determined to be approximately 64 participants, yielding a total sample size of 128 participants for both groups. Data was collected from 66 NVD cases, 44 C-section cases with normal scar and 22 cases with hypertrophic cases to make the data comparable for analyses, making total participants to be 132. The data collection started immediately after obtaining ethical committee approval and spanned from September 2025 to January 2026 at which point our sample size for all the required groups was achieved.

Upon obtaining informed consent, participants' demographic data, including age, parity, menopausal status, socioeconomic background, and relevant medical history, were recorded. Clinical symptoms, such as vaginal bulge, pelvic pressure, urinary, bowel and sexual health dysfunction, were documented. The scar was assessed using predefined criteria by two surgeons independently and consensus was reached in all cases. A normal scar was defined as scar formed after a cesarean section that has normal width, is not raised from its margins, and does not show excessive thickening or collagen deposition. A firm and thick scar with raised margins above the surface was designated to be hypertrophic scar.[16]

Pelvic floor muscle strength was also assessed independently by two research team members using the modified oxford grading scale, which is a validated 6-point scale (0–5) to measure pelvic floor muscle contraction strength through digital palpation.[17] In the few cases where discrepancy was found, agreement was reached after evaluation by the supervisor (a clinician with more than fifteen years of clinical experience). The highest score from three attempts was recorded for each participant to ensure consistency in the assessment. Participants were examined in a relaxed supine position with upper body at 120° to the lower limbs.

RESULTS:

A total of 132 postpartum women were included in the study. The socio-demographic and clinical parameters of these participants are presented in table 1.

Table 1. Baseline sociodemographic and clinical characteristics of the participants (N = 132)

Continuous Parameters	**Mean ± SD**	**Median (IQR)**
Age (Years)	30.45 ± 4.61	31.0 (27.0–33.8)
Height (cm)	155.93 ± 4.44	155.0 (152.0–159.0)
Weight (kg)	67.14 ± 8.56	66.3 (62.0–71.8)
BMI (kg/m²)	27.60 ± 3.24	27.3 (26.1–29.6)
PFMS Score	3.66 ± 0.95	4.0 (3.0–4.0)
Categorical Parameters	**Category**	**n** (%)
Age Categories	21–25 years	16 (12.1)
	26–30 years	48 (36.4)
	31–35 years	52 (39.4)
	≥ 36 years	16 (12.2)
Parity	Primiparous	8 (6.1)
	Multiparous	106 (80.3)
	Grand multiparous	18 (13.6)

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BMI Categories	20–25 kg/m²	18 (13.6)
	25–30 kg/m²	89 (67.4)
	30–35 kg/m²	25 (18.9)
Mode of Delivery	NVD	66 (50.0)
	CS	66 (50.0)
Type of Scar	No Scar	66 (50.0)
	Normal Scar	44 (33.3)
	Hypertrophic Scar	22 (16.7)
Socioeconomic Status	Low	46 (34.8)
	Middle	86 (65.2)
Comorbidity	Diabetes	17 (12.9)
	Hypertension	4 (3.0)
	None	111 (84.1)
Vaginal Bulge	Yes	35 (26.5)
	No	97 (73.5)
Pelvic Pressure	Yes	55 (41.7)
	No	77 (58.3)
Urinary Incontinence	Yes	52 (39.4)
	No	80 (60.6)
Sexual Dysfunction	Yes	20 (15.2)
	No	112 (84.8)
PFMS Category	Weak	14 (10.6)
	Moderate	47 (35.6)
	Strong	71 (53.8)

The mean age was 30.45 ± 4.61 years and mean BMI was 27.60 ± 3.24 kg/m. Most participants were overweight 89 (67.4%). The median PFM strength score was 4.0 (IQR: 3.0–4.0), with more than half of the participants demonstrating strong PFM strength 71 (53.8%). Pelvic pressure 55 (41.7%) and UI 52 (39.4%) were the most commonly reported pelvic floor symptoms. The majority of women were multiparous 106 (80.3%), belonged to the middle socioeconomic class 86 (65.2%), and had no comorbidities 111 (84.1%). Among CS cases, 44 (33.3%) had normal scars and 22 (16.7%) had hypertrophic scars. (Table 1).

Table 2. Association of PFMS with MOD, Scar Type, and Parity

Variable	Category (n)	Median (IQR)	Test Statistic	p-value
Mode of Delivery	NVD (66)	3.0 (3.0–4.0)	U = 3064.5	<0.001
	CS (66)	4.0 (3.0–5.0)		
Type of Scar	No Scar (66)	3.0 (3.0–4.0)	H = 26.15	<0.001
	Normal Scar (44)	5.0 (3.25–5.0)		
	Hypertrophic Scar (22)	3.5 (3.0–4.0)		
Parity	Primiparous (8)	4.0 (2.25–5.0)	H = 5.18	0.075
	Multiparous (106)	4.0 (3.0–4.0)		
	Grand Multiparous (18)	3.0 (3.0–3.25)		

IQR: Interquartile Range (25th–75th percentile); U: Mann–Whitney U statistic; H: Kruskal–Wallis test statistic.

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PFM strength was significantly associated with both MOD and scar type as shown in table 2. Women who underwent CS had significantly higher PFM strength scores than those who had NVD ($p < 0.001$). Similarly, significant differences were observed among scar types ($p < 0.001$), with women having normal CS scars demonstrating the highest PFM strength (median [IQR]: 5.0 [3.25–5.0]). In contrast, parity was not significantly associated with PFM strength ($p = 0.075$). (Table 2).

Table 3. Association of PFMS Categories with Scar Type and MOD

Variable		Weak n (%)	Moderate n (%)	Strong n (%)	p-value
Type of Scar	No Scar (n=66)	11 (16.7)	28 (42.4)	27 (40.9)	**0.002**
	Normal Scar (n=44)	3 (6.8)	8 (18.2)	33 (75.0)	
	Hypertrophic Scar (n=22)	0 (0.0)	11 (50.0)	11 (50.0)	
MOD	NVD (n=66)	11 (16.7)	28 (42.4)	27 (40.9)	**0.006**
	CS (n=66)	3 (4.5)	19 (28.8)	44 (66.7)	

PFM strength categories differed significantly according to both scar type and MOD as shown in table 3. A significantly greater proportion of women with normal CS scars demonstrated strong PFM strength compared with women without scars and those with hypertrophic scars ($p = 0.002$). Similarly, women who underwent CS were more likely to exhibit strong PFM Strength than those who had NVD ($p = 0.006$). (Table 3).

Table 4. Association of PFD Symptoms with MOD and Scar Type

Variable		Vaginal Bulge n (%)	Pelvic Pressure n (%)	UI n (%)	Sexual Dysfunction n (%)
MOD	NVD (n=66)	17 (25.8)	30 (45.5)	24 (36.4)	12 (18.2)
	CS (n=66)	18 (27.3)	25 (37.9)	28 (42.4)	8 (12.1)
	p value	0.844	0.377	0.476	0.332
Scar Type	No Scar (n=66)	17 (25.8)	30 (45.5)	24 (36.4)	12 (18.2)
	Normal Scar (n=44)	7 (15.9)	12 (27.3)	14 (31.8)	2 (4.5)
	Hypertrophic Scar (n=22)	11 (50.0)	13 (59.1)	14 (63.6)	6 (27.3)
	p value	0.012	0.032	0.035	0.033

No significant association was observed between MOD and PFD symptoms as shown in table 4. In contrast, scar type demonstrated significant associations with all assessed PFD symptoms. Women with hypertrophic scars has a higher frequency of vaginal bulge (50.0%), pelvic pressure (59.1%), urinary incontinence (63.6%), and sexual dysfunction (27.3%) compared with women with normal scars and those without scars (all $p < 0.05$). (Table 4).

Table 5. Univariate and Multivariable Ordinal Logistic Regression Analysis for Factors Associated with Higher PFM Strength

Variable	Univariate OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Age (years)	0.94 (0.87–1.01)	0.072	0.96 (0.88–1.06)	0.417
BMI (kg/m²)	0.93 (0.84–1.04)	0.191	0.89 (0.80–1.00)	0.049

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Primiparous vs Grand Multiparous	2.63 (0.53–13.16)	0.240	1.20 (0.16–9.18)	0.863
Multiparous vs Grand Multiparous	3.00 (1.15–7.81)	0.024	3.17 (1.02–9.91)	0.047
Normal Scar vs Hypertrophic Scar	2.40 (0.83–6.90)	0.105	1.78 (0.59–5.35)	0.308
No Scar vs Hypertrophic Scar	0.56 (0.22–1.42)	0.218	–	–
NVD vs CS	–	–	0.36 (0.13–0.99)	0.049
Model statistics (multivariable model): $\chi^2 = 23.89$, $p = 0.001$; Nagelkerke $R^2 = 0.195$. *OR: Odds Ratio; CI: Confidence Interval.*				

Ordinal logistic regression was performed to explore factors associated with higher PFM strength categories as shown in table 5. In the adjusted model, multiparity was associated with higher odds of stronger PFM strength compared with grand multiparity (OR=3.17, 95% CI: 1.02–9.91, p=0.047), whereas increasing BMI (OR=0.89, 95% CI: 0.80–1.00, p=0.049) and normal vaginal delivery (OR=0.36, 95% CI: 0.13–0.99, p=0.049) were associated with lower odds of belonging to a higher PFM strength category. (Table 5).

DISCUSSION:

PFM Strength was found to be significantly better preserved after CS than NVD at 6-8 weeks postpartum in participants of this study. Majority of the participants were classified as having strong PFM Strength. A clear gradient was also observed by scar status: the highest pelvic floor muscle strength was seen in women with normal scars, and lowest in the no-scar group. Signs and symptoms of PFD were significantly more common in patients with no scar (NVD group). Parity, however, was not significantly associated with PFM Strength in participants of this study.

This pattern is broadly consistent with the published evidence showing that vaginal birth exerts a stronger adverse effect on early pelvic floor function. In a meta-analysis of 4,491 women, significantly better pelvic floor outcomes after caesarean delivery were reported, with lower PFM Strength differences, lower vaginal muscle voltage, and reduced odds of stress UI and POP.[9] The odds ratio for stress UI favoured caesarean delivery at 0.45, while the odds ratio for pelvic organ prolapse was 0.59. Similarly, Hilde et al. (2013) reported that vaginal resting pressure, PFM Strength and endurance were all reduced by 6-8 weeks postpartum, and that women who delivered by CS had significantly higher resting pressure, strength and endurance than those who delivered vaginally.[8] Batista et al. (2011) also found lower PFM Strength after NVD (25.6 ± 14.5 cmH_2O) than after CS (39.6 ± 22.0 cmH_2O), supporting our findings.[14]

The literature has not been uniform, and this inconsistency should be recognised when interpreting our results. A review of 11 studies involving 1,726 primiparous women found no overall difference in short-term PFM Strength between CS and NVD, although lower strength was noted after episiotomy or instrumented vaginal delivery.[10] A study from Iran also reported similar findings suggesting that the effect of delivery mode may be modified by obstetric trauma, parity and the method used for postpartum assessment.[13] Our findings shows that NVD without episiotomy was associated with lower PFM Strength, but the absence of a parity effect suggests that early postpartum pelvic floor behaviour may be shaped more strongly by birth-related tissue stress than by parity alone.

The finding of better PFM Strength following CS is clinically important because it suggests that MOD influences early postpartum pelvic floor recovery. Consistent with previous evidence, NVD appears to be associated with greater pelvic floor trauma, even when symptoms are not yet evident during the early postpartum period, whereas CS may preserve PFM Strength by avoiding direct injury to the levator ani complex and associated connective tissues.[7,9] These observations support current recommendations aimed at minimising unnecessary perineal trauma during childbirth. Nevertheless, the findings should not be

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interpreted as evidence that CS completely prevents PFD, as pregnancy itself and postpartum physiological changes remain important contributors to pelvic floor morbidity.

The present findings therefore support a more nuanced clinical interpretation. NVD appears to be associated with greater early pelvic floor trauma, even when symptoms are not yet fully expressed, whereas CS appears to preserve early PFM strength to a greater extent. At the same time, scar-related tissue change appears to exert its own influence on recovery, which suggests that postpartum care should not be limited to symptom enquiry alone. Early assessment at 6-8 weeks postpartum may be justified for all women, with particular attention to those with hypertrophic scars, obstetric trauma or persistent urinary symptoms. In addition, the evidence from Gao et al. (2024) indicates that gestational weight gain, constipation and vaginal inflammation may also contribute to postpartum dysfunction.[6] Therefore, prevention should not be viewed solely through the lens of delivery mode. A recent scoping review concluded that data on PFM tone and strength remain scarce.[2] This underlines the need for longitudinal work that follows women from pregnancy through the first postpartum year and beyond, while also examining scar healing, muscle tone and symptom progression together.

The scar-related findings add an important layer to the interpretation. Scar morphology was associated with PFM strength, and women with normal scars demonstrated the highest strength, whereas lower values were seen with hypertrophic scars. This pattern is consistent with a recent study (2025) in which 604 women were assessed at 6-8 weeks postpartum.[11] They reported that the active PFM tone was shown to increase in a graded fashion across scar groups. Compared with the no-scar group, the normal-scar group showed higher active tone, and the hypertrophic-scar group showed the highest tone; the association remained significant after adjustment for age, BMI and comorbidities. It is thus suggested that scar healing may not merely be a cutaneous issue, but may influence early postpartum pelvic floor function through tissue fibrosis, adhesions or altered fascial mobility.

The significant association observed between scar characteristics and PFM strength introduces an important clinical consideration that has received limited attention in the literature. Although CS may preserve PFM strength, abnormal scar healing may adversely influence recovery. The lower PFM strength observed among women with hypertrophic scars suggests that scar tissue, through fibrosis, adhesions or altered fascial mobility, may influence force transmission across the abdominal wall and pelvic floor. Consequently, postpartum assessment should perhaps extend beyond evaluation of pelvic floor symptoms alone and include systematic examination of abdominal scars. Women with hypertrophic scars may benefit from targeted physiotherapy interventions, including scar mobilisation techniques, soft tissue therapy and pelvic floor rehabilitation programmes designed to optimise tissue mobility and restore normal muscle function.

The symptom profile in this cohort should also be interpreted in the context of time after birth. Although pelvic pressure and UI were common, a direct relationship between parity and PFM strength was not demonstrated at 6-8 weeks postpartum. This may reflect the fact that symptoms and anatomical support changes often evolve gradually rather than becoming fully established in the immediate postpartum period. A prospective cohort study of 1528 women followed for 15 years reported strong association of NVD with cumulative incidence of UI (34.5%), anal incontinence (30.6%), pelvic organ prolapse (POP) (30.0%) and overactive bladder (21.8%).[1] They also reported significantly reduced risk of UI (adjusted hazard ratio [aHR] 0.46), overactive bladder (aHR 0.51) and POP (aHR 0.28) following CS.[1] Hill et al. (2021) followed 597 primiparas after vaginal delivery and found that one year postpartum 41% reported stress UI, 32% nocturia and 23% flatus incontinence, while 9% had procedentia at or below the hymen.[18] Many symptoms in their study participants persisted or emerged over time, and a substantial proportion of the worse support was attributable to de novo changes after delivery. Cristóvão et al. (2025) likewise showed that PFM strength was linked

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with bothersome UI across the first postpartum year, with 52% of women having a Modified Oxford Scale score of at least 3 at 3 months and 84% by 12 months, while 42% still reported UI at 3 months.[19] These studies indicate that a single early postpartum assessment may underestimate the eventual burden of dysfunction.

The absence of marked symptom differences according to parity during the early postpartum period may reflect the evolving nature of pelvic floor dysfunction. Symptoms often develop gradually as anatomical and neuromuscular changes become established over time. Therefore, the relatively short follow-up period in the present study may have limited the detection of clinically significant pelvic floor disorders. This interpretation is supported by Hill et al. (2021), who demonstrated that urinary and bowel symptoms remained common one year after childbirth despite substantial postpartum recovery.[18] These findings suggest that early postpartum pelvic floor assessment should be viewed as the beginning of a continuum of care rather than a single-point evaluation.

Long-term data further support the view that NVD carries a greater burden of pelvic floor morbidity, although CS should not be considered fully protective. Blomquist et al. (2018) followed women over many years and found that, compared with spontaneous NVD, CS was associated with a lower hazard of stress UI, overactive bladder and POP.[20] Barca et al. (2021) reported the same direction of effect in a very large systematic review and meta-analysis, with 1,597,303 participants and significantly higher rates of UI, pelvic organ prolapse and anal incontinence after vaginal delivery.[7] Baud et al. (2020) similarly found that six years after birth, women with elective CS reported less urgency UI and stress UI than women with uncomplicated vaginal delivery, although lower abdominal/ genital pain and pain related to sexual activity were more common after CS.[21] Gao et al. (2024) added an important nuance by showing that CS was associated with lower UI but higher abnormal resting PFMS, suggesting that preservation of continence symptoms does not necessarily imply normal muscle activity.[6] Taken together, these studies indicate that the protective effect of CS is real for selected pelvic floor outcomes, but it is incomplete and should not be interpreted as absolute.

The long-term protective effect CS against stress UI and pelvic organ prolapse reported by Barca et al. (2021), Blomquist et al. (2018) and Baud et al. (2020) may have implications for patient counselling.[7,20,21] Women should be informed that mode of delivery influences future pelvic floor health and that NVD is associated with a greater risk of certain pelvic floor disorders. However, this information must be interpreted cautiously and balanced against the recognised risks of CS. The available evidence does not support elective CS solely for the prevention of PFD. Furthermore, findings from Gao et al. (2024) demonstrated that CS was associated with higher rates of abnormal resting muscle activity despite a lower incidence of UI, reinforcing the concept that CS is not a complete safeguard against PFD.[6]

From a service-delivery perspective, our findings may have implications for postpartum follow-up protocols. Routine pelvic floor assessment at 6-8 weeks postpartum could be considered for all women irrespective of mode of delivery. Particular attention may be warranted for women with hypertrophic scars, previous obstetric trauma, multiple births or early symptoms of PFD. Early identification of impaired muscle function may facilitate timely referral for physiotherapy and rehabilitation. In addition, public health strategies aimed at reducing PFD should continue to emphasise modifiable risk factors.

The regression analysis suggested that higher BMI and normal vaginal delivery were independently associated with lower PFM strength categories, whereas multiparity was associated with better PFM strength compared with grand multiparity. However, given the relatively small sample size and exploratory nature of the regression analysis, these findings should be interpreted cautiously and confirmed in larger prospective studies.

Future research should focus on longitudinal cohort studies to track patients from pregnancy through at least one year postpartum, to capture the time-course of PFMS and symptom development. Interventional trials to test whether scar-specific therapies improve PFM outcomes in

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women with hypertrophic scars caould be conducted. There is also a need for research on clinical outcomes. Such studies could clarify whether the observed early postpartum PFM differences translate into meaningful differences in quality of life or dysfunction years later.

CONCLUSION

Compared to NVD, CS was associated with better preservation of PFM strength in the early postpartum period, while hypertorphic scar was associated with lower PFM strength than normal scar. CS has mixed effects on early pelvic floor recovery: it seems to preserve early PFM strength (possibly due to spared levator integrity), while simultaneously can lead to altered PFMS because of scar-related changes. NVD when compared with CS increases the risk of UI and POP in the longer term. These insights collectively underscore the complex interplay of MOD, tissue healing, and muscle function. They highlight the importance of personalized postnatal care that monitors both women who delivered vaginally (for prolapse or UI) and those who had CS (for scar formation, abnormal tone and pelvic pain), with interventions tailored accordingly.

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