Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(5), 1665-1671| ISSN:2251-6727

"Invisible Strain: How Age, Parity, and Poverty Shape Pelvic Floor Muscle Strength in Indian Women"

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(Received: 16 July 2025 Revised: 20 August 2025 Accepted: 20 September 2025)

KEYWORDS

Pelvic floor dysfunction; Pelvic floor muscle strength; Socio-economic status; Age; Parity; India

ABSTRACT:

Background

Pelvic floor dysfunction (PFD) significantly impacts women's quality of life, yet remains underreported and undertreated in India due to cultural stigma, lack of awareness, and healthcare inequities. Socio-demographic and obstetric factors such as age, parity, and socio-economic status are key determinants of pelvic floor muscle (PFM) integrity.

Objective

To evaluate PFM strength among Indian women and analyze its associations with age, parity, mode of delivery, menopausal status, and socio-economic background.

Methods

This cross-sectional study included 430 women aged 18–55 years attending the gynecology outpatient department of a tertiary hospital in Uttar Pradesh. PFM strength was assessed via digital palpation using the Modified Oxford Scale. Socio-demographic and clinical data were recorded through structured proformas. Statistical associations were tested using Chi-square, t-tests, and ANOVA, with significance set at $p < 0.05$.

Results

Over half of the participants (57.7%) demonstrated weak-to-absent contractions (Grades 0–2), while only 17.6% exhibited good-to-strong contractions (Grades 4–5). Weak PFM strength was significantly associated with age ≥40 years ($p = 0.01$), multiparity ($p < 0.001$), vaginal delivery ($p = 0.002$), middle/lower socio-economic status ($p = 0.04$), and postmenopausal status ($p < 0.001$). Endurance was poor, with a mean contraction time of 3.9 seconds; only 12.5% sustained contractions ≥7 seconds.

Conclusion

Weak PFM strength is highly prevalent among Indian women and strongly associated with advancing age, parity, vaginal delivery, lower socio-economic status, and menopause. These findings underscore the urgent need for routine screening, community awareness, and integration of pelvic floor muscle training into reproductive and primary healthcare to reduce the burden of PFD.

Introduction

Pelvic floor muscle (PFM) integrity is a fundamental aspect of women's health, contributing to continence, pelvic organ support, and sexual well-being. Dysfunction of these muscles manifests as urinary incontinence, pelvic organ prolapse, and fecal incontinence, conditions that can significantly impair quality of life and impose economic and psychosocial burdens (1,2). Globally, the prevalence of pelvic floor dysfunction (PFD) is estimated to affect up to 25–45% of adult women, with variations across regions due to differences in healthcare access, obstetric practices, and socio-cultural factors (3,4). Despite its substantial public health implications, pelvic floor health has often been overlooked in discussions of women's health, particularly in low- and middle-income countries (LMICs).

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In India, the issue assumes particular importance given the country's demographic diversity, high maternal morbidity, and socio-economic inequalities. Several studies indicate that pelvic floor disorders are underreported, underdiagnosed, and undertreated among Indian women (5,6). Contributing factors include lack of awareness, normalization of symptoms, and cultural stigma surrounding reproductive and sexual health. Women may delay seeking medical advice due to embarrassment, fear of social judgment, or limited access to specialized healthcare services (7). Furthermore, traditional practices such as early marriage, repeated childbirth, and physically demanding domestic or agricultural labor increase susceptibility to PFM weakness (8).

Socio-economic status is a key determinant of pelvic floor health. Women from lower socio-economic strata often face compounded risks due to poor nutrition, limited access to institutional deliveries, inadequate postnatal care, and higher parity (9). Conversely, women in urban and higher-income groups, while having better access to healthcare, may still encounter PFD due to sedentary lifestyles, obesity, and delayed childbearing (10). This dual burden underscores the multifaceted nature of pelvic floor integrity and the importance of situating it within the broader socio-economic context.

While global literature on PFM integrity is expanding, there remains a paucity of comprehensive data on Indian women. Most existing studies are hospital-based, lack community-level representation, and rarely explore socio-economic dimensions in depth (11). Without robust evidence, policy-making and health interventions remain fragmented and inadequate. Understanding the socio-economic determinants of PFM integrity is therefore essential to develop holistic strategies that combine preventive, therapeutic, and educational measures.

This article aims to critically examine pelvic floor muscle integrity among Indian women, focusing on the socio-economic factors that influence its status. By addressing this gap, it seeks to provide insights for clinicians, public health practitioners, and policymakers to improve awareness, screening, and management of pelvic floor disorders, thereby enhancing women's overall health and quality of life.

Material and Methods

Study Design and Setting

This cross-sectional observational study was conducted in the Department of Obstetrics and Gynaecology at Teerthanker Mahaveer Medical College and Research Centre, Moradabad, Uttar Pradesh, India. Data were collected over two years from women attending the outpatient department (OPD).

Study Population

A total of 430 women aged 18–55 years were recruited. Written informed consent was obtained from all participants prior to enrolment. Ethical approval was granted by the Institutional Ethics Committee of Teerthanker Mahaveer University (Approval No: TMU/IEC/2023-24/02).

Inclusion and Exclusion Criteria

- **Inclusion criteria:** Parous and nulliparous women aged 18–55 years, willing to participate and undergo clinical examination.
- **Exclusion criteria**: Pregnant women, those with recent pelvic surgery (<6 months), pelvic malignancy, neurological disorders affecting pelvic function, or refusal to consent.

Socio-Demographic and Clinical Parameters

A structured proforma was used to record socio-demographic and clinical data, including:

- **Age** (categorized as <30, 30–39, 40–49, ≥50 years)
- **Parity** (nulliparous, primiparous, multiparous)
- **Mode of delivery** (vaginal, cesarean)
- **Socio-economic status** (assessed using Modified Kuppuswamy Scale, classified into upper, middle, and lower classes)
- **Education level** (illiterate, primary, secondary, graduate and above)
- **Occupation** (homemaker, manual labor, professional/other)

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- **Menopausal status** (premenopausal, postmenopausal)
- **Relevant comorbidities** (obesity, diabetes mellitus, chronic cough/constipation)

Assessment of Pelvic Floor Muscle Strength

Pelvic floor muscle (PFM) strength was assessed using digital palpation by a single investigator. Strength was graded using **the Modified Oxford Scale (0–5):**

- Grade 0: No contraction
- Grade 1: Flicker
- Grade 2: Weak
- Grade 3: Moderate
- Grade 4: Good
- Grade 5: Strong

Additional parameters included:

- **Endurance:** maximum duration (in seconds) a contraction could be sustained (up to 10 seconds)
- **Repetition ability:** number of effective contractions in three attempts
- **Co-activation:** presence of accessory muscle recruitment (abdominal, gluteal, thigh muscles)

Data Collection and Statistical Analysis

All data were entered into Microsoft Excel and analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics (mean, standard deviation, frequency, percentage) were used for baseline variables. Associations between PFM strength and socio-demographic/obstetric factors were assessed using Chi-square test for categorical variables and independent *t*-test/ANOVA for continuous variables. A p-value <0.05 was considered statistically significant.

Results

Participant Characteristics

A total of **430 women** were included in the study. The mean age was **37.8 ± 9.6 years** (range: 18–55 years). Most participants were multiparous (**72.1%**), and vaginal delivery was the most common mode of childbirth (**68.6%**). Based on the Modified Kuppuswamy Scale, the majority belonged to the middle and lower socio-economic classes (**64.4%**). Approximately one-fourth (**26.5%**) of women were postmenopausal. The detailed socio-demographic and clinical characteristics are presented in **Table 1**.

Table 1. Baseline socio-demographic and clinical characteristics of participants (n = 430)

Variable	Category	Frequency (n)	Percentage (%)
Age group (years)	<30	96	22.3
	30–39	142	33.0
	40–49	118	27.4
	≥50	74	17.2
Parity	Nulliparous	120	27.9
	Multiparous	310	72.1
Mode of delivery	Vaginal	295	68.6
	Cesarean	135	31.4
Socio-economic status	Upper class	153	35.6

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	Middle/Lower class	277	64.4
Menopausal status	Premenopausal	316	73.5
	Postmenopausal	114	26.5
Education	Illiterate/Primary	168	39.0
	Secondary or higher	262	61.0

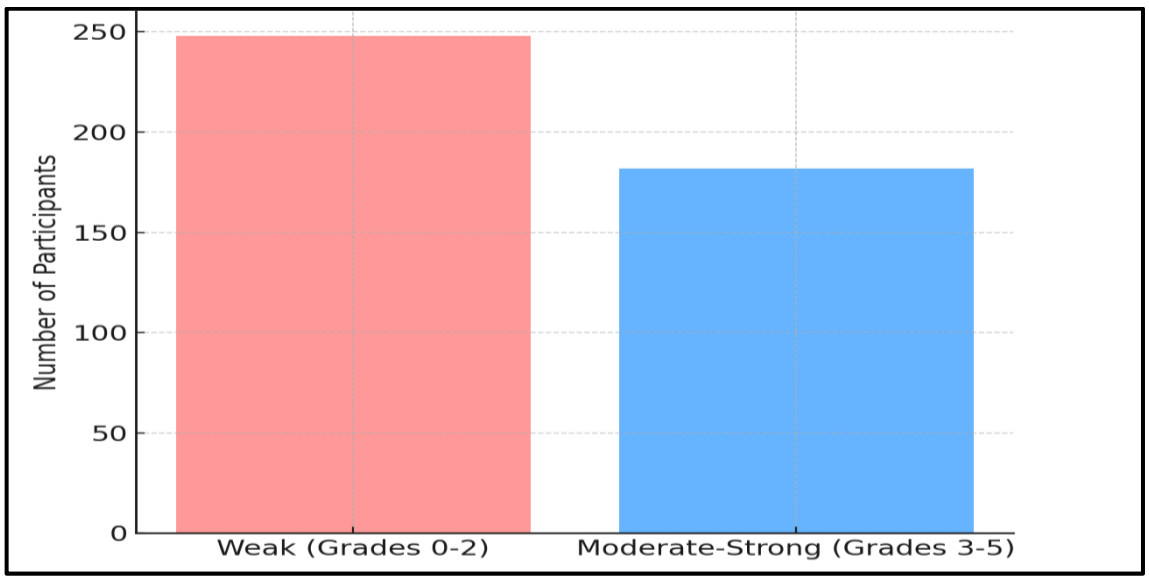
Pelvic Floor Muscle Strength

On digital palpation using the **Modified Oxford Grading Scale**, more than half of the participants (**57.7%**) had weak to absent contraction (Grades 0–2), while only **17.6%** demonstrated good to strong contraction (Grades 4–5). The distribution is summarized in **Table 2** and illustrated in **Figure 1**.

Table 2. Distribution of pelvic floor muscle strength (n = 430)

Oxford Grade	Frequency (n)	Percentage (%)
Grade 0 (No contraction)	46	10.7
Grade 1 (Flicker)	74	17.2
Grade 2 (Weak)	128	29.8
Grade 3 (Moderate)	106	24.7
Grade 4 (Good)	56	13.0
Grade 5 (Strong)	20	4.6

Figure 1. Overall pelvic floor muscle strength categories (weak vs. moderate–strong)



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Endurance and Repetition

- The **mean endurance time** was **3.9 ± 1.8 seconds**.
- Only **12.5%** sustained contraction ≥7 seconds.
- **38.6%** could perform ≥3 effective contractions consecutively.

Association with Socio-Demographic and Clinical Variables

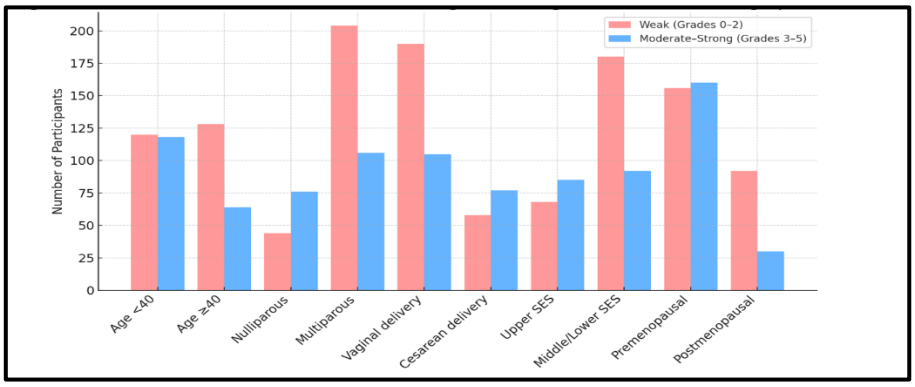
Pelvic floor muscle strength showed significant associations with several parameters. Weak PFM strength was more common among women aged ≥40 years, multiparous women, those with multiple vaginal deliveries, and postmenopausal women. Women belonging to middle/lower socio-economic classes also demonstrated a higher prevalence of poor PFM integrity compared to those in the upper class.

The details of associations are presented in **Table 3**.

Table 3. Association of socio-demographic and clinical variables with pelvic floor muscle strength

Variable	Weak PFM (Grades 0–2)	Moderate–Strong PFM (Grades 3–5)	p-value
Age <40	120	118	0.01
Age ≥40	128	64	0.01
Nulliparous	44	76	<0.001
Multiparous	204	106	<0.001
Vaginal delivery	190	105	0.002
Cesarean delivery	58	77	0.002
Upper SES	68	85	0.04
Middle/Lower SES	180	92	0.04
Premenopausal	156	160	<0.001
Postmenopausal	92	30	<0.001

Figure 2. Distribution of weak vs. moderate–strong pelvic floor muscle strength across socio-demographic variables



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Discussion

Discussion

This hospital-based cross-sectional study assessed pelvic floor muscle (PFM) integrity in 430 women using digital palpation. More than half of the participants (57.7%) exhibited weak or absent contractions (Oxford Grades 0–2), while only 17.6% demonstrated good to strong strength. These findings underscore the significant burden of pelvic floor dysfunction (PFD) among Indian women.

Comparison with Global Literature

The high prevalence of weak PFM strength in our cohort parallels global data, where up to 40–50% of women report symptoms related to urinary incontinence, pelvic organ prolapse, or fecal incontinence (12,13). Large epidemiological studies such as the Women's Health Initiative confirmed the strong relationship between parity, delivery mode, and pelvic floor dysfunction (4). A recent systematic review also emphasized that PFD risk rises progressively with age and parity, regardless of cultural or geographical setting (14).

Our results reinforce the role of **childbirth-related trauma** in pelvic floor integrity. Multiparity and vaginal delivery were significantly associated with weak muscle strength. This is consistent with international findings that vaginal delivery causes stretching and denervation of the levator ani muscle, resulting in long-term functional impairment (8,15). A landmark JAMA cohort study also reported that women with multiple vaginal deliveries had the highest lifetime risk of prolapse and incontinence compared to those delivered by elective cesarean section (16). However, cesarean delivery is not entirely protective, as hormonal and aging factors still contribute to dysfunction (17).

Indian Context

In India, studies have consistently shown underreporting and underdiagnosis of PFD due to cultural stigma and normalization of symptoms (5,6). Our study, which found weak PFMs in more than half of participants, aligns with prevalence rates reported from Karnataka, Andhra Pradesh, and Tamil Nadu (18–20). Socio-economic status also emerged as a significant determinant: women from middle and lower strata had poorer PFM strength, reflecting disparities in nutrition, healthcare access, and occupational workload. Similar associations between poverty and poor pelvic health have been observed in other Indian cohorts (10).

Postmenopausal women in our study demonstrated significantly weaker PFM compared to premenopausal women, consistent with evidence that estrogen deficiency and age-related collagen loss contribute to reduced muscle tone and increased tissue laxity (9,21). Educational attainment showed a trend toward better muscle strength, suggesting that awareness and health-seeking behavior may partially mitigate PFD risk, although this was not statistically significant.

Clinical Implications

Our endurance and repetition analysis showed that the majority of women were unable to sustain contractions beyond 5 seconds or perform multiple effective repetitions. This highlights the lack of awareness and practice of pelvic floor muscle training (PFMT). PFMT is internationally recommended as a first-line intervention for prevention and treatment of incontinence and prolapse (12,1). Incorporating PFMT into antenatal, postnatal, and gynecological care in India could significantly reduce the long-term burden of PFD.

Strengths and Limitations

Strengths of this study include its relatively large sample size and standardized use of the Modified Oxford Grading Scale with a single examiner to reduce inter-observer bias. However, being hospital-based, the results may not reflect community prevalence. Digital palpation, while widely used, is subjective compared to perineometry or electromyography. Further longitudinal, community-based studies are needed to validate these findings and provide national prevalence estimates.

Future Directions

Our results underscore the need for integrating pelvic floor health into reproductive and primary healthcare programs. Community-based awareness campaigns, routine screening for high-risk women, and structured PFMT programs should be prioritized. Policymakers must also address socio-economic disparities, as women in disadvantaged groups bear a disproportionate burden of pelvic floor dysfunction.

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Conclusion

This study revealed a high prevalence of weak pelvic floor muscle strength among Indian women, with significant associations observed with age, parity, vaginal delivery, socio-economic status, and menopausal status. These findings emphasize the urgent need for routine screening, awareness programs, and integration of pelvic floor muscle training into obstetric and gynecological care. Addressing socio-economic disparities and promoting early preventive interventions will be critical in improving pelvic health outcomes and quality of life for women in India.

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