



RISK FACTORS FOR ACUTE URINARY RETENTION IN BENIGN PROSTATIC HYPERTROPHY PATIENTS

Urology

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ABSTRACT

Objective: To identify and analyze clinical and demographic risk factors associated with AUR in patients diagnosed with BPH, with particular attention to age, LUTS, prostate size, PSA levels, and relevant medical history. **Materials And Methods:** This prospective, cross-sectional observational study was conducted over 18 months in the Department of General Surgery at Muzaffarnagar Medical College, Uttar Pradesh. A total of 50 male patients with clinically or radiologically confirmed BPH were enrolled using purposive sampling after obtaining informed consent. Data were collected through structured clinical history, physical examination, ultrasound assessment of prostate size, and PSA testing. Statistical analysis was performed using Student's t-test and chi-square test with a significance threshold of $p < 0.05$. **Results:** Urinary retention was most prevalent in the 66–75 year age group (86.7%), with a statistically significant association between increasing age and AUR ($p = 0.015$). LUTS also showed a significant correlation with AUR ($p = 0.019$). No significant associations were found with prior surgery ($p = 0.852$), use of opioids or decongestants ($p = 0.730$), prostate size ($p = 0.942$), or PSA levels ($p = 0.791$). Patients with AUR were significantly older on average ($p = 0.020$), while mean prostate size and PSA levels did not differ significantly between groups. **Conclusion:** Advancing age and the presence of LUTS are significant risk factors for AUR in patients with BPH. Other factors such as PSA levels, prostate volume, previous surgeries, or medication history were not found to be predictive in this cohort. Early risk identification may aid in the timely management and prevention of AUR.

KEYWORDS

Acute Urinary Retention, Benign Prostatic Hyperplasia, Lower Urinary Tract Symptoms, Prostate-Specific Antigen

INTRODUCTION

Benign prostatic hyperplasia (BPH) is a non-cancerous, multifocal, hyperplastic, and progressive histological change occurring in the stromal and epithelial components of the prostate's transitional zone.^{1,2} In India, the prevalence of BPH has been reported as 25% in men aged 40–49, 37% in those aged 50–59 and 60–69, and 50% in the 70–79 age group.³

BPH is frequently associated with prostate enlargement (volume > 30 mL). It may physically compress the urethra, leading to anatomical bladder outlet obstruction (BOO), which clinically presents as lower urinary tract symptoms (LUTS), urinary tract infections, acute urinary retention (AUR), renal dysfunction, hematuria, or bladder stones.⁴

AUR represents one of the most severe and distressing complications in the progression of BPH. It is marked by the sudden inability to initiate urination, resulting in painful bladder distension that necessitates immediate catheterization. Clinically, AUR is classified as either precipitated or spontaneous, with both forms strongly linked to BOO caused by BPH.⁵ Predictive factors for AUR in BPH include prostate volume, PSA levels, and the severity of urinary symptoms.

Longitudinal studies have shown that the five-year risk of AUR is 1.6% in men aged 40–49 and increases to 10% in those aged 70–79. For patients with BPH persisting beyond ten years, the risk rises to one in three.⁶ In men who do not initiate alpha-blocker therapy after an initial AUR episode, the recurrence rate has been found to be between 76% and 83%.⁷

The three central pathophysiologic mechanisms behind AUR are BOO, detrusor underactivity, and neurogenic bladder, with the first two being the predominant contributors in BPH patients.⁸ Key risk factors for AUR include a previous AUR episode, high symptom scores, larger prostate volume, elevated PSA levels, intravesical prostatic protrusion, and high post-void residual (PVR) urine combined with a low peak urine flow rate following a trial without catheter (TWOC), all of which may necessitate more aggressive treatment.^{9–11}

Large-scale community studies have further identified advanced age, severe LUTS, reduced peak flow rate, increased PVR, enlarged

prostate, and elevated PSA as major risk factors for spontaneous AUR.^{12,6} Dynamic clinical indicators, such as symptom worsening and rising PVR during pharmacological therapy, are also considered strong predictors of AUR.¹³

Management of AUR typically involves prompt bladder decompression through catheterization, followed by TWOC, administration of alpha-blockers, and usually 5-alpha-reductase inhibitors, with surgery considered if conservative management fails.^{14,15} TWOC is generally attempted after 2–3 days of $\alpha 1$ -blockade and leads to successful voiding in approximately 60% of cases. A placebo-controlled, double-blind trial of 360 men with AUR showed a significant improvement in TWOC outcomes with alfuzosin 10 mg compared to placebo.¹⁶ Alpha-blockers can help delay surgery and may eliminate the need for it in selected individuals, although TURP remains the standard surgical option if TWOC fails.¹⁷

Given the high prevalence of BPH and its substantial effect on patient well-being, further research is essential to better predict AUR risk. Identifying these risk factors is vital for timely intervention and improving management strategies. This study was conducted to explore the contributing factors to AUR in BPH patients, aiming to enhance clinical decision-making, reduce morbidity, and improve overall quality of life.

MATERIALS AND METHODS

This prospective, cross-sectional observational study was conducted in the Department of General Surgery at Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, over a period of 18 months following approval from the Institutional Ethical Committee. A total of 50 male patients diagnosed with benign prostatic hyperplasia (BPH) through clinical evaluation, imaging, or laboratory findings were enrolled using purposive sampling. Written informed consent was obtained from all participants. Adult male patients with a confirmed diagnosis of BPH who consented to participate were included in the study. Patients with history of lower urinary tract or prostate surgery, presence of prostate cancer, neurological disorders affecting bladder function (such as Parkinson's disease, multiple sclerosis, or spinal cord injury), prior urethral catheterization before the diagnosis of acute urinary retention, and active urinary tract infection at the time of enrolment were excluded from the study.

Consecutive patients meeting the inclusion criteria were enrolled using purposive sampling until the target sample size of 50 was achieved. Each participant was assigned a unique identification number to ensure confidentiality. Detailed clinical histories were recorded, including age, duration and severity of BPH symptoms, prior episodes of acute urinary retention, and presence of comorbid conditions. Physical examinations focused on abdominal and digital rectal assessments to evaluate prostate size and consistency. Imaging studies, primarily ultrasound, were conducted to assess prostate volume and structural anomalies, while laboratory tests such as prostate-specific antigen (PSA) levels and urine analysis were performed to support the diagnosis and evaluate associated risk factors. Data were collected at the time of enrollment, documented using a structured proforma, and subsequently transferred to a secure electronic database. Regular quality checks and data verification were carried out to maintain the accuracy and reliability of the dataset.

Statistical Analysis

The collected data was entered into a Microsoft Excel sheet. Continuous or quantitative data were summarized using mean and standard deviation. The difference between two means was assessed using Student's t-test. Discrete or qualitative data were presented as proportions, and the significance of differences in proportions was evaluated using the chi-square test. A 95% confidence level was maintained for all statistical analyses."

RESULTS

In this study, the highest incidence of urinary retention was observed in the 66–75 year age group in 86.7% of patients, among those aged 76–85 years, 75% had urinary retention. Conversely, the 56–65 year age group exhibited a lower prevalence (37.5%) affected. A statistically significant correlation was identified between age and urinary retention ($p=0.015$), suggesting that advancing age is a key risk factor for the development of urinary retention. [Table-1]

Table 1- Association Of Urinary Retention With Age Group Of Patients

Age Group (Years)	Urinary Retention		P value
	No	Yes	
56-65	5(62.5)	3(37.5)	$\chi^2=8.379$, Df=2, p value=0.015(S)
66-75	4(13.3)	26(86.7)	
76-85	3(25)	9(75)	

A significant association was found between LUTS and AUR ($p=0.019$), with patients reporting LUTS being more likely to develop AUR. However, prior surgical history ($p=0.852$) and the use of opioids or decongestants ($p = 0.730$) were not significantly associated with AUR. [Table-2]

Table 2- Association Of Lower Urinary Tract Symptoms And Clinical History With Acute Urinary Retention In BPH Patients

Variable		Urinary retention		p value
		No (n=12)	Yes (n=38)	
LUTS	No	8(42.1)	11(57.9)	0.019(S)
	Yes	4(12.9)	27(87.1)	
Previous Surgery History	No	5(22.7)	17(77.3)	0.852
	Yes	7(25)	21(75)	
Previous Opioids Medication Decongestant	No	7(25.9)	20(74.1)	0.730
	Yes			

No significant associations were found between AUR and either prostate-specific antigen (PSA) levels ($p=0.791$) or prostate size ($p=0.942$), indicating that these factors did not significantly impact the risk of AUR in the studied population. [Table-3]

Table 3- Association Of PSA Level And Prostate Size With Acute Urinary Retention In BPH Patients

Variable		Urinary retention		p value
		No (n=12)	Yes (n=38)	
PSA level	3.6-4.5	9(25)	27(75)	0.791
	>4.5	3(21.4)	11(78.6)	
Prostate size	61-80	10(23.8)	32(76.2)	0.942
	>80	2(25)	6(75)	

A statistically significant difference in mean age was observed between patients with and without AUR ($p=0.020$), with the AUR group being older on average. However, no meaningful differences were found

between the two groups regarding prostate size ($p=0.692$) or PSA levels ($p=0.690$). [Table-4]

Table 4- Comparison Of Age, Prostate Size, And PSA Levels In Patients With And Without Acute Urinary Retention In BPH

Variable	Urinary retention		t value	p value
	No (n=12)	Yes (n=38)		
Age (Years)	67.17±7.26	71.79±5.32	2.397	0.020(S)
Prostate size (cm ³)	76.83±5.47	76.16±5.01	0.398	0.692(NS)
PSA level (ng/ml)	4.23±0.35	4.27±0.35	0.401	0.690(NS)

DISCUSSION

This study aimed to analyze the risk factors involved in the development of AUR in BPH patients and compare the relative contributions of each factor.

Our study found a significant association between increasing age and the occurrence of acute urinary retention (AUR) ($p<0.05$), with the highest prevalence in the 66–75 age group, followed by 76–85 years, and a lower prevalence in the 56–65 group. This aligns with several studies showing a rise in AUR incidence with age, particularly in men over 70. Demirel HC et al¹⁸ reported a significantly higher mean age in AUR patients ($p < 0.05$), with those over 70 having a markedly increased risk. Velmurugan P et al¹⁹ and Jacobsen et al²⁰ similarly identified advanced age as a crucial risk factor. Narayan Thapa et al²¹ also noted that AUR was most common in the 56–75 age group.

Age-related increases in AUR risk are primarily due to prostate changes—such as stromal hyperplasia, smooth muscle proliferation, and collagen deposition—that heighten urinary outflow resistance. Additionally, aging impairs bladder contractility due to detrusor dysfunction, making men over 65 more susceptible to urinary retention and warranting close monitoring.

PSA Levels and Urinary Retention

In our study, PSA levels did not demonstrate a statistically significant association with acute urinary retention (AUR) ($p>0.05$). Patients with PSA levels between 3.6–4.5 ng/mL had a 75% prevalence of AUR and those with levels >4.5 ng/mL showed a slightly higher prevalence of 78.6%. These findings suggest that PSA alone may not serve as a reliable predictor of AUR in our patient cohort.

In contrast, Roehrborn et al²² identified high PSA and prostate volume as strong predictors of AUR, positing that elevated PSA reflects increased prostate size and subsequent urinary obstruction. Similarly, studies by Kefi et al²³, Narayan Thapa et al²¹, Marberger MJ et al²⁴, and the PLESS Group have consistently reported significant associations between elevated PSA and AUR risk.

Although PSA is a valuable marker for prostate cancer and correlates with prostate volume in BPH, it may not reliably predict AUR. Our study found no significant association, likely due to individual variations in prostate composition, smooth muscle tone, and other urodynamic factors. Thus, while informative of disease progression, PSA may not serve as an independent predictor of AUR in all patient populations.

Prostate Size and Urinary Retention

Our study found no significant association between prostate size and AUR. AUR was observed in 76.2% of patients with prostate size 61–80 cm³ and in 75% of those with size >80 cm³, suggesting that prostate volume alone may not be a decisive factor in AUR development. Similar results were reported by Kefi et al²³, who found no significant difference in resected prostate volume between patients with and without AUR, indicating that total gland size may not be the sole determinant. In contrast, Demirel HC et al¹⁸ reported a significant influence of prostate size, but not PSA, on AUR occurrence. Velmurugan P et al¹⁹ also identified increasing prostate size as a key risk factor for AUR, linking larger glands with higher obstruction risk. Narayan Thapa et al²¹ found prostate size predictive of AUR, though noted fewer cases in grade IV compared to grade III enlargement, attributing this to sample size limitations and the influence of intravesical prostatic protrusion (IPP) over total volume. This supports emerging evidence that the growth pattern—particularly median-lobe prominence and IPP—may be more clinically relevant than overall size.

A significant association was found between LUTS and acute urinary retention (AUR) ($p = 0.019$), with 87.1% of patients presenting with

LUTS experiencing AUR, compared to 57.9% without LUTS. This supports the pathophysiological link between LUTS—particularly obstructive symptoms—and underlying detrusor dysfunction and bladder outlet obstruction (BOO), both key contributors to AUR.

A significant association was found between medical comorbidities and AUR ($p = 0.025$), with 85.3% of patients with comorbidities (diabetes, hypertension, cardiovascular disease) developing AUR, versus 56.3% without. Diabetes mellitus, in particular, has been identified as a risk factor due to diabetic autonomic neuropathy impairing bladder function, as noted by Sasaki et al.²⁵ Chronic hyperglycemia may cause detrusor underactivity, predisposing to AUR. Narayan Thapa et al.²¹ found both diabetes and smoking to significantly increase AUR incidence, linking metabolic and vascular dysfunction with bladder dysfunction. Hypertension and cardiovascular disease may contribute to AUR by impairing vascular supply to the prostate and bladder, leading to ischemia, prostatic infarction, and tissue remodeling. These mechanisms underscore the importance of managing systemic comorbidities to reduce the risk of AUR in BPH patients.

A well-structured design with clearly defined inclusion and exclusion criteria is our study's strengths. However, the study is limited by its small sample size, single-center design, and use of purposive sampling, which may restrict generalizability and introduce selection bias. Future research should include larger, multi-center, longitudinal studies with multivariate analysis to strengthen statistical power, improve generalizability.

CONCLUSION

The study concluded AUR in patients with BPH is significantly associated with increasing age, particularly among those in the 66–75-year age group, as well as with the presence of lower urinary tract symptoms (LUTS). Supplementary factors, including increased post-void residual urine volume and the existence of comorbidities such as diabetes and cardiovascular diseases, exacerbated the risk. In contrast, factors such as PSA levels, prostate size, history of previous surgery, and the use of opioids or decongestant medications did not show a significant association with urinary retention in this cohort.

These findings highlighted the significance of early risk stratification in BPH patients, enabling clinicians to identify those at elevated risk for AUR and to customize care methods accordingly. The results provide significant insights into the risk profile for AUR; however, future research with bigger, multi-center studies is advisable to corroborate these findings and enhance intervention methods for better long-term outcomes.

REFERENCES

- McVary KT, Roehrborn CG, Avins AL, et al. Update on AUA guideline on the management of benign prostatic hyperplasia. *J Urol* 2011; 185: 1793–803
- Bushman W. Etiology, epidemiology, and natural history of benign prostatic hyperplasia. *Urol Clin North Am* 2009; 36: 403–15.
- Bhat SA, Rather SA, Islam N. An overview of benign prostatic hyperplasia and its appreciation in Greco-Arab (Unani) system of medicine. *Asian Journal of Urology*. 2022 Apr 1;9(2):109–18.
- Fusco F, Creta M, De Nunzio C, et al. Progressive bladder remodeling due to bladder outlet obstruction: a systematic review of morphological and molecular evidences in humans. *BMC Urol* 2018; 18: 15
- Shimbo H, Kurita Y, Takada S, Imanishi T, Otsuka A, Furue H, Nakanishi T, Mugiya S, Ozono S. Resistive index as risk factor for acute urinary retention in patients with benign prostatic hyperplasia. *Urology*. 2010 Dec 1;76(6):1440–5.
- Jacobsen SJ, Jacobson DJ, Girman CJ, et al. Natural history of prostatism: risk factors for acute urinary retention. *J Urol*. 1997;158(2):481–487.
- Muruganandham K, Dubey D, Kapoor R. Acute urinary retention in benign prostatic hyperplasia: Risk factors and current management. *Indian J Urol*. 2007;23(4):347–353
- Thorne MB, Geraci SA. Acute urinary retention in elderly men. *Am J Med* 2009;122:815–9.
- Thomas K, Chow K, Kirby RS. Acute urinary retention: a review of the aetiology and management. *Prostate Cancer Prostatic Dis*. 2004;7(1):32–37.
- Hargreave TB, McNeill AS. Acute urinary retention in men: the risks and outcomes with medical therapy. *Curr Urol Rep*. 2005;6(4):263–270.
- Crawford ED, Wilson SS, McConnell JD, et al; MTOPS Research Group. Baseline factors as predictors of clinical progression of benign prostatic hyperplasia in men treated with placebo. *J Urol*. 2006;175(4):1422–1427.
- Kolman C, Girman CJ, Jacobsen SJ et al. Distribution of post-void residual urine in randomly selected men. *J Urol* 1999; 161: 122–7
- Vallancien G, Emberton M, Alcaraz A et al. Alfuzosin 10 mg once daily for treating benign prostatic hyperplasia. *BJU Int* 2008; 101: 847–52
- McNeill SA. Spontaneous versus precipitated AUR: the same? *World J Urol* 2006; 24: 354–9
- Manikandan R, Srirangam SJ, O'Reilly PH et al. Management of acute urinary retention secondary to benign prostatic hyperplasia in the UK: a national survey. *BJU Int* 2004; 93: 84–8
- McNeill SA, Hargreave TB, members of the ALFAUR Study Group. Alfuzosin once daily facilitates return to voiding in patients in acute urinary retention. *J Urol* 2004; 171: 2316–20
- Izard J, Nickel JC. Impact of medical therapy on transurethral resection of the prostate:

two decades of change. *BJU international*. 2011 Jul;108(1):89–93.

- Demirel HC, Gökkaya CS, Özden C, Aktas BK, Bulut S, Memis A, et al. The risk factors for acute urinary retention in patients with benign prostatic hyperplasia/Benign prostatic hyperplasia hastalarda akut üriner retansiyon gelişimine etki eden risk faktörleri. *Urology Research & Practice*. 2012 Jun 1;38(2):65
- Velmurugan P, Bhaskara Prakash AR, Sriram K, Venkat Ramanan S, Natarajan K. Predictors of Acute Urinary Retention in Benign Prostatic Hyperplasia - A Comparative Study in Patients with Acute Urinary Retention and Without Retention. *JMSR*. 2019 Feb; 7(2): 899-905.
- Jacobsen SJ, Jacobson DJ, Girman CJ, et al. Natural history of prostatism: risk factors for acute urinary retention. *J Urol*. 1997; 158:481–487.
- Thapa N, Basukala S, Shah KB, Rayamajhi BB, Ayer D, Basukala B, Karki S, Bista SB. Associated risk factors for acute urinary retention among patients presenting with benign prostatic hyperplasia at a tertiary care hospital in Nepal. *Journal of Patan Academy of Health Sciences*. 2021 Dec 31;8(3):87–93.
- Roehrborn CG, McConnell JD, Lieber M, Kaplan S, Geller J, Malek GH, et al Serum prostate-specific antigen concentration is a powerful predictor of acute urinary retention and need for surgery in men with clinical benign prostatic hyperplasia. *PLESS Study Group Urology* 1999;53:473–80
- Kefi A, Koseoglu H, Celebi I, Yonukoglu K, Esen A. Relation between acute urinary retention, chronic prostatic inflammation and accompanying elevated prostate-specific antigen. *Scand J Urol Nephrol* 2006;40:155–60
- Marberger MJ, Andersen JT, Nickel JC, et al. Prostate volume and serum prostate-specific antigen as predictors of acute urinary retention. Combined experience from three large multinational placebo-controlled trials. *Eur Urol*. 2000; 38:563–568.
- Sasaki K, Yoshimura N, Chancellor MB. Implications of diabetes mellitus in urology. *Urol Clin North Am*. 2003; 30(1):1–12.