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Uroflowmetry Derived Index: A New Novel Metric in BPE Evaluation and Treatment Planning

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What's known on the subject? and What does the study add?

Uroflowmetry and international prostate symptom score (IPSS) commonly used in benign prostatic enlargement (BPE) assessment. Diagnostic ambiguity often due to mismatch between symptom scores and flow rates. Urodynamic studies are considered the gold standard; however, they are invasive and less accessible. Guidelines recommend combining symptom scores with objective parameters for accurate evaluation. Isolated flow metrics insufficient for predicting treatment outcomes reliably. Introduction of the flow-derived bladder outlet efficiency (FDBOE) index as a novel, non-invasive parameter; integration of voiding efficiency and dynamic flow parameters into a single composite metric. Demonstration of strong inverse correlation between FDBOE and IPSS. Stratification of patients using FDBOE grading to predict treatment response and surgical need; provision of a simple, reproducible, and resource-friendly tool for clinical decision-making in BPE.

Abstract

Objective: Benign prostatic enlargement (BPE) causes lower urinary tract symptoms (LUTS) in ageing men. While conventional diagnostic tools like the international prostate symptom score (IPSS) and uroflowmetry are routinely used, they often yield equivocal findings. Urodynamic studies, though definitive, are invasive and less accessible. This study aimed to evaluate the clinical utility of a novel, non-invasive uroflowmetry-derived parameter—flow-derived bladder outlet efficiency (FDBOE)—in assessing symptom severity and predicting treatment outcomes in BPE.

Materials and Methods: A prospective observational study was conducted over four months involving 51 male patients aged >45 years presenting with LUTS due to BPE. After exclusion of confounding urological conditions, baseline IPSS and uroflowmetry assessments were performed. FDBOE was calculated using the formula: Voiding efficiency × Q_{avg} × (flow time/total voiding time). All patients were started on silodosin (8 mg daily) and reassessed after four weeks.

Results: FDBOE values ranged from 0.51 to 7.76 mL/sec, with a mean of 3.49±1.70 mL/sec. A strong inverse correlation between FDBOE and IPSS ($r=-0.832$, $p<0.001$) was observed. Sensitivity analysis using an FDBOE threshold of ≤3.3 mL/sec yielded a sensitivity of 92.6% for detecting severe LUTS. Post-treatment analysis revealed that 95% of grade I patients, 35% of grade II patients, and none of the grade III patients required surgical intervention.

Conclusion: FDBOE is a simple, reproducible, non-invasive parameter that correlates strongly with LUTS severity, and predicts treatment outcomes in BPE. It offers practical utility in clinical decision-making, especially in resource-limited settings.

Keywords: BPE, uroflowmetry, IPSS, voiding efficiency

Introduction

Benign prostatic enlargement (BPE) leads to lower urinary tract symptoms (LUTS) in nearly 50% of men over 50 years old (1). Workup in these patients begins with an international prostatic symptom score (IPSS) calculation. Uroflowmetry, a common non-invasive test, is routinely done as an extension of the clinical examination. All these tests aim to assess the severity of the disease at the time of diagnosis to start the treatment.

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They also warn patients about the future risk of worsening symptoms or the likelihood of failure of medical therapy.

However, many times, equivocal findings on uroflowmetry raise questions about the future progression of the disease. Also, sometimes the IPSSs do not correlate with uroflowmetry findings. Patients with high symptom scores may exhibit normal flow rates, and vice versa, complicating the diagnostic process (2). Many clinicians opt for a urodynamic study (UDS) in such cases to decide the further management plan. But unfortunately, urodynamic studies are not available everywhere, especially in remote areas where medical facilities are not very adequate. Furthermore, the invasive nature of the UDS reduces the number of patients opting for it. As such, there arises a need to obtain more concrete answers using non-invasive tests.

In light of the same, we conducted a prospective study to determine whether uroflowmetry values could be useful, especially in equivocal results, to assess the severity of the disease and predict the outcome of the medical management. Through this study, we attempted to derive a flow-derived index using routinely available uroflowmetry variables such as voiding efficiency (VE), average flow rate (Q_{avg}), flow time and total voiding time. The main idea behind the index derivation was to provide a more holistic representation of voiding dynamics to predict symptom severity and treatment response more accurately. To our knowledge, this is the first observational study to explore the utility of a flow-derived index as a predictive tool for symptom burden and medical treatment outcomes in men with BPE and LUTS. This is the first prospective observational study on such a topic.

Materials and Methods

It was a prospective observational study carried out over 4 months at our institute. Approval from the KMC Medical College and Hospital Institutional Ethics Committee (approval number: IEC/KMC/2025/0487, date: 04.02.2025) was obtained before commencing the study. The study population included male patients with BPE, aged >45 years, who came to the outpatient department with LUTS. Patients with indwelling catheters, underlying urinary tract infections, gross haematuria, urethral stricture disease or neurogenic bladder were excluded from the study. Proper informed consent was taken from all the patients before enrolling them in the study.

The IPSSs of all the included patients were calculated. Following this, they all underwent uroflowmetry testing. Voided volume, post-void residual volume (PVR), VE, maximum flow rate (Q_{max}), average flow rate (Q_{avg}), flow time (time during which the urine flow occurred) and total voiding time (total time taken from the command to void to the end of flow) were all calculated and analysed. Ultrasound of kidneys, urinary bladder and prostate, urine routine examination, urine culture, complete blood count, kidney function test, and serum prostate-specific antigen were also done as a part of the routine workup for BPE.

Using the uroflowmetry parameters, a product of VE x Q_{avg} x flowtime/total voiding time was calculated for all the patients at the initial presentation. This product was labeled the flow-derived bladder outlet efficiency (FDBOE). Patients were then administered medical management with the same alpha blocker (tablet silodosin 8 mg), and 4 weeks later, they were reassessed with IPSS, voiding satisfaction, and Uroflowmetry. The FDBOE calculated on the initial presentation was correlated with the IPSS, voiding satisfaction, and uroflowmetry findings after 4 weeks of medical management. The results were analysed (Figure 1).

In the FDBOE calculation—VE × Q_{avg} × (flow time/total voiding time)—, each variable adheres to standard urodynamic units. VE is expressed as a fraction (not a percentage), derived from the ratio of voided volume to total bladder volume (voided volume + post-void residual); hence, it is unitless. Q_{avg}, or average flow rate, is measured in millilitres per second (mL/s), which is the conventional unit reported in uroflowmetry. Both flow time and total voiding time are recorded in seconds, rendering their ratio dimensionless. Therefore, the final FDBOE value retains the unit of mL/sec, effectively reflecting a modified flow efficiency metric. This unit consistency allows for meaningful comparisons across patients and over time, and ensures that the index can be seamlessly integrated into routine clinical uroflowmetry assessments.

Statistical Analysis

As this was the first such prospective study, a convenience sample of at least 30 patients was taken as the sample size. However, all the patients meeting the inclusion criteria within the study

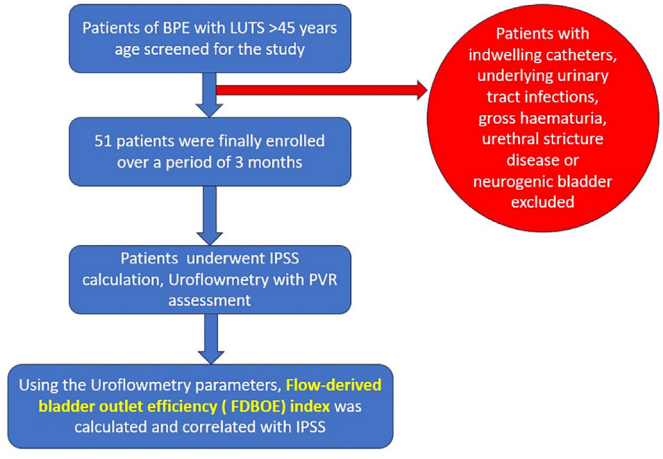

Figure 1. Showing study algorithm

IPSS: International prostate symptom score, LUTS: Lower urinary tract symptoms, PVR: Post-void residual volume

period were included. Statistical analysis was done using SPSS software version 28. Pearson's correlation coefficient was used to determine the correlation between the different parameters.

Results

In this prospective observational study, 51 male patients with BPE were enrolled. The mean age of the cohort was 62.3 years, with ages ranging from 48 to 78 years. Based on their baseline IPSS, 27 patients (52.9%) presented with severe LUTS (IPSS ≥20), while the remaining 24 patients (47.1%) were categorised as having moderate LUTS (IPSS 8-19). None of the patients presented with mild LUTS.

The calculated FDBOE index ranged from 0.51 to 7.76 mL/sec, with a mean value of 3.49±1.70 mL/sec across the cohort. This helped in understanding the data spread and natural clustering of patients. Patients with FDBOE values significantly below the mean consistently exhibited severe symptoms and poor voiding dynamics. In contrast, those with values significantly above the mean displayed milder symptoms and efficient bladder emptying. To formalize this, sensitivity analysis was performed using IPSS ≥20 as a marker for severe LUTS, leading to the identification of an optimized FDBOE threshold of ≤3.3 mL/sec, which correctly identified nearly 90% of severe cases. Thus, patients with FDBOE values, <2.9 mL/sec, slightly below the threshold to maintain higher specificity, were classified as grade I (low efficiency). The middle range, between 2.9 and 4.5 mL/sec, was defined as grade II (moderate efficiency), representing patients with mixed symptom profiles and intermediate voiding dynamics. Grade III (high efficiency) included those with FDBOE values >4.5 mL/sec, where patients consistently exhibited efficient bladder outlet function and lower symptom burden. This stratification logically transforms the continuous FDBOE data into clinically actionable categories, aligning statistical observations with meaningful clinical outcomes for practical application in patient management. Grade I (low efficiency) with FDBOE <2.9 mL/sec included 20 patients (39.2%); grade II (moderate efficiency) with FDBOE values between 2.9 and 4.5 mL/sec comprised 17 patients (33.3%); and grade III (high efficiency) with FDBOE >4.5 mL/sec encompassed 14 patients (27.5%).

Patients in grade I predominantly demonstrated severe LUTS, with 17 out of 20 patients (85%) in this group having IPSS ≥20. The mean IPSS in this subset was notably high at 21.8, accompanied by lower average flow rates and elevated PVR volumes. Particularly patients with FDBOE <1.5 mL/sec represented the most clinically significant subgroup, with uniformly severe symptoms and markedly impaired voiding parameters. This suggests that FDBOE values below this threshold may serve as a "red flag" indicator of significant bladder outlet inefficiency. Conversely, patients in grade III predominantly had moderate LUTS, with only one patient showing severe symptoms. Their mean IPSS was significantly lower at 14.3, reflecting milder symptomatology and efficient bladder emptying.

Correlation analysis underscored the clinical relevance of the FDBOE index. A strong inverse correlation was observed between FDBOE and IPSS ($r=-0.832$, $p<0.001$), indicating that higher FDBOE values were consistently associated with lower symptom scores. In contrast, conventional uroflowmetry parameters displayed weaker associations: the average flow rate (Q_{avg}) showed a moderate inverse correlation ($r=-0.664$, $p<0.001$), and PVR exhibited a moderate positive correlation ($r=+0.552$, $p<0.001$) with IPSS. This confirms that FDBOE, as a composite metric, reflects symptom burden more robustly than single uroflowmetry measures.

A sensitivity analysis further validated the clinical utility of the FDBOE index. Using FDBOE <2.9 mL/sec as a threshold for defining low outlet efficiency, the index correctly identified 23 of 27 patients with severe LUTS, yielding a sensitivity of 85.2%. Additionally, when focusing on patients with FDBOE <1.5 mL/sec, the index exhibited a perfect correlation with severe symptoms, albeit, in a smaller subset, suggesting that this stricter threshold may serve as a highly specific predictor of advanced bladder outlet obstruction (BOO). Using IPSS ≥20 as the reference standard for severe LUTS, the diagnostic performance of the FDBOE index was evaluated at two thresholds. At a cut-off of ≤3.3 mL/sec, FDBOE demonstrated excellent sensitivity (100%) and negative predictive value (100%), ensuring that no patients with severe LUTS were missed. However, specificity was modest at 62.9%, with a positive predictive value of 55.2% and an overall accuracy of 74.5%, reflecting a higher rate of false positives. In contrast, applying a stricter threshold of <2.9 mL/sec improved the balance of diagnostic metrics, yielding a sensitivity of 93.8%, specificity of 82.9%, positive predictive value of 71.4%, negative predictive value of 96.7%, and accuracy of 86.3%. These findings suggest that while the 3.3 mL/sec cut-off is optimal for ruling out severe LUTS, the 2.9 mL/sec threshold offers superior overall diagnostic performance and may be more clinically useful in stratifying patients.

After 4 weeks of follow-up, it was found that the clinical significance of FDBOE-based stratification was strongly reflected in treatment outcomes. In grade I, of the 20 patients, 19 (95%) ultimately required surgical intervention due to failure of medical therapy, underscoring the predictive value of low FDBOE scores in identifying patients with refractory BOO. In grade II, out of 17 patients, 6 (35%) required surgery after failing to respond adequately to alpha-blocker therapy, highlighting the variable treatment trajectory in this intermediate group. Notably, in grade III, which included 14 patients, none (0%) progressed to surgical intervention, indicating that patients

with high FDBOE values reliably benefited from conservative medical management. These outcome patterns validate the FDBOE grading as not only a reflection of baseline VE but also a predictive marker for clinical decision-making. Patients with lower FDBOE values are more likely to fail medical therapy and require early surgical referral, while those with higher efficiency scores can be confidently managed with pharmacotherapy alone. This reinforces the practical utility of the FDBOE index as a non-invasive, outcome-oriented tool in the management of BPE.

The results substantiate the FDBOE index as a superior, integrative uroflowmetry-derived parameter. Patients with FDBOE <2.9 mL/sec should be considered at risk for severe LUTS and suboptimal response to medical therapy alone, potentially benefiting from closer monitoring or earlier surgical consideration. Conversely, FDBOE >4.5 mL/sec appears predictive of good bladder outlet efficiency, milder symptom burden, and better responsiveness to pharmacotherapy.

The results suggest a strong inverse correlation between FDBOE and IPSS, supporting the use of FDBOE as a valuable, non-invasive predictor of symptom severity and treatment response in BPE. Unlike traditional uroflowmetry metrics, which may present ambiguous or conflicting information when considered in isolation, FDBOE integrates multiple functional dimensions into a single quantifiable value. This makes it a particularly useful tool in settings where urodynamic studies are unavailable or infeasible. Furthermore, it holds promise for identifying patients who may require closer follow-up or early surgical referral compared to those likely to benefit from conservative medical therapy alone.

It is important to clarify that this study was intentionally designed as a pilot prospective observational investigation, with the primary objective of introducing and preliminarily validating the FDBOE index as a novel, non-invasive metric derived from standard uroflowmetry variables. The sample size of 51 patients, though modest, was sufficient to demonstrate statistically significant correlations, most notably, a strong inverse relationship between FDBOE and IPSS. This provides early evidence of the index's potential clinical relevance. The absence of a control group reflects the fact that this was not an interventional or comparative study, but rather a hypothesis-generating analysis focused on correlating a new parameter with established clinical markers. Furthermore, the 4-week follow-up was deliberately chosen to assess the initial symptomatic response to alpha-blocker therapy, which is known to manifest early improvements in LUTS. While a longer follow-up period would be essential to establish the predictive durability of FDBOE, and a control group would strengthen the generalisability of results, this preliminary study was not intended to draw definitive conclusions but to lay the groundwork for larger, more robust prospective trials.

Discussion

BPE is a leading cause of LUTS in ageing males and can significantly impact quality of life. The standard evaluation of BPE includes symptom assessment using the IPSS and objective testing such as uroflowmetry. However, in many clinical scenarios, IPSS and uroflowmetry findings do not correlate well, leading to diagnostic ambiguity. In such cases, UDS are often recommended but are invasive, costly, and not always feasible in routine outpatient or rural settings (3). In response to this diagnostic gap, our study introduced the FDBOE index, a novel, non-invasive parameter derived from standard uroflowmetry components, aiming to offer a more integrated and clinically useful assessment of bladder outlet function.

The FDBOE index is calculated as VE × average flow rate (Q_{avg}) × flow time/total voiding time. This formula captures multiple aspects of voiding physiology, unlike traditional single-parameter measures. Q_{avg} was deliberately chosen for the FDBOE formula because it reflects the overall voiding dynamics across the entire flow period, whereas Q_{max} captures only a single peak moment that is highly variable, and effort-dependent. Given the objective of FDBOE to represent sustained outlet efficiency rather than transient flow peaks, Q_{avg} was considered the more reliable parameter for incorporation into the composite index. Our study found a strong inverse correlation between FDBOE and IPSS, with patients showing low FDBOE values (<2.5) having significantly higher IPSSs (severe LUTS); those with high FDBOE values (>4.5) exhibited mild symptoms. For example, such as patients 12 and 47 had the highest FDBOE values (7.4 and 7.76, respectively) and the lowest IPSSs, suggesting efficient bladder emptying. Conversely, patients with low FDBOE (e.g., patient 8 with a value of 0.81) presented with an IPSS of 24 and a PVR of 125 mL, indicating severe obstruction. This trend is consistent with earlier findings that support the value of combining VE and flow rates for better assessment of bladder outlet performance.

Existing guidelines and expert consensus underscore the limitations of traditional uroflowmetry parameters in reliably diagnosing BOO and predicting treatment outcomes. The European Association of Urology (EAU) Guidelines highlight that parameters such as Q_{max} and PVR often fail to capture the full spectrum of voiding dysfunction, especially in cases where symptom severity does not align with flow rates or prostate size. Similarly, Oelke et al. (4) recommend the use of more integrative assessment tools that combine symptom scores with objective measures, recognizing that reliance on isolated

flow metrics can lead to diagnostic uncertainty in benign prostatic obstruction. Furthermore, Abrams et al. (5) through the International Continence Society, have underscored the necessity for standardisation in lower urinary tract terminology, and evaluation metrics to ensure consistency and clinical relevance in practice. Homma et al. (6) and Park and Lee (7) further emphasise the need for objective, non-invasive metrics that correlate meaningfully with patient-reported symptoms, given the observed inconsistencies between symptom scores and conventional flow rates in LUTS evaluation. In this context, our study introduces the FDBOE index as a clinically practical, non-invasive alternative that integrates VE with dynamic flow parameters to overcome these diagnostic gaps. The strong inverse correlation observed between FDBOE and IPSS in our cohort directly addresses the disconnect highlighted in prior literature, offering a reproducible metric that not only reflects symptom burden more accurately but also predicts treatment response, thus aligning with the call for improved diagnostic tools in current guidelines.

Our data also show that FDBOE could be a practical tool for treatment planning and monitoring. Patients with higher baseline FDBOE values responded more favourably to medical therapy (silodosin 8 mg) over four weeks, as evidenced by improved IPSSs and subjective voiding satisfaction. These findings echo those of Gacci et al. (8) and Lepor et al. (9), who observed that improvements in flow parameters often translate into symptomatic relief when patients are treated with alpha-blockers. By providing a quantifiable and reproducible measure of outlet efficiency, FDBOE may assist clinicians in stratifying patients for medical versus surgical management, particularly when traditional uroflowmetry results are inconclusive or conflicting with clinical symptoms.

Furthermore, the FDBOE index is calculated using non-invasive, widely available data, making it an ideal tool for resource-limited settings where invasive diagnostics like UDS are impractical. Its ease of use, reproducibility, and strong correlation with IPSS make it highly suitable for widespread adoption in primary and secondary care. As supported by studies from Zwergel et al. (10), el Din et al. (11), and Roehrborn et al. (12), integrating flow parameters with symptom scores significantly improves diagnostic accuracy and patient outcomes. In conclusion, FDBOE represents a clinically valuable, non-invasive, and cost-effective addition to the BPE diagnostic toolkit. It offers improved interpretability of uroflowmetry results and may serve as a reliable predictor of treatment response, bridging the gap between subjective symptoms and objective findings in BPE evaluation.

Although this study positions FDBOE as a practical, non-invasive alternative to invasive UDS, it is important to recognize that UDS remains the gold standard for the assessment of BOO. For a novel index such as FDBOE to be considered a strong predictor or a potential surrogate for UDS, direct comparison with established urodynamic parameters is essential. Indices like the BOO index (BOOI) and bladder contractility index (BCI), derived from pressure-flow studies, provide objective insights into outlet resistance and detrusor contractility, which cannot be fully inferred from uroflowmetry alone. While the current study demonstrates a robust correlation between FDBOE and symptom burden, future research should include a subset of patients undergoing UDS to validate FDBOE against this gold standard metric. Such correlation would not only confirm the physiological accuracy of FDBOE in reflecting outlet function, but also significantly strengthen its clinical credibility as a reliable, non-invasive tool for diagnosis and treatment planning in a BPE.

The primary focus of this study was to introduce the FDBOE index as a novel, non-invasive parameter derived from routine uroflowmetry variables, and to assess its correlation with symptom severity in BPE. While the uniqueness of the index was highlighted, we acknowledge that a more comprehensive review of existing composite indices—such as the BOOI, BCI, and other urodynamic-based scoring systems—would provide greater scientific context. These existing indices, although informative, rely on invasive pressure-flow studies, which are not always feasible in routine outpatient or resource-limited settings. FDBOE, by contrast, offers a practical, non-invasive alternative that incorporates VE, flow rate, and time dynamics into a single metric. Furthermore, integrating the EAU 2024 Guidelines, which underscore the limitations of standard uroflowmetry and advocate for improved, accessible diagnostic tools, would strengthen the manuscript. A more detailed comparison with such guidelines and the current literature landscape will be incorporated in future iterations, to better delineate the position of FDBOE within established clinical frameworks. This will highlight the specific diagnostic gap it aims to address.

We acknowledge the concerns regarding the complexity of Table 1 and broader methodological limitations. The detailed presentation was intended to maintain transparency and allow for granular analysis of individual patient parameters in relation to the novel FDBOE index. However, we agree that summarising the data into clinically meaningful groupings—such as FDBOE grades with corresponding mean IPSS, Q_{avg}, and PVR—would enhance clarity and clinical relevance. As this was a pilot feasibility study, the modest sample size, short follow-up, and absence of a control group reflect the preliminary nature of the work rather than definitive conclusions.

Table 1. Showing uroflowmetry parameters and FDBOE index calculation

	IPSSs	Voided volume (mL)	PVR (mL)	Voiding efficiency [voided volume / (voided volume + PVR)]	Q_{avg} (mL/sec)	Flow time (sec)	Total voiding time (sec)	Flow-based bladder outlet efficiency index (voiding efficiency x Q_{avg} x flowtime/total voiding time)
1.	20/35	157	83	0.65	4.9	32	35	2.88
2.	14/35	247	25	0.90	8.1	27	33	5.83
3.	16/35	102	45	0.69	5.3	24	30	2.92
4.	15/35	82	21	0.79	4.0	21	24	2.84
5.	17/35	162	32	0.83	6.8	28	32	4.93
6.	22/35	45	54	0.45	3.6	13	15	1.45
7.	19/35	153	36	0.80	4.7	32	38	3.16
8.	24/35	110	125	0.46	2.1	44	54	0.81
9.	20/35	125	78	0.61	5.8	34	39	3.08
10.	16/35	152	86	0.63	6.1	31	40	3.17
11.	21/35	148	75	0.66	5.9	29	39	2.8
12.	12/35	223	25	0.90	9.2	18	20	7.4
13.	20/35	50	3	0.94	3.0	15	18	2.35
14.	14/35	78	15	0.83	2.5	31	31	2.07
15.	13/35	219	75	0.74	3.4	60	64	2.35
16.	14/35	103	35	0.74	4.3	19	24	2.51
17.	18/35	206	68	0.74	5.1	26	29	3.41
18.	23/35	145	95	0.60	4.2	22	26	2.13
19.	17/35	165	72	0.69	4.9	27	30	3.07
20.	16/35	193	59	0.79	4.3	24	28	2.93
21.	22/35	100	90	0.53	3.8	28	34	1.64
22.	18/35	175	55	0.761	5.2	30	35	3.39
23.	13/35	230	25	0.902	6.5	20	23	5.10
24.	15/35	198	52	0.792	5.6	25	28	3.96
25.	24/35	98	105	0.483	2.9	35	43	1.14
26.	20/35	142	65	0.686	4.7	32	36	2.87
27.	12/35	250	18	0.933	8.5	22	24	7.26
28.	16/35	190	48	0.798	5.9	30	33	4.28
29.	19/35	130	90	0.591	4.2	33	38	2.15
30.	14/35	210	35	0.857	6.7	28	31	5.20
31.	15/35	161	75	0.68	4.7	19	23	2.64
32.	13/35	216	45	0.79	6.1	24	26	4.48
33.	21/35	155	110	0.58	3.9	28	33	1.93
34.	22/35	80	65	0.55	2.8	20	60	0.51
35.	15/35	156	54	0.74	6.2	31	34	4.12
36.	18/35	126	68	0.64	5.8	29	31	3.47
37.	17/35	110	55	0.66	5.9	28	30	3.63
38.	16/35	130	53	0.71	6.1	33	35	4.08
39.	21/35	86	62	0.58	3.8	34	39	1.92
40.	20/35	78	45	0.63	3.9	32	35	2.2
41.	17/35	146	54	0.73	5.5	29	31	3.75
42.	14/35	210	45	0.82	8.9	24	25	6.03
43.	15/35	180	54	0.76	6.0	29	31	4.26
44.	18/35	179	82	0.68	5.1	33	36	3.17
45.	20/35	110	76	0.59	4.2	32	35	2.26
46.	16/35	156	67	0.69	5.8	30	33	3.63
47.	12/35	245	45	0.84	9.6	26	27	7.76
48.	19/35	156	75	0.67	5.0	28	30	3.14
49.	22/35	74	67	0.52	2.6	39	44	1.19
50.	13/35	218	46	0.82	6.2	23	25	4.67
51.	17/35	141	58	0.70	5.3	28	31	3.35

PVR: Post-void residual volume, IPSS: International prostate symptom score, FDBOE: Flow-derived bladder outlet efficiency

Study Limitations

The primary aim was to introduce and explore the utility of FDBOE, and despite the limitations, a strong inverse correlation with IPSS was observed, suggesting potential clinical value. While the current form may not fully meet the standards of high-level evidence, the originality of the approach, and the need for non-invasive, accessible diagnostic tools in BPE support the rationale for further research with larger, methodologically rigorous studies.

Conclusion

In conclusion, the FDBOE index demonstrates strong potential as a non-invasive, integrative marker for assessing bladder outlet function in patients with BPE. A clear inverse relationship was observed between FDBOE and IPSS, with lower FDBOE values correlating with more severe urinary symptoms. This index, combining multiple uroflowmetry parameters, provides a more comprehensive assessment than individual metrics alone. FDBOE may be especially useful in cases with inconclusive uroflowmetry results or where invasive urodynamic studies are impractical. Its clinical utility lies in aiding diagnosis, predicting treatment response, and guiding management decisions in men with LUTS.

Ethics

Ethics Committee Approval: Approval was obtained from the KMC Medical College and Hospital Institutional Ethics Committee (approval number: IEC/KMC/2025/0487, date: 04.02.2025).

Informed Consent: Patient consent was obtained.

Footnotes

Authorship Contributions

Surgical and Medical Practices: G.S., P.N., Concept: G.S., P.N., Design: G.S., P.N., Data Collection or Processing: G.S., P.N., Analysis or Interpretation: G.S., P.N., Literature Search: G.S., P.N., Writing: G.S., P.N.

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