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Correlation of Parity and Mode of Delivery with Pelvic Floor Dysfunction: A Cross-Sectional Study

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ABSTRACT

Background: The pelvic floor muscles (PFM) aid in maintaining anal and urinary continence while supporting the pelvic organs. The strain that pregnancy and childbirth place on these muscles frequently results in pelvic floor dysfunction (PFD). The number of births and the delivery procedure are two examples of factors that can impact this disease. Establishing a link between pelvic floor dysfunction in postpartum women and parity and delivery method was the aim of the study.

Methods: In the present observational study, 60 postpartum women between the ages of 20 and 35 were evaluated 6 to 12 months after giving birth. Both written informed consent and ethical approval were acquired. Pelvic floor muscle strength was evaluated using the Oxford grading scale and vaginal palpation, and PFD symptoms were identified using the Australian Pelvic Floor Questionnaire. Statistical analysis was performed to find correlations.

Results: A significant relationship was found between pelvic floor dysfunction, delivery mode, and the number of births ($p = 0.002$). The Oxford scale with PFD and the Australian Pelvic Floor Questionnaire showed a significant correlation ($p = 0.001$). Significant non-linear relationships between PFD and muscle strength scores, and between PFD and specific questionnaire items, were found at the 5% significance level.

Conclusion: Pelvic floor dysfunction is substantially correlated with both the number of births and the delivery method. To reduce the impact of PFD on women's health care, these results highlight the necessity of early postpartum screening and rehabilitation approaches.

Keywords: Parity, Postpartum Period, pelvic floor, Questionnaires, Pelvic Floor Disorders.

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INTRODUCTION

The complex collection of striated muscles known as the pelvic floor muscles (PFM) maintains fecal and urinary continence while supporting the pelvic viscera, including the bladder, uterus, and rectum. The coordinated activity of muscles and related connective tissue structures, such as ligaments and endopelvic fascia, is essential to their structural and functional competency [1].

During pregnancy, the pelvic floor is subjected to progressive mechanical overload due to the growing gravid uterus and increased intra-abdominal pressure [2]. In addition, hormonal fluctuations, particularly relaxin and progesterone, lead to softening of connective tissues, reducing pelvic floor tone and compromising fascial support [3]. These changes increase the risk of PFD.

PFD is a multifactorial condition that may manifest as urinary incontinence, anal incontinence, pelvic organ prolapse, or sexual dysfunction, all of which significantly affect a woman's quality of life [4]. Globally, nearly one-third of postpartum women experience urinary incontinence, with higher prevalence after vaginal or instrumental deliveries compared to caesarean section [5]. Vaginal childbirth in particular has been associated with pelvic floor trauma, levator ani injury, and pudendal nerve damage, increasing the risk of long-term dysfunction [6].

In India, Singh et al. (2013) [7] reported that urinary incontinence and other PFD symptoms are frequently underdiagnosed and undertreated, owing to sociocultural stigma, lack of awareness, and low healthcare-seeking behaviour among women. Many accept pelvic floor symptoms as a natural part of childbirth or aging, which delays diagnosis and treatment. Furthermore, the scarcity of region-specific epidemiological data limits the development of targeted interventions.

In light of this, the current study was conducted to investigate the relationship among postpartum women in India between parity, delivery method, and pelvic floor dysfunction. By identifying these associations, the study aims to support earlier diagnosis and guide targeted postpartum rehabilitation strategies.

METHODS

The Institutional Ethics Committee of KLE Institute of Physiotherapy, Belagavi, granted ethical clearance for this observational cross-sectional study under reference number 176. To ensure accuracy and scientific transparency, the study closely adhered to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines. All participants provided written informed consent after being fully informed about the goals, methods, and confidentiality guarantees of the study.

Participants and Recruitment:

Sixty postnatal women aged 6-12 months postpartum were recruited from KLE Prabhakar Kore Hospital and Research Centre, Belagavi. Eligible participants were aged 20 to 35 years, demonstrated the cognitive ability to comprehend and complete a self-administered questionnaire, and willingly gave their written, informed consent to take part in the research. The criteria for exclusion were current pregnancy, a history of urogynecological surgery (prolapse repair, continence procedures), and diagnosed neurological disorders affecting pelvic floor function (such as spinal cord injuries or multiple sclerosis)

Data Collection Procedure:

After obtaining consent, demographic and obstetric details were recorded using a structured proforma. Participants were provided with the Australian Pelvic Floor Questionnaire (APFQ) to assess symptoms of pelvic floor dysfunction. This validated instrument comprises 42 questions across four domains: bladder function (Q1–Q15), bowel function (Q16–Q27), prolapse symptoms (Q28–Q32), and sexual function (Q33–Q42). Each item is scored from 0 (no symptoms) to 3 (severe symptoms). The average of the scores within each domain is used to determine the domain scores, which are multiplied by 10, yielding a score between 0 and 10 per domain and a total dysfunction score of up to 40. Higher scores indicate more severe dysfunction [8].

Following the questionnaire, using the Modified Oxford Grading Scale and vaginal digital palpation, a qualified physiotherapist assessed the strength of the pelvic floor muscles. This scale, with a score range of 0 (no contraction) to 5 (strong contraction with lift and compression), assesses voluntary contraction of the pelvic floor muscles. The assessment was conducted in a standardized supine position in a private clinical setting to ensure participant comfort and measurement accuracy [9].

Outcome measures:

Primary Outcome: Total and domain-specific scores from the Australian Pelvic Floor Questionnaire were assessed to determine the severity of pelvic floor dysfunction. *Secondary outcome*: The Modified Oxford Scale was used to grade the strength of the pelvic floor muscles.

RESULTS

Version 26 of IBM SPSS Statistics was used to analyze all of the data. The demographics and clinical features of the participants were summarized using descriptive statistics, including means, standard deviations, frequencies, and percentages. The associations between parity, mode of delivery, and pelvic floor dysfunction (as measured by the Australian Pelvic Floor Questionnaire) were investigated using Pearson's correlation coefficient. Furthermore, associations between each questionnaire domain and pelvic floor muscular strength (as determined by the Oxford scale) were assessed. The data's normality was verified before performing parametric testing. P-values below 0.05 were regarded as statistically significant.

The obstetric and demographic features of the 60 postpartum women who were enrolled in the trial are listed in Table 1. The cohort predominantly consisted of multiparous women within the reproductive age range typical for the region. The distribution between vaginal and caesarean deliveries was nearly equal, reflecting local obstetric practices.

Table 1: Participants' Demographics and Obstetric Details

Variable	Minimum	Maximum	Mean ± SD / % (n)
Age (years)	21.00	35.00	28.03 ± 4.20
Weight (kg)	45.00	86.00	58.96 ± 8.90
Height (cm)	150.00	186.00	160.20 ± 6.33
BMI (kg/m²)	16.53	30.73	23.02 ± 3.52
Vaginal delivery	—	—	46.7% (n = 28)
Caesarean section	—	—	53.3% (n = 32)
Primiparous (Parity = 1)	—	—	38.3% (n = 23)
Multiparous (Parity ≥ 2)	—	—	61.7% (n = 37)

The Oxford scale-graded pelvic floor muscular strength and the severity of symptoms across four categories, as determined by the Australian Pelvic Floor Questionnaire (APFQ), are shown in Table 2. Most participants demonstrated moderate to good muscle strength. The bladder and sexual function domains exhibited relatively higher symptom burdens, whereas prolapse symptoms were minimal, consistent with previous regional studies.

Table 2: Oxford Scale and Australian Pelvic Floor Questionnaire (APFQ) Scores (Qualitative Statistics)

Variable	Minimum	Maximum	Mean ± SD / % (n)
Oxford Scale = 2	—	—	11.7% (n = 7)
Oxford Scale = 3	—	—	35.0% (n = 21)
Oxford Scale = 4	—	—	50.0% (n = 30)
Oxford Scale = 5	—	—	3.3% (n = 2)
Bladder Function Score	0	10.60	3.25 ± 2.72
Bowel Function Score	0	6.60	2.84 ± 1.57
Prolapse Symptoms Score	0	8.00	0.30 ± 1.36
Sexual Function Score	0	13.75	6.65 ± 2.07
APFQ Total Score	3.60	38.95	13.05 ± 6.00

The Pearson correlation analyses evaluating the associations between parity, the pelvic floor muscle power, mode of delivery, and symptoms of pelvic floor dysfunction are summarized in Table 3. Increased parity is associated with a higher likelihood of vaginal delivery, as indicated by a statistically significant inverse association between parity and delivery method. The preventive impact of stronger pelvic musculature in reducing the intensity of postpartum symptoms was highlighted by a significant inverse correlation between pelvic floor muscle strength and both overall pelvic floor dysfunction and each APFQ domain. The results showed a significant inverse correlation between mode of delivery and parity ($r = -0.386$, $p = 0.002$), with multiparous women more likely to have vaginal deliveries. A strong negative correlation was observed between pelvic floor dysfunction severity (APFQ scores) and pelvic floor muscle strength (Oxford scale) ($r = -0.555$, $p < 0.001$). Significant negative correlations were also found between Oxford scores and individual APFQ domains: bladder ($r = -0.493$), bowel ($r = -0.402$), prolapse ($r = -0.433$), and sexual function ($r = -0.368$), all $p < 0.005$. These findings indicate that higher parity and vaginal delivery are associated with greater pelvic floor dysfunction and weaker muscle strength.

Table 3: Correlation Analyses between Clinical Variables (Pearson's Correlation Coefficient)

Correlation Between	r-value	p-value	Interpretation
Mode of Delivery & Parity	−0.386	0.002*	Significant inverse relationship
Oxford Scale & APFQ Total	−0.555	0.001*	Significant inverse relationship
Oxford Scale & Bladder Function	−0.493	0.000*	Significant inverse relationship
Oxford Scale & Bowel Function	−0.402	0.001*	Significant inverse relationship
Oxford Scale & Prolapse Symptoms	−0.433	0.001*	Significant inverse relationship
Oxford Scale & Sexual Function	−0.368	0.004*	Significant inverse relationship

DISCUSSION

Sexual function, pelvic organ support, and continence all depend critically on the health of the pelvic floor muscles. The muscles of the pelvic floor have been tailored to meet the constantly changing demands of continence and pelvic stability. They are mostly made up of type I (slow-twitch) fibers, which are responsible for prolonged tonic contractions, and type II (fast-twitch) fibers, which enable rapid voluntary and reflex contractions [10]. The differential vulnerability of these fiber types to obstetric trauma underpins the pathophysiology of postpartum pelvic floor dysfunction (PFD) [11].

Our study elucidates the significant influence of both modes of delivery and parity on the strength and functioning of the pelvic floor muscles in postpartum women up to a year after giving birth. Consistent with prior findings, vaginal delivery—particularly assisted vaginal birth involving episiotomy, vacuum, or forceps—was associated with a higher prevalence of urinary incontinence, sexual dysfunction, and bowel symptoms, likely due to direct trauma to the levator ani complex and pudendal nerve injury, as described by García-Mejido et al. (2020) [12]. Notably, 38.3% of primiparous women in our cohort experienced urinary incontinence and reduced sexual activity, underscoring the impact of first vaginal delivery on pelvic floor integrity.

Our results are in agreement with Friedman et al. (2012) [13], who observed persistent pelvic floor muscle weakness and higher rates of dysfunction years after vaginal and forceps deliveries compared with caesarean section. However, our study expands on these observations by using the validated Australian Pelvic Floor Questionnaire (APFQ), allowing correlation between muscle strength and bladder, bowel, prolapse, and sexual function. We observed strong inverse correlations between Oxford scale scores and all APFQ domains, indicating that reduced muscle contractility is closely linked with the severity of dysfunction. This multidimensional approach provides a more comprehensive understanding of pelvic floor changes postpartum than studies focusing only on objective strength or subjective symptoms.

The partial protective effect of caesarean delivery on pelvic floor muscle strength in our study (53.3% of women) mirrors the findings of Wang et al. (2022) [14], who reported early postpartum preservation of pelvic floor structures in women undergoing caesarean section. However, as also noted by Wang and colleagues, this protective effect is temporary, as connective tissue remodelling and neurogenic factors continue to influence long-term outcomes.

Our results further reinforce the role of parity in determining pelvic floor function. Multiparous women exhibited significantly weaker pelvic floor muscles compared with primiparous women, consistent with the epidemiological observations of Dietz (2006) [15], who emphasized the cumulative obstetric injury and connective tissue fatigue associated with repeated childbirth. This highlights the need for early pelvic floor muscle training, particularly in multiparous women.

Interestingly, Li et al. (2015) [16] reported no significant difference in pelvic floor muscle strength between delivery modes at 42 days postpartum after pelvic floor training. In contrast, our findings suggest that the biomechanical and neurophysiological effects of delivery mode become more evident beyond the early postpartum period. This discrepancy likely reflects differences in the timing of assessment and rehabilitation interventions, reinforcing the importance of longitudinal monitoring and individualized therapeutic strategies.

In summary, unlike many previous studies that evaluated either symptoms or muscle strength in isolation, our study combined a validated multidimensional questionnaire (APFQ) with objective clinical grading (Oxford scale) in an Indian population. This dual approach allowed domain-specific correlation between muscle function and symptoms. Moreover, while Friedman et al. (2012) [13] and Wang et al. (2022) [14] emphasized delivery mode, and Dietz (2006) [15] highlighted parity, our study integrated both variables simultaneously, offering a more comprehensive understanding. This makes the findings especially valuable for region-specific screening and rehabilitation strategies for postpartum women.

Limitation:

The study was conducted within a single clinical setting, using standardized tools and assessments, on a defined population. While this ensured consistency in methodology, broader population-based studies may provide additional insights across varied clinical contexts. The use of validated questionnaires and clinical grading scales ensured reliability in symptom and strength evaluation.

CONCLUSION

The current study shows a strong correlation between postpartum women's pelvic floor dysfunction, parity, and delivery method. Lower pelvic floor muscle strength and more severe symptoms were associated with higher parity and vaginal delivery. These results highlight the necessity of focused therapy and early postpartum assessment to reduce long-term pelvic floor issues.

Abbreviation:

PFM -The pelvic floor muscles
PFD-pelvic floor dysfunction
APFQ- Australian Pelvic Floor Questionnaire
SPSS- Statistical packages for social sciences
SD: Standard Deviation
r: Pearson's correlation coefficient
p: Probability value

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Conflict of Interest: The authors hereby declare that there are no conflicts of interest to disclose.

Informed Consent: All participants provided their written informed consent before the commencement of the study.

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