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Clinico-Pathological Evaluation of Lower Urinary Tract Symptoms in A Tertiary Care Setting

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Abstract

Lower urinary tract symptoms (LUTS) encompass a range of bothersome urinary complaints that significantly impact quality of life. This prospective observational study investigated the clinico-pathological characteristics of LUTS in 200 patients presenting to a tertiary care center. The study aimed to enhance understanding of this prevalent condition and inform clinical practice. The most common presenting complaints were dysuria (40.5%), retention of urine (34%), poor stream (34.5%), and difficulty in micturition (31%). The predominant diagnoses were benign prostatic hyperplasia (BPH) (25%) and urethral stricture (22.5%), followed by bladder cancer (18%). Laboratory investigations revealed hematuria in 13.5% of patients and pyuria in 9%. The diversity of diagnoses and clinical presentations underscores the importance of a comprehensive clinico-pathological evaluation for accurate diagnosis and tailored treatment of LUTS.

Keywords: Lower urinary tract symptoms, LUTS, BPH, Urethral stricture, Bladder cancer

Introduction

Lower urinary tract symptoms (LUTS) present a complex array of complaints that affect the storage, voiding, and post-micturition phases of urinary function [1]. These symptoms, while often dismissed as a natural part of aging, can significantly impair an individual's quality of life and overall well-being [2]. The International Continence Society (ICS) classifies LUTS into three distinct categories: storage symptoms (increased daytime frequency, nocturia, urgency, and urinary incontinence), voiding symptoms (hesitancy, straining, weak stream, intermittency, and terminal dribble), and post-micturition symptoms (post-micturition dribble and a feeling of incomplete emptying) [3]. The specific combination and severity of these symptoms vary among individuals, necessitating a personalized approach to diagnosis and management [4].

The prevalence of LUTS is substantial, affecting an estimated one in four adults globally [5]. The likelihood of experiencing LUTS increases with age, with over 70% of individuals aged 80 and above reporting some form of these symptoms [6]. The widespread nature of LUTS translates into a significant economic burden, accounting for a considerable portion of healthcare expenditures [7-9]. Beyond the financial implications, LUTS profoundly impacts the quality of life, disrupting sleep, limiting social interactions, hindering physical activity, and contributing to psychological distress [10-13]. The unpredictable and often embarrassing nature of LUTS can lead to social isolation, anxiety, and depression, further diminishing the well-being of those affected.

The aetiology of LUTS is multifactorial, encompassing a wide array of contributing factors. Benign prostatic hyperplasia (BPH), a common condition in aging men, often leads to bladder outlet obstruction and voiding difficulties [14-16]. Detrusor over activity (DO), characterized by involuntary bladder contractions, results in urgency and frequency, while detrusor under activity (DU) manifests as weak or absent bladder contractions, leading to incomplete emptying and retention [17-19]. Neurological disorders, such as Parkinson's disease and multiple sclerosis, can disrupt the intricate neural control of micturition [20]. Pelvic floor dysfunction, encompassing both weakness and over activity, can also contribute to LUTS [4, 21, 22]. Anatomical abnormalities, including bladder stones and urethral strictures, can obstruct urine flow, while certain medications can inadvertently affect bladder function [23-25]. The intricate interplay of these factors necessitates a comprehensive approach to LUTS diagnosis and management.

The clinico-pathological evaluation (CPE) emerges as a crucial tool in navigating the complexities of LUTS. By integrating patient history, physical examination, laboratory investigations, and imaging modalities, the CPE enables accurate diagnosis and differentiation between various LUTS subtypes [26]. This comprehensive assessment aids in identifying the underlying cause, whether it be BPH, DO, DU, neurological dysfunction, or other contributing factors. Moreover, the CPE allows for the stratification of LUTS severity, guiding clinicians in tailoring treatment intensity and monitoring strategies [27]. In certain cases, the CPE can also contribute to prognostic assessment, predicting the potential course of LUTS and identifying individuals at risk of complications [28].

Driven by the need to enhance our understanding of LUTS and its varied manifestations, this study aimed to evaluate the clinico-pathological findings in patients presenting with LUTS at a tertiary care centre. The specific objectives were to characterize the demographic profile, clinical presentations, laboratory findings, and diagnostic patterns associated with LUTS in this patient population.

Materials and Methods

The foundation of this research was a prospective observational study, meticulously conducted within the Department of General Surgery at Gandhi Medical College and its associated Hamidia Hospital in Bhopal. The study spanned two years, from August 2022 to August 2024. The study population encompassed 200 consecutive patients, irrespective of gender or age, who presented with clinical manifestations of Lower Urinary Tract Symptoms (LUTS). The inclusion criteria encompassed individuals with storage symptoms (frequency, nocturia, urgency, urinary incontinence), voiding symptoms (slow stream, hesitancy, straining), or post-micturition symptoms (incomplete emptying, dribble). However, patients with LUTS attributed to

trauma or those declining participation were excluded from the study.

Data collection involved a comprehensive approach, including detailed history taking and a battery of investigations. These investigations included routine urine analysis, urine culture and sensitivity, renal function tests, X-ray KUB, ultrasonography of the kidneys, ureters, and bladder (KUB) and prostate, post-void residual urine measurement, micturating cystourethrogram/retrograde urethrogram, uroflowmetry, serum prostate-specific antigen (PSA), and urodynamic studies. The breadth of these investigations aimed to provide a holistic understanding of the patients' LUTS.

The data was organized and analysed using appropriate statistical software (Epi Info Version 6). The analysis encompassed frequency distributions, cross-tabulations, and descriptive statistics for quantitative and categorical variables. The statistical rigor of the study was further enhanced by employing Student's t-test for comparing means and the Chi-Square test for categorical data, with a p-value of <0.05 signifying statistical significance.

Results

Demographic Characteristics

The study cohort consisted of 200 patients, with a male predominance (81.5%). The age distribution revealed that the majority of patients (64.5%) were over 51 years old, with the largest group (51.5%) falling within the 51-70 age range. The distribution of patients by age and gender demonstrated a statistically significant association (p<0.001).

Table 1: Distribution of patients according to the age group and gender

Age Group	Gender		Total	Chi square value
	Male	Female		
	N (%)	N (%)	N (%)	P value
≤30	14 (8.6)	7 (18.9)	21 (10.5)	43.043
31-50	27 (16.6)	23 (62.2)	50 (25.0)	0.000
51-70	96 (58.9)	7 (18.9)	103 (51.5)	
≥71	26 (16.0)	0 (0.0)	26 (13.0)	
Total	163 (100.0)	37 (100.0)	200 (100.0)	

Clinical Presentation

The most prevalent presenting complaints were dysuria (40.5%), retention of urine (34%), poor stream (34.5%), and difficulty in micturition (31%). Less frequent complaints included suprapubic pain (15%), haematuria (10%), and dribbling (18.5%). [Table 4]

Table 2: Distribution of patients according to the presenting complaints

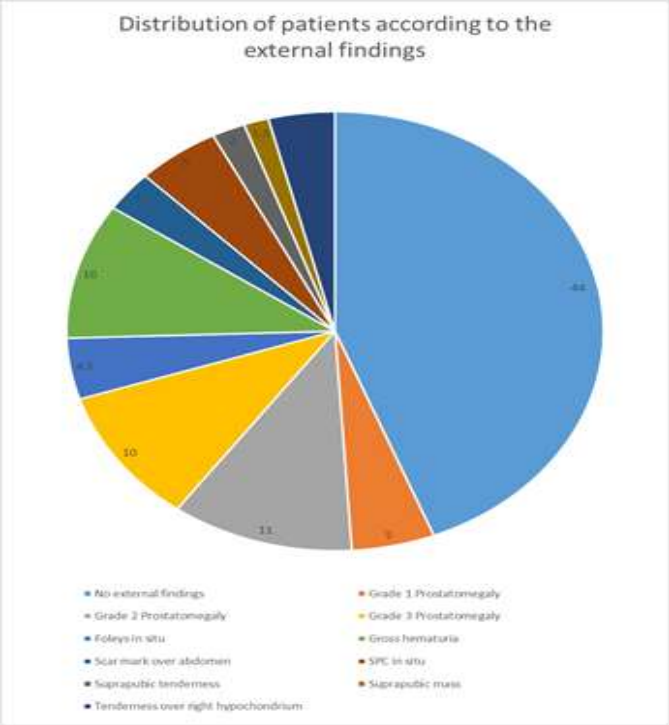
Sn.	Presenting Complaints	No of Patients	Percentage
1	Difficulty in micturition	62	31.0
2	Retention of urine	68	34.0
3	Poor stream	69	34.5
4	Suprapubic pain	30	15.0
5	Hematuria	18	9.0
6	Dysuria	44	22.0
7	Burning Micturition	37	18.5
8	Dribbling	37	18.5

External Findings

A significant proportion of patients (44%) did not exhibit any abnormal external findings. Among those with abnormal findings, Grade 2 (11%) and Grade 3 (10%) prostatomegaly were the most common, followed by gross haematuria (10%) and the presence of Foley catheters (4.5%).

Laboratory Findings

Urine microscopy detected red blood cells (RBCs) in 13.5% of patients and pus cells in 9%. The mean serum urea and creatinine levels were 38.98 mg/dl (SD 26.12) and 1.00 mg/dl (SD 0.99), respectively. Serum PSA, measured in a subset of 55 male patients, had a mean value of 22.3 ng/ml (SD 35.2)



Graph 1: Distribution of patients according to the external findings

Distribution of Diagnoses

The most frequent diagnoses were benign prostatic hyperplasia (BPH) (25%) and urethral stricture (22.5%), followed by bladder cancer (18%). The remaining cases encompassed a range of other urological conditions, including renal calculi, bladder outlet obstruction, and others.

Table 3: Distribution of patients according to diagnosis

Sn.	Diagnosis	No of Patients	Percentage
1	BPH	50	25.0
2	Urethral stricture	45	22.5
3	Ca UB	36	18.0
4	Renal calculi	15	7.5
5	BOO	10	5.0
6	VVF	4	2.0
7	UTI	8	4.0
8	Ca Prostate	8	4.0
9	VUJ Calculi	7	3.5
10	Neurogenic bladder	4	2.0
11	Bladder calculi	6	3.0
12	Ureteric calculi	4	2.0
13	Chronic prostatis	3	1.5
Total		200	100

Discussion

The Demographic Landscape of LUTS

The present study revealed that the majority of patients presenting with LUTS were older men, a finding that aligns with the well-established association between LUTS and increasing age, particularly in men [29, 30]. The age-related increase in LUTS can be attributed to several factors, including prostatic enlargement in men and decreased bladder capacity in both sexes [31]. The higher prevalence of comorbidities in older individuals, such as diabetes and hypertension, may also contribute to LUTS development and progression [32].

The male predominance observed in our study (81.5%) is consistent with the literature, which consistently reports a higher prevalence of LUTS in men [30, 33]. This gender disparity is primarily attributed to anatomical and hormonal differences. Benign prostatic hyperplasia (BPH), a major contributor to LUTS, is prevalent in older men [33]. In contrast, LUTS in women can stem from various factors, including pelvic floor dysfunction, hormonal changes, and childbirth-related trauma [34, 35]. Interestingly, our data revealed an interaction between age and gender in LUTS presentation. While LUTS was

more common in older men, the majority of female patients were in the 31-50 age group. This suggests that distinct factors may drive LUTS development in men and women at different life stages. In women, childbirth and hormonal fluctuations associated with menopause could be significant contributors to LUTS in the 31-50 age group [36, 37]. The predominance of LUTS in older men could be explained by the progressive nature of BPH and the accumulation of other age-related risk factors [31, 38].

The demographic findings of this study emphasize the importance of targeted screening and preventive measures for LUTS in specific age and gender groups. Healthcare providers should be particularly vigilant in assessing and managing LUTS in older men, given the high prevalence and potential impact on quality of life. In women, the focus should be on identifying and addressing potential risk factors related to childbirth and menopause. Further research is needed to elucidate the precise mechanisms underlying the age and gender-related differences in LUTS presentation.

The Clinical Spectrum of LUTS

The most frequent presenting complaints in our study cohort were dysuria (40.5%), retention of urine (34.0%), poor stream (34.5%), and difficulty in micturition (31.0%). These findings resonate with the typical LUTS symptomatology reported in various studies. Notably, Bharti et al. (2023) observed that storage LUTS, particularly nocturia and frequency, were predominant in postmenopausal women, while voiding LUTS, such as weak stream, were also common [36]. Similarly, Mohamad Anuar et al. (2022) identified nocturia as the most prevalent and bothersome symptom in their community-based study [39]. The high prevalence of these specific complaints in our study underscores the importance of thoroughly evaluating both storage and voiding symptoms in patients presenting with LUTS. The accurate identification of the predominant symptom complex can guide targeted treatment interventions.

In our study, a significant proportion of patients (44%) presented with no abnormal external findings. However, prostatomegaly (Grades 2 and 3), gross haematuria, and other abnormalities were observed in the remaining patients. The absence of external findings in almost half of the patients emphasizes the importance of a comprehensive evaluation that extends beyond a physical examination. As highlighted by Debbarma et al. (2023), relying solely on patient-reported symptoms might lead to under diagnosis of LUTS, as many individuals may not spontaneously report their complaints due to a lack of awareness or social stigma [35]. The presence of specific external findings can offer valuable diagnostic and treatment planning clues. For instance, prostatomegaly is a hallmark of BPH, which was the most common diagnosis in our study, alongside urethral stricture [40]. Gross haematuria could indicate urinary tract malignancy, such as bladder or prostate cancer [33]. Further investigations, such as urine cytology, cystoscopy, and imaging studies, are crucial for confirming the diagnosis and tailoring treatment accordingly.

The diverse clinical presentations observed in our study underscore the critical importance of a comprehensive evaluation that goes beyond patient-reported symptoms. The combination of patient history, physical examination findings, and targeted investigations is essential for unravelling the underlying cause of LUTS and formulating personalized treatment plans.

Laboratory and Diagnostic Insights

The laboratory findings in our study revealed that a minority of patients presented with haematuria (13.5%) or pyuria (9%). While these proportions may seem

relatively low, the presence of either finding carries clinical significance in the context of LUTS. Haematuria, the presence of red blood cells in the urine, can signal various underlying conditions, including urinary tract infections, urolithiasis, or even malignancy [33]. Similarly, pyuria, the presence of white blood cells in the urine, often suggests an underlying inflammatory or infectious process, such as a UTI [32]. The detection of haematuria or pyuria should prompt further investigation to identify the specific cause and guide appropriate treatment.

The majority of our patients had serum urea and creatinine levels within the normal range. However, a subset exhibited elevated levels, particularly of serum urea. Elevated serum urea and creatinine can indicate renal dysfunction, a potential complication of LUTS, especially in older individuals with comorbidities [38]. The mean age of patients with elevated urea levels in our study was higher than those with normal levels, suggesting an age-related susceptibility to renal impairment. These findings emphasize the importance of monitoring renal function in LUTS patients, especially in older populations.

Serum PSA levels were evaluated in a subset of male patients. A significant proportion (36.4%) had PSA levels above 10.01 ng/ml. Elevated PSA levels are often associated with BPH and prostate cancer [31]. In our study, both BPH and prostate cancer were among the diagnosed conditions. The role of PSA in LUTS evaluation remains a subject of ongoing debate. Our findings support the notion that PSA, when interpreted in conjunction with other clinical and laboratory parameters, can provide valuable information for guiding further investigation and management of LUTS in men.

The distribution of diagnoses in our study population revealed a significant prevalence of benign prostatic hyperplasia (BPH) and urethral stricture, followed by bladder cancer. The remaining cases comprised a variety of other urological conditions. The diversity of diagnoses underscores the importance of a comprehensive and individualized approach to LUTS management. The optimal management strategy hinges on accurately identifying the underlying cause, which may necessitate further investigations beyond routine laboratory tests. The goal is to provide tailored interventions that effectively alleviate symptoms, improve quality of life, and minimize the risk of complications.

Study Strengths, Limitations, and Future Directions

The present study possesses several strengths that enhance its contribution to the understanding of LUTS. The prospective design allowed for the systematic collection of data and minimized the risk of recall bias. The comprehensive data collection, encompassing detailed history, physical examinations, and a wide array of laboratory and imaging investigations, provided a holistic view of the clinico-pathological characteristics of LUTS. The inclusion of a diverse patient population, irrespective of age and gender, further strengthens the generalizability of the findings.

However, the study also has certain limitations that warrant acknowledgment. The cross-sectional nature precludes the assessment of causality and long-term outcomes. The study's conduct at a tertiary care center may introduce a selection bias, as the patient population might not be entirely representative of the general population. The lack of detailed urodynamic evaluations in all patients limits the ability to fully elucidate the underlying mechanisms of LUTS in some cases.

Future research should focus on addressing these limitations and expanding upon the current findings. Longitudinal studies are needed to assess the long-term outcomes of LUTS and the impact of various treatment

modalities. Multi center studies involving a wider range of healthcare settings would enhance the generalizability of the results. The incorporation of advanced diagnostic tools, such as novel imaging modalities and biomarkers, could further refine the diagnostic process and improve patient care. Additionally, future research should explore the psychological and social dimensions of LUTS, as these aspects significantly impact the quality of life of affected individuals.

Conclusion

The present study has illuminated the clinical and pathological spectrum of lower urinary tract symptoms (LUTS) in a diverse patient population. The findings corroborate the well-established association between LUTS and increasing age, particularly in men. The study also highlights the diverse aetiologies of LUTS, ranging from benign conditions like BPH and urethral stricture to malignant diseases like bladder and prostate cancer. The most common presenting complaints were retention of urine, poor stream, difficulty in micturition, and dysuria, underscoring the importance of thorough assessment and diagnostic workup for accurate diagnosis and tailored treatment.

The heterogeneity of LUTS presentations and the potential for serious underlying conditions necessitate a comprehensive and individualized approach to management. The study's findings emphasize the need for heightened awareness among healthcare providers regarding LUTS, particularly in older males. Early recognition and prompt intervention can significantly impact patient outcomes. The importance of a thorough clinical and laboratory evaluation to facilitate accurate diagnosis and appropriate management of LUTS cannot be overstated. Future research with larger, multicentre studies and control groups could further enhance our understanding of the complex landscape of LUTS and guide the development of targeted therapeutic strategies.

Abbreviations

LUTS - Lower Urinary Tract Symptoms

ICS - International Continence Society

BPH - Benign Prostatic Hyperplasia

DO - Detrusor Over activity

DU - Detrusor Under activity

KUB - Kidneys, Ureters, and Bladder

PSA - Prostate-Specific Antigen

UTI - Urinary Tract Infection

SD - Standard Deviation

IPD - Inpatient Department

QoL - Quality of Life

OAB - Overactive Bladder

BOO - Bladder Outlet Obstruction

VVF - Vesicovaginal Fistula

Ca - Carcinoma

VUJ - Vesicoureteral Junction

PUJ - Pelviureteric Junction

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