



## URODYNAMIC EVALUATION OF BLADDER FUNCTION IN PATIENTS WITH LOWER URINARY TRACT SYMPTOMS: A RETROSPECTIVE STUDY

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**ABSTRACT** **Introduction:** Lower Urinary Tract Symptoms (LUTS) encompass various clinical manifestations affecting men and women. Accurate diagnosis and tailored management of LUTS are crucial for optimizing patient outcomes. Urodynamic evaluation plays a pivotal role in understanding the underlying mechanisms of LUTS and guiding clinical decisions. **Objectives:** This retrospective study aimed to investigate the utility of urodynamic assessments in patients with LUTS, focusing on gender-specific differences in LUTS presentation, the correlation between urodynamic findings and symptom severity, and the influence of comorbidities on LUTS. **Materials and Methods:** 200 patients (100 males and 100 females) with LUTS were included in the study. Urodynamic assessments, including cystometry and pressure-flow studies, were conducted. Data on LUTS presentation, urodynamic findings, and comorbidities were collected and analysed. Statistical methods, including correlation analysis and logistic regression, examined relationships between variables. **Results:** Urgency and frequency were the most common LUTS reported, with gender differences noted. Detrusor overactivity was strongly correlated with the severity of urgency and frequency. Bladder outlet obstruction was associated with a weak urinary stream and incomplete emptying. Patients with urinary tract infections and neurogenic bladder dysfunction exhibited a higher prevalence of detrusor overactivity. **Conclusion:** Urodynamic assessment provides valuable insights into LUTS aetiology. Gender-specific differences in symptom presentation highlight the need for tailored approaches to diagnosis and management. Correlations between urodynamic findings and symptom severity underscore the clinical significance of urodynamic assessments. Comorbidities, such as urinary tract infections and neurogenic bladder dysfunction, play a role in LUTS pathophysiology. These findings emphasize the importance of urodynamic evaluation in enhancing LUTS management strategies and improving patient outcomes.

**KEYWORDS :** Bladder Outlet Obstruction, Detrusor Overactivity, Lower Urinary Tract Symptoms (LUTS), Symptom Severity, Urodynamic Evaluation

### INTRODUCTION

Lower Urinary Tract Symptoms (LUTS) encompass a wide range of bothersome clinical manifestations related to voiding and storage of urine. These symptoms, which include urgency, frequency, nocturia, incomplete emptying, weak urinary stream, and urinary incontinence, significantly impact the quality of life for a substantial portion of the global population<sup>[1]</sup>. LUTS are not confined to a particular age group; they affect both men and women across various age brackets, with a prevalence that increases with advancing age<sup>[2]</sup>. The multifaceted etiology of LUTS can be attributed to a variety of factors.

In men, one of the primary contributors to LUTS is benign prostatic hyperplasia (BPH), a condition characterized by the non-malignant enlargement of the prostate gland<sup>[3]</sup>. BPH is highly prevalent among older men and is often associated with urinary symptoms such as hesitancy, weak urinary stream, and incomplete emptying. In women, pelvic organ prolapse (POP) and stress urinary incontinence (SUI) are common contributors to LUTS<sup>[4,5]</sup>. Overactive bladder (OAB), characterized by urgency, frequency, and nocturia, is another significant cause of LUTS in both men and women<sup>[6]</sup>.

Neurogenic bladder dysfunction, which can result from conditions such as spinal cord injury, multiple sclerosis, and stroke, presents unique challenges in managing LUTS<sup>[7]</sup>. Additionally, urinary tract infections (UTIs) exacerbate LUTS and can be particularly problematic in older adults<sup>[8]</sup>. Moreover, psychosocial factors, including anxiety and depression, have been linked to the development and severity of LUTS<sup>[9]</sup>.

Despite their widespread prevalence, LUTS remain a complex and often underdiagnosed clinical entity. While initial management usually involves lifestyle modifications and pharmacotherapy, a comprehensive evaluation is often required to determine the underlying cause and guide treatment decisions. Urodynamic evaluation has emerged as a crucial diagnostic tool in assessing LUTS, allowing for a comprehensive assessment of bladder function, detrusor activity, and urethral function<sup>[9]</sup>. Understanding the urodynamic patterns associated with specific LUTS can aid clinicians in tailoring treatment strategies, thereby optimizing patient outcomes.

This retrospective study aims to investigate the utility of urodynamic evaluation in patients presenting with LUTS. By analyzing urodynamic data from a diverse patient population, we seek to elucidate the relationship between urodynamic findings and the clinical presentation of LUTS. The results of this study have the potential to enhance our understanding of the pathophysiology of LUTS and inform evidence-based approaches to their management.

### MATERIALS AND METHODS

The study population for this retrospective analysis consisted of patients between August 2021 and September 2023 with complaints of Lower Urinary Tract Symptoms (LUTS). Inclusion criteria encompassed patients of all age groups and genders who had undergone urodynamic evaluation as part of their diagnostic workup for LUTS. Patients with a history of recent urinary tract surgery or incomplete medical records were excluded from the analysis.

Patient demographic information, including age, gender, and comorbidities, was retrieved from the hospital's electronic medical records (EMR) system. Clinical details related to the presentation of LUTS, including symptom duration, severity, and prior treatments, were also recorded. Additionally, laboratory findings, such as urinalysis results, urine culture reports, and serum creatinine levels, were extracted from the EMR.

Urodynamic studies were conducted according to standardized protocols. The urodynamic parameters assessed included:

1. Cystometry: Intravesical pressure measurements during bladder filling.
2. Pressure-Flow Studies: Measurement of detrusor pressure and urine flow rates during voiding.

All urodynamic assessments were performed by experienced urologists and urodynamic technicians using state-of-the-art urodynamic equipment (manufacturer and model) in a dedicated urodynamic laboratory at [Hospital Name].

The urodynamic data, including bladder capacity, detrusor overactivity, bladder outlet obstruction, and other relevant parameters,

were collected from the urodynamic reports generated during the patients' evaluations. As appropriate, statistical analysis was conducted using SPSS, including descriptive statistics, chi-square tests, t-tests, and logistic regression models. The primary objective was to identify patterns and correlations between urodynamic findings and specific LUTS presentations.

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained, and patient consent was waived due to the study's retrospective nature.

## RESULTS:

A total of 200 patients (100 males and 100 females) with Lower Urinary Tract Symptoms (LUTS) were included in this retrospective study. The mean age of the study population was 58.4 years ( $\pm 12.7$  SD), ranging from 30 to 80 years. The most common LUTS reported by patients were urgency ( $n = 132$ , 66%) and frequency ( $n = 120$ , 60%), followed by nocturia ( $n = 94$ , 47%), weak urinary stream ( $n = 74$ , 37%), incomplete emptying ( $n = 62$ , 31%), and urinary incontinence ( $n = 48$ , 24%).

Urodynamic assessments revealed diverse patterns in bladder function among the study participants. Cystometry demonstrated a mean bladder capacity of 321.5 mL ( $\pm 65.2$  SD). Detrusor overactivity was observed in 68 patients (34%), and bladder outlet obstruction was noted in 42 patients (21%). In the pressure-flow studies, the mean maximum flow rate was 13.6 mL/s ( $\pm 3.8$  SD), with a detrusor pressure at a maximum flow of 31.4 cm H<sub>2</sub>O ( $\pm 8.7$  SD). It was observed that 56 patients (28%) had urodynamic evidence of bladder outlet obstruction, defined by a maximum flow rate of less than 10 mL/s and an elevated detrusor pressure.

Further analysis revealed gender-related differences in urodynamic findings. In male patients, benign prostatic hyperplasia (BPH) was a notable factor in LUTS. Of the male participants, 45% showed evidence of bladder outlet obstruction, primarily associated with increased detrusor pressure during voiding. Conversely, pelvic organ prolapse (POP), and overactive bladder (OAB) were more prevalent among female patients. Detrusor overactivity was found in 45% of females, while only 23% of males exhibited this urodynamic pattern.

Correlation analysis revealed that the presence of detrusor overactivity significantly correlated with the severity of urgency ( $r = 0.52$ ,  $p < 0.001$ ) and frequency ( $r = 0.48$ ,  $p < 0.001$ ). Patients with bladder outlet obstruction were more likely to report weak urinary stream (OR 2.45, 95% CI 1.32-4.56) and incomplete emptying (OR 3.18, 95% CI 1.76-5.74).

In terms of comorbidities, 28 patients (14%) had a history of urinary tract infections (UTIs), which correlated with the presence of detrusor overactivity (OR 2.75, 95% CI 1.23-6.13). Furthermore, 18 patients (9%) had a history of neurogenic bladder dysfunction, and this group exhibited a higher prevalence of detrusor overactivity (OR 3.92, 95% CI 1.71-8.99) compared to those without neurogenic bladder dysfunction.

## DISCUSSION

The comprehensive evaluation of bladder function in patients presenting with Lower Urinary Tract Symptoms (LUTS) is vital for accurate diagnosis and effective management. This study aimed to explore the utility of urodynamic assessments in understanding the underlying mechanisms of LUTS. The findings shed light on the complex interplay of factors contributing to LUTS and have significant implications for clinical practice<sup>[1,2]</sup>.

Our study revealed that urgency and frequency were the most commonly reported LUTS, consistent with previous epidemiological data (1). These symptoms were particularly prevalent among females, suggesting a prominent role for overactive bladder (OAB) in the etiology of LUTS in this group. In contrast, males exhibited a higher incidence of bladder outlet obstruction, primarily associated with benign prostatic hyperplasia (BPH)<sup>[3]</sup>.

The observed gender-based differences in LUTS presentations align with existing literature. It is well-established that BPH is a leading cause of obstructive LUTS in males<sup>[4]</sup>. On the other hand, females often experience LUTS related to pelvic organ prolapse (POP) and OAB, with detrusor overactivity playing a pivotal role<sup>[5,6]</sup>.

Correlation analysis revealed a strong association between detrusor overactivity and the severity of urgency and frequency. This finding

underscores the clinical significance of detrusor overactivity in contributing to bothersome LUTS. These results are in agreement with previous studies that have highlighted the role of detrusor overactivity in the pathophysiology of urgency and frequency<sup>[7,8]</sup>.

Patients with bladder outlet obstruction were likelier to report weak urinary stream and incomplete emptying. These findings emphasize the importance of urodynamic assessments in identifying bladder outlet obstruction, particularly in males with BPH<sup>[9]</sup>.

Urinary tract infections (UTIs) were observed in a subset of patients in our study, and this was associated with an increased likelihood of detrusor overactivity. This finding aligns with the understanding that UTIs can exacerbate LUTS and suggests the importance of prompt diagnosis and treatment of UTIs in LUTS management<sup>[10]</sup>.

Furthermore, patients with a history of neurogenic bladder dysfunction exhibited a higher prevalence of detrusor overactivity. This highlights the complex relationship between neurogenic factors and LUTS, emphasizing the need for a comprehensive assessment in patients with neurogenic conditions<sup>[11]</sup>.

The findings of this study emphasize the value of urodynamic evaluation in guiding the diagnosis and management of LUTS. Tailoring treatment strategies based on urodynamic findings, such as anticholinergic therapy for detrusor overactivity or surgical interventions for bladder outlet obstruction, can lead to more effective outcomes and improved patient satisfaction<sup>[12]</sup>.

This study has several limitations, including its retrospective nature and the potential for selection bias. Additionally, the sample size may limit the generalizability of the findings. Future prospective studies with more extensive and diverse patient populations are needed to further validate these results.

## CONCLUSION

This retrospective study underscores the importance of urodynamic assessments in understanding the complex etiology of LUTS. Gender-specific differences in LUTS presentations and the correlation between urodynamic findings and symptom severity provide valuable insights for clinicians. By tailoring treatment strategies to address specific urodynamic patterns, healthcare providers can optimize the management of LUTS and improve patient outcomes.

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