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Research Article

Association of Apical Prolapse Stage with Lower Urinary Tract Symptom Domains and Postvoid Residual Urine in Women with Uterine Prolapse

Sayeda Rahila Atiq[1], Tahreem Rasheed[2*], Nadia Zulfiqar[3], Saima Noreen[4], Tehmina Hayat[5], Faryal Akhtar[6]

[1]Specialist. Department of Gynaecology and Obstetrics. Dr Sulaiman Al Habib hospital. Riyadh.
[2*]Assistant Professor. Department of Gynaecology and Obstetrics. Bakhtawar Amin Medical and Dental College. Multan.
[3]Assistant Professor. Department of Gynaecology and Obstetrics. Sahara Medical College. Narowal.
[4]Senior registrar. Department of Gynaecology and Obstetrics. Jinnah Hospital. Lahore.
[5]Senior Registrar. Department of Gynaecology and Obstetrics. Rai Medical College. Sargodha.
[6]Assistant Professor. Department of Gynaecology and Obstetrics. Multan Medical & Dental College Multan.

Corresponding Author: Tahreem Rasheed
Assistant Professor. Department of Gynaecology and Obstetrics. Bakhtawar Amin Medical and Dental College. Multan.

Email: [1]rahila.farsaad@outlook.com, [2*]tehreemrasheed01@gmail.com, [3]nadiaamjad19@gmail.com, [4]doctorsaimanoreen@yahoo.com, [5]tehminhayat1@gmail.com, [6]faryalakhtar.2012@gmail.com

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Abstract

Background: Many women with uterine prolapse also have urinary symptoms, but how far the uterus descends says little about how much urinary trouble a woman has. Looking at each symptom domain on its own may clarify the link.

Objective: To examine how apical prolapse severity relates to filling, voiding, and incontinence symptoms and to postvoid residual urine in women attending gynecology clinics.

Methods: In this analytical cross-sectional study, 300 consecutive women with symptomatic uterine prolapse were recruited from the tertiary hospitals in Punjab, Pakistan. Prolapse was staged with the Pelvic Organ Prolapse Quantification system, urinary symptoms were measured with the Urdu ICIQ-FLUTS, and postvoid residual urine was measured by ultrasound. Group comparisons, Spearman correlation, and multivariable logistic regression were used.

Results: Mean age was 56.1±9.9 years. Apical stage II, III, and IV prolapse was present in 32.0%, 48.0%, and 20.0% of women, respectively. Bothersome voiding symptoms were reported by 47.3%, and 26.0% had residual urine above 100 mL. Advanced apical prolapse was independently associated with bothersome voiding symptoms (adjusted odds ratio 3.49; 95% confidence interval 1.74–7.00). Point C correlated with voiding score (r_s=0.370) and residual urine (r_s=0.701; both $p<0.001$), whereas incontinence scores did not differ across stages (p=0.411).

Conclusion: Advanced uterine prolapse is consistently associated with greater voiding difficulty and higher residual urine, while storage and leakage symptoms follow a different pattern. Assessing each urinary domain alongside compartment-specific examination and ultrasound measurement of residual urine offers a practical, locally validated way to identify women with impaired bladder emptying and to guide counselling and treatment planning.

Keywords: Uterine Prolapse, Pelvic Organ Prolapse, Voiding Dysfunction.

INTRODUCTION

Pelvic organ prolapse interferes with comfort, mobility, and daily routines, and embarrassment often stops women from seeking help. In rural Pakistan, a population-based survey found clinically confirmed prolapse in 10.3% of women, and most of them had never seen a doctor about it despite the disruption to their lives. [1]

Prevalence figures swing widely depending on whether prolapse is defined by symptoms, by examination, or by both. Women from lower-income settings are also underrepresented, so published estimates apply poorly to patients in Pakistani gynecology clinics. [2] An updated meta-analysis named vaginal delivery, parity, older age, higher body mass index, and levator injury as risk factors for primary

prolapse, and any study of urinary complaints has to take these into account. [3]

Pelvic support weakens through a mix of childbirth injury, inherited susceptibility, and ageing. This explains why anatomical defects so often overlap, but it does not mean every urinary symptom comes from uterine descent. [4] An international consultation found urinary complaints to be common in prolapse and identified obstructive voiding as the symptom most consistently tied to it. [5]

Questionnaires capture what an examination cannot: how much symptoms bother a woman and which problems she most wants treated. [6] Evaluation guidance therefore calls for reproducible prolapse measurement, a check of bladder emptying, and further tests only when indicated, rather than reliance on anatomical stage alone. [7]

A prospective cohort linked reproductive history and body size to later prolapse, so vaginal births and body mass index need careful recording. [8] The examination maneuver can also change how much descent is seen, which makes a consistent technique across hospitals essential. [9]

Worldwide, the number of women living with prolapse keeps climbing even though age-standardized incidence has fallen, so the need for accessible assessment is not going away. [10] Reviews suggest that a distorted bladder outlet and altered bladder function may both play a part, yet studies disagree on how prolapse stage relates to the wider range of urinary complaints. [11] Current overactive bladder guidance recommends a history, examination, and urinalysis, with further testing reserved for selected patients. [12]

A validated Urdu version of the International Consultation on Incontinence Questionnaire–Female Lower Urinary Tract Symptoms (ICIQ-FLUTS) makes it possible to measure urinary symptoms locally without relying on an untested tool. [13] The wide spread of worldwide prevalence estimates across assessment methods is another reminder that populations and measurements need clear definitions. [14]

This study therefore set out to examine how apical prolapse severity relates to separate urinary symptom domains in women with uterine prolapse at three hospitals in Punjab, Pakistan. It also looked at accompanying anterior and posterior defects and at residual urine, with a particular focus on bothersome voiding. Since every participant had uterine prolapse, the comparison is between degrees of prolapse, not between women with and without it.

MATERIALS AND METHODS

This analytical cross-sectional study was carried out in the gynecology departments from January 2025 to December 2025.. Women attending outpatient clinics with symptomatic uterine prolapse were recruited consecutively before any treatment for the current presentation, and each contributed one baseline assessment. Eligibility depended on prolapse rather than on urinary symptoms, so differences in symptom burden could be examined within a defined prolapse population.

Women aged 18 years or older with symptomatic uterine prolapse and POP-Q point C at or below 1 cm above the hymen were eligible. Exclusion criteria were pregnancy, delivery within the previous six months, previous hysterectomy, previous prolapse or continence surgery, current pessary use, neurogenic bladder, urinary tract malignancy, and inability to complete the assessment. Women with symptomatic urinary infection were treated and then reassessed. Clinical care took priority whenever urgent evaluation was needed, and repeat attendances were identified through study identifiers.

The minimum sample size, calculated with a single-proportion formula (95% confidence, assumed proportion 50%, absolute precision 6%), was 267 women. Adding 10% for incomplete assessments gave 297, rounded up to 300. This calculation addresses precision of estimation and does not guarantee power for every adjusted association. Recorded characteristics included age, parity, vaginal deliveries, menopausal status, bulge duration, diabetes, constipation, and chronic cough; residence, education, and medication use were also collected but were not part of this analysis. Height and weight were measured, and body mass index was calculated in kg/m^2.

Female clinicians performed POP-Q examinations after bladder emptying, using the hymen as the reference point and recording points Ba, Bp, and C and total vaginal length in centimeters during maximal Valsalva. If the bulge a woman described was not reproduced, the examination was repeated standing. Apical stage was assigned from point C relative to total vaginal length, and overall stage from the most distal compartment. Apical stages III–IV were classed as advanced prolapse, with stage II as the reference.

Anterior and posterior defects were recorded independently.

Urinary symptoms over the previous four weeks were assessed with the validated Urdu ICIQ-FLUTS; when a woman needed help, the original wording was read to her unchanged. Filling, voiding, and incontinence scores were calculated separately, and bother ratings were not added to domain scores. Supplementary questions recorded incomplete emptying and manual reduction of the prolapse to void. Urgency, leakage, hesitancy, straining, and intermittency were counted when reported at least sometimes. A three-day bladder diary recorded daytime and nocturnal voids. Outcome definitions and thresholds are listed in Table 1.

Table 1. Clinical Measurements and Outcome Definitions

Variable	Definition or measurement
Apical prolapse severity	Point C and total vaginal length; stage II versus III–IV
Anterior or posterior prolapse	Ba or Bp ≥−1 cm, respectively
Primary outcome	Hesitancy, straining, or intermittency at least sometimes, with corresponding bother ≥5/10
Filling score	ICIQ-FLUTS domain, 0–16
Voiding score	ICIQ-FLUTS domain, 0–12
Incontinence score	ICIQ-FLUTS domain, 0–20
Frequency and nocturia	Diary mean >8 daytime voids or ≥2 nocturnal voids
Elevated residual urine	Repeat-confirmed postvoid residual >100 mL

The primary endpoint relies on an operational threshold, not a validated diagnostic cutoff. Urinalysis was used to screen for infection. Residual urine was measured by transabdominal ultrasound within ten minutes of spontaneous voiding; readings above 100 mL were repeated after a second void, and the repeat reading determined classification. Urodynamic testing was not part of the research protocol. Anatomical stage, urinary complaints, and residual volume were treated as separate observations, and a sensation of incomplete emptying was not equated with measured retention.

Before analysis, forms were checked for inconsistent codes, impossible anatomical values, out-of-range scores, and duplicate identifiers. Domain scores were recalculated from their items, and mixed incontinence required both stress and urgency leakage. Missing observations were kept distinct from absent symptoms. Covariates were chosen for clinical relevance, and age and body mass index were kept continuous to avoid losing information.

Analyses were performed in Python 3.12 with NumPy, SciPy, pandas, and statsmodels. Continuous variables are summarized as mean±SD or median (IQR), and proportions are given with Wilson confidence intervals. Stages were compared with Pearson chi-square or Fisher–Freeman–Halton exact tests and Kruskal–Wallis tests, and correlations were assessed with Spearman coefficients. Logistic regression estimated adjusted odds ratios for bothersome voiding, with advanced apical prolapse, age, body mass index, vaginal deliveries, diabetes, point Ba, and hospital (fixed effect) as explanatory variables. Collinearity and Hosmer–Lemeshow fit were checked, and a sensitivity analysis omitted Ba. Secondary comparisons were exploratory and not adjusted for multiplicity; two-sided $p<0.05$ was considered significant.

RESULTS

All 300 women completed the anatomical, questionnaire, diary, and residual urine assessments and were included in the analysis. Mean age was 56.1±9.9 years, mean body mass index was 26.5±3.9 kg/m², and three quarters were postmenopausal (Table 2).

Table 2. Demographic and Clinical Characteristics of Participants

Characteristic	Overall value, N=300
Age, years	56.1±9.9
Body mass index, kg/m²	26.5±3.9

Parity	4.0 (3.0–5.0)
Vaginal deliveries	4.0 (3.0–5.0)
Postmenopausal	224 (74.7)
Diabetes mellitus	40 (13.3)
Chronic constipation	105 (35.0)
Chronic cough	42 (14.0)
Bulge duration, years	3.6 (2.0–5.3)

Values are mean±SD, median (IQR), or n (%). Stage III was the most common apical stage, and one in five women had stage IV prolapse (Table 3). Anterior defects accompanied the uterine prolapse far more often than posterior defects. Overall POP-Q stage differed from apical stage in some women because the most distal vaginal wall defect determines the overall classification.

Table 3. Anatomical Findings and Compartment Involvement

Anatomical finding	**Result, N=300**
Apical stage II	96 (32.0)
Apical stage III	144 (48.0)
Apical stage IV	60 (20.0)
Anterior compartment defect	256 (85.3)
Posterior compartment defect	103 (34.3)
Point C, cm	3.8 (0.6–6.6)
Point Ba, cm	1.9 (0.0–3.6)
Point Bp, cm	-1.8 (-2.7–-0.7)
Overall POP-Q stage II/III/IV, n	73/165/62

Values are n (%) or median (IQR) unless stated otherwise.

Bothersome voiding symptoms were reported by 142 women (47.3%; 95% CI 41.8–53.0%). Their frequency rose from 22.9% at stage II to 66.7% at stage IV, and hesitancy, straining, and intermittent stream followed the same gradient (Figure 1). Incomplete emptying and manual reduction to void also differed between stages, the latter rising most steeply. Urgency, daytime frequency, nocturia, and the three leakage categories did not differ significantly. Stress and urgency leakage were counted independently, and mixed incontinence represents their overlap.

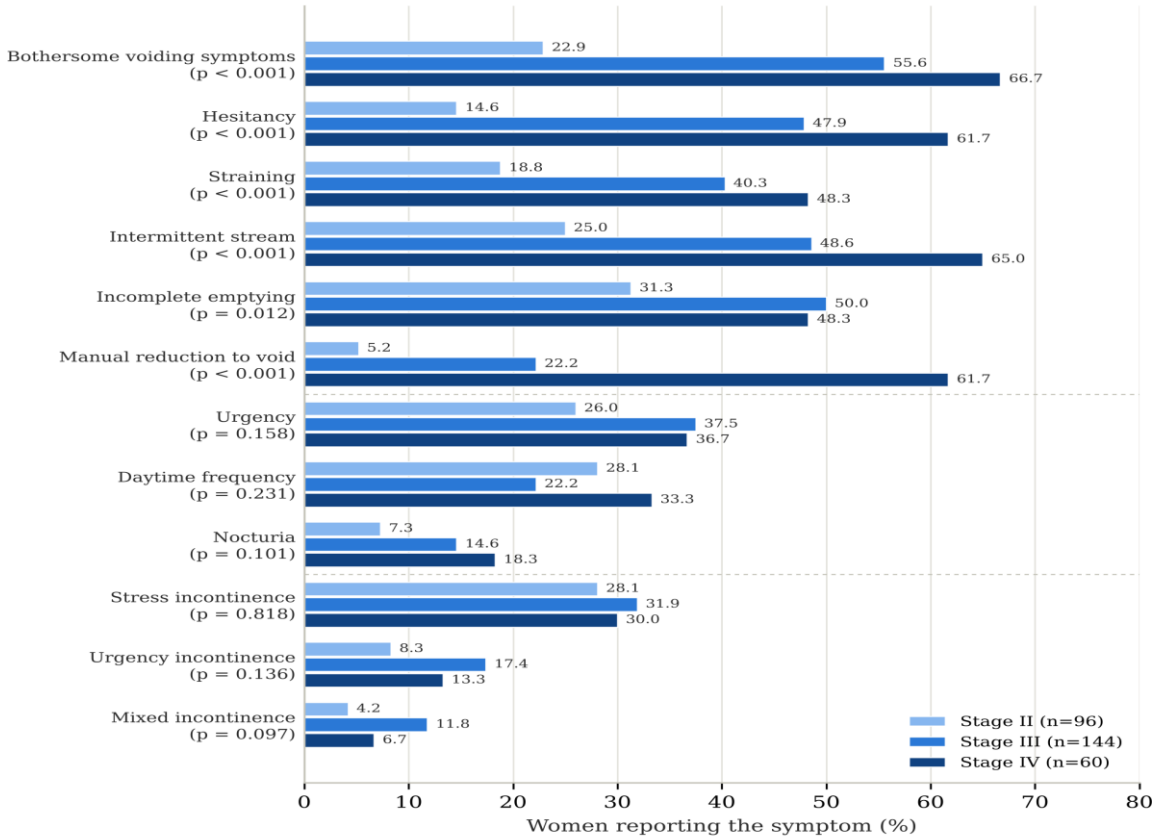


Figure 1. Urinary Symptoms by Apical Prolapse Stage. Bars Show the Percentage of Women in Each Stage Reporting Each Symptom; P Values are from Chi-Square Tests.

Median voiding score rose with stage, filling scores differed less, and incontinence scores were almost identical across stages (Figure 2A). Point C correlated with voiding score (r_s=0.370, p<0.001), filling score (r_s=0.185, p=0.001), and residual urine (r_s=0.701, p<0.001), but only weakly and non-significantly with incontinence score (r_s=0.066, p=0.256).

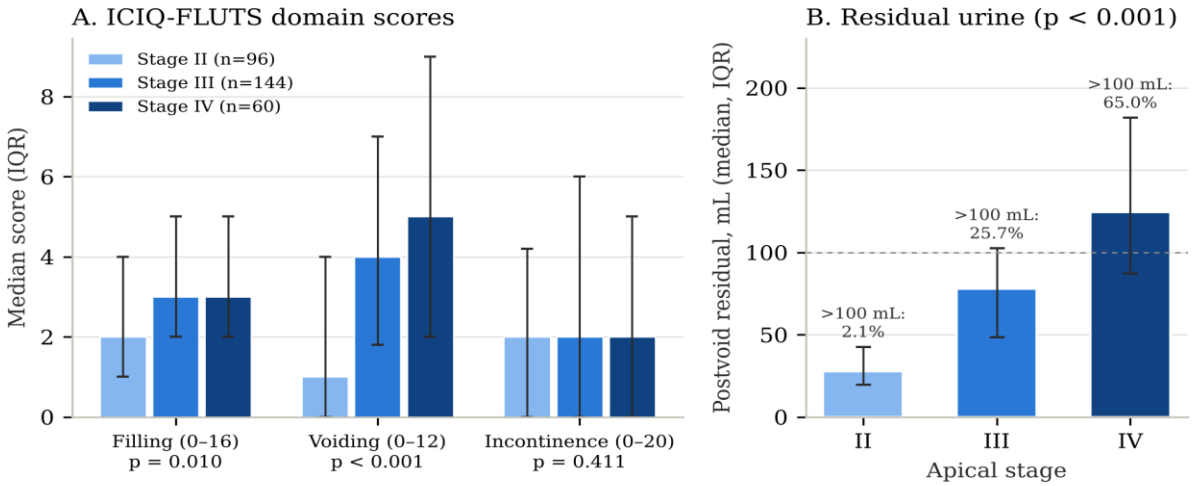


Figure 2. (A) ICIQ-FLUTS Domain Scores and (B) Postvoid Residual Urine by Apical Stage. Bars Show Medians and Whiskers the Interquartile Range; Panel B Labels Give the Proportion with Confirmed Residual Urine Above 100 Ml. P Values are from Kruskal–Wallis Tests.

Residual urine above 100 mL was confirmed in 78 women (26.0%), rising from 2.1% at stage II to 65.0% at stage IV (Figure 2B). Of 87 initial readings above 100 mL, 78 remained

elevated on repeat measurement. Reported incomplete emptying correlated only weakly with measured residual volume (r_s=0.200, p<0.001), so the two findings are related but not interchangeable.

Advanced apical prolapse remained associated with bothersome voiding after adjustment (Table 4). Age and diabetes were also independently associated, whereas the confidence intervals for body mass index, vaginal parity, and anterior descent reached or crossed unity. Removing Ba in the sensitivity analysis increased the estimate for advanced prolapse (adjusted OR 4.97; 95% CI 2.72–9.08), so the choice of anatomical covariates affects its magnitude.

Table 4. Adjusted Associations with Bothersome Voiding Symptoms

Explanatory variable	Adjusted OR	95% CI	p value
Apical stage III–IV versus II	3.49	1.74–7.00	<0.001
Age, per 10-year increase	1.32	1.01–1.74	0.043
Body mass index, per 5 kg/m² increase	1.38	0.99–1.93	0.060
Vaginal deliveries, per delivery	1.09	0.94–1.25	0.254
Diabetes, yes versus no	4.50	1.92–10.54	<0.001
Anterior descent, Ba per cm increase	1.13	1.00–1.28	0.058

Hospital was included as a fixed effect. The model contained 142 outcome events and eight explanatory parameters. The maximum variance inflation factor was 1.53, and the Hosmer–Lemeshow test indicated adequate fit (χ^2=8.30, 8 df, p=0.405).

DISCUSSION

Women with advanced apical prolapse were more likely to report bothersome voiding and had larger residual volumes, while leakage barely changed with stage. These odds ratios describe symptoms present at one point in time; they do not estimate future risk or prove that descent caused the complaints. FINPOP also found compartment-specific links with some overactive bladder symptoms and improvement after repair, yet symptoms persisted in some women, so anatomy does not explain every urinary complaint. [15]

The LURN cohort is a useful point of comparison. In women seeking treatment, obstructive symptom scores rose with prolapse measurements, while overall symptom severity tended to fall. [16] The present findings, a strong voiding association and a weak filling correlation, point in the same direction and make a case for assessing urinary domains separately instead of using one catch-all label.

Stress leakage behaves differently. A later FINPOP analysis showed that surgery resolved existing stress incontinence in some women and created new symptoms in others, so more descent does not simply mean more leakage. [17] Multicenter work on cough testing found that prolapse reduction, position, and bladder volume all affect detection, which makes comparisons based on reported symptoms alone unreliable. [18]

A prospective comparison found that office cough testing had low sensitivity against urodynamics for stress and occult incontinence. [19] The absence of a stage-related leakage pattern here therefore does not rule out underlying continence dysfunction, particularly in women being considered for surgery.

Treatment studies add useful context. In the PEOPLE randomized trial, starting with a pessary did not meet the prespecified noninferiority margin against surgery for patient-reported improvement, although both groups improved. [20] Its parallel prospective cohort also found improvement with either treatment and more improvement after surgery, but women chose their own treatment, which clouds the comparison. [21]

In another prospective study, improvement during a short pessary trial agreed poorly with improvement after subsequent surgery. [22] Temporary reduction of the prolapse is therefore an imprecise guide to an individual woman's eventual pelvic floor outcome.

Residual volume matters for assessment, but on its own it does not predict how a woman will void after surgery. Postoperative retention depends partly on perioperative factors and concomitant procedures, so baseline anatomy tells only part of the story. [23] A Dutch economic evaluation found an initial pessary strategy to be cheaper; whether that holds in Pakistan depends on local treatment costs, travel, and access to follow-up. [24]

A recent study reported lower residual urine after prolapse repair alongside a reduction in

bladder capacity, suggesting that improved emptying involves more than a purely mechanical explanation. [25] The weak correlation between perceived incomplete emptying and measured residual urine in the present analysis likewise supports measuring both.

This study has several strengths. Women were recruited consecutively from three tertiary hospitals, and complete data were available for all 300 participants. Prolapse was measured compartment by compartment with the standardized POP-Q system, and urinary symptoms were assessed with a validated Urdu questionnaire supported by a three-day bladder diary. Residual urine was measured objectively by ultrasound and confirmed on repeat reading, so measured retention was kept separate from reported emptying difficulty. Analyzing each symptom domain separately, with adjusted models and a sensitivity analysis, gave a more detailed picture than a single urinary score could. Because the design is cross-sectional and all participants had prolapse, the findings describe associations within this population rather than causal effects. Longitudinal studies can build on these results to test whether baseline findings predict urinary improvement after treatment.

CONCLUSION

Advanced uterine prolapse is consistently associated with greater voiding difficulty and higher residual urine, whereas storage and leakage symptoms follow a different course. Combining domain-specific symptom assessment with compartment-level examination and ultrasound measurement of residual urine offers a practical, locally validated approach for identifying women with impaired bladder emptying. This approach can guide counselling and treatment planning and lays the groundwork for future longitudinal research.

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