

GWater Optimization for LUTS Patients

Dr.Md. Siddiqur Rahman¹, Dr.Sadia Rahman Shoshi², Dr. Shahana Afroze³,
Dr. Mohammad Asaduzzsman⁴

1. Associate Professor, Department of Urology. Dhaka Medical College, Dhaka, Bangladesh

2. MS (Urology) Course, Phase-B, Dhaka Medical College, Dhaka, Bangladesh

3. Director. Islamic Mission. Islamic Foundation, Dhaka, Bangladesh

4. Associate Professor & Head of Department. Medical Oncology. NICRH, Mohakhali, Dhaka, Bangladesh

Abstract

Background: Lower urinary tract symptoms (LUTS) are highly prevalent among older adults and significantly impair urinary function, sleep quality, and overall quality of life. Water optimization and fluid-behavior modification have emerged as simple, low-cost, non-pharmacological strategies for LUTS management.

Aim of the study: To evaluate the effectiveness of water optimization strategies in improving lower urinary tract symptoms and to investigate the relationship between hydration behavior and symptom severity among patients with LUTS.

Methods: This prospective interventional study was conducted in the Department of Urology of Dhaka Medical College Hospital in Bangladesh. A total of 120 adult patients with LUTS were enrolled consecutively and followed for 8 weeks. Participants received individualized counseling regarding fluid management, including reduction of excessive water intake, limitation of evening and night-time fluid consumption, and reduction of caffeinated beverages. Baseline and follow-up assessments included International Prostate Symptom Score (IPSS), daytime urinary frequency, nocturia, urgency episodes, quality of life score, and fluid intake patterns. Statistical analysis was performed using SPSS version 26.0, and $p < 0.05$ was considered statistically significant.

Result: The mean age of participants was 63.4 ± 9.1 years, and 68.33% were male. Following intervention, significant reductions were observed in total daily water intake, evening fluid intake, night-time water consumption, and caffeinated beverage intake (all $p < 0.001$). IPSS significantly improved from 18.6 ± 5.4 to 11.2 ± 4.3 , while daytime voiding frequency decreased from 11.1 ± 2.8 to 7.8 ± 2.1 episodes/day. Nocturia episodes reduced from 3.4 ± 1.2 to 1.7 ± 0.9 per night, and urgency episodes decreased from 10.8 ± 4.7 to 5.2 ± 3.1 per week (all $p < 0.001$). Significant symptom improvement was achieved in 61.67% of participants, and 67.50% reported satisfaction with the intervention. Compliance with water optimization (adjusted OR 4.82, $p < 0.001$), reduced evening fluid intake (adjusted OR 3.44, $p = 0.004$), and reduced caffeine intake (adjusted OR 2.91, $p = 0.015$) were significant predictors of LUTS improvement.

Conclusion: Water optimization and targeted fluid-behavior modification significantly improved LUTS severity, nocturia, urgency, and quality of life among patients with LUTS. These findings support water optimization as an effective, inexpensive, and easily implementable first-line conservative management strategy for LUTS.

Keywords: Lower urinary tract symptoms, LUTS, water optimization, fluid management, IPSS, quality of life

Corresponding author: Dr. Siddiqur Rahman, Associate Professor, Department of Urology. Dhaka Medical College, Dhaka, Bangladesh.

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I. Introduction

Lower urinary tract symptoms (LUTS) are the symptom complex that is the common pathway to the diseases affecting the lower urinary tract [1]. The etiology of LUTS in men is complex in nature and involves dysfunction of the bladder, prostate, and urethra. [2]. Symptoms may be classified as storage, voiding, or post-micturition and have a variety of systemic, neurological, drug-related, or urological causes [3]. LUTS are estimated to affect 2.3 billion individuals, or 45.8% of the world population in 2018, an increase of 18.4% since 2008 [4]. A regional medical college hospital in Bangladesh showed that 43% of suspected Urinary tract infections (UTIs) patients have significant bacterial growth of uropathogens in their urine samples [5]. The escalating numbers emphasize the importance of developing efficient and cost-effective symptom management strategies. Water optimization is an important supportive intervention in the treatment of LUTS patients, and it is considered an important conservative management strategy among the various options [6]. Fluid management for LUTS is the correct amount, timing, and type of fluid to ensure a proper urine volume to meet metabolic requirements without excessive fluid that contributes to storage symptoms or excessive fluid restriction that increases risk of dehydration, urinary tract infection, and bladder irritation [7]. Hence, adequate hydration is

deemed to be crucial for bladder health and symptom management. Urine production and bladder function are physiologically closely related to water optimization. If fluid intake is extremely high, the kidneys will excrete more urine, and the bladder will fill up more and more frequently [6,8]. On the other hand, urgency and other lower urinary tract symptoms (LUTS) may worsen due to concentrated urine, which increases the bladder urothelium's exposure to possible irritants [9]. This urothelial irritation greatly contributes to lower urinary tract symptoms (LUTS), such as increased urgency and dysuria [10]. In many patients, changing the timing and amount of water consumed, especially decreasing fluid intake before bedtime, will help to resolve nocturia and sleep problems [11]. There are several benefits to optimizing water use in LUTS management. It is non-invasive, inexpensive, easy to implement, and can be used in conjunction with pharmaceutical or behavioral treatment [12]. Fluid balance is important and can help minimize LUTS and enhance patient comfort, but over-restriction can lead to dehydration, constipation, concentrated urine, and a worsening of renal function, especially in patients aged over 50 years [13]. Therefore, fluid maintenance should be carefully monitored and managed. The prevalence of LUTS has been growing, but data on fluid intake and hydration practices are limited [14]. Therefore, further studies are needed to evaluate the effect of water optimization on symptom control and quality of life in LUTS patients. The study aimed to evaluate the effect of water optimization in the management of LUTS and to investigate the correlation between hydration strategies and symptom severity in patients with LUTS.

II. Methodology & Materials

This prospective interventional study was conducted in the Department of Urology of Dhaka Medical College Hospital in Bangladesh between 1st. January, 2025 to February 2026. The study aimed to evaluate the effectiveness of water optimization strategies in improving lower urinary tract symptoms (LUTS) among adult patients. A total of 120 patients diagnosed with LUTS were enrolled consecutively according to predefined eligibility criteria.

Inclusion Criteria:

- Patients aged ≥ 40 years
- Presence of lower urinary tract symptoms for at least 3 months
- Ability to understand and comply with fluid modification instructions

Exclusion Criteria:

- Active urinary tract infection
- Neurogenic bladder disorder
- History of urinary tract malignancy
- Severe heart failure or decompensated renal disease requiring strict fluid restriction
- Patients receiving surgical treatment for LUTS during the study period

Ethical Considerations

Prior to commencement of the study, approval was secured from the Institutional Review Board (IRB). Each participant was informed in detail about the objectives, procedures, potential benefits, and voluntary nature of the study, and written informed consent was obtained before inclusion. Privacy and confidentiality of all collected data were carefully preserved throughout the research process, and participants retained the right to withdraw from the study at any stage without any consequence.

Intervention: Water Optimization Strategy

All participants received individualized counseling regarding fluid and beverage management. The intervention included:

- Reduction of excessive daily water intake according to patient requirements
- Limitation of fluid intake during evening hours
- Avoidance of excessive night-time drinking
- Reduction of caffeinated beverages such as tea and coffee
- Maintenance of adequate hydration without overconsumption

Patients were educated using simple verbal instructions and follow-up counseling during scheduled visits.

Data Collection

Data were collected using a structured questionnaire and clinical assessment form at baseline and during follow-up. At enrollment, demographic and clinical information including age, sex, body mass index

(BMI), comorbid conditions, and duration of lower urinary tract symptoms (LUTS) were recorded. Baseline urinary symptoms were evaluated through detailed history taking and assessment using the International Prostate Symptom Score (IPSS). Information regarding daytime voiding frequency, nocturia episodes, urgency episodes, urge incontinence, and quality of life associated with urinary symptoms was also documented. In addition, participants were assessed for their habitual fluid intake pattern, including total daily water intake, evening fluid intake after 6 PM, night-time water consumption, and intake of caffeinated beverages.

Following initiation of the water optimization intervention, all participants were monitored for a period of 8 weeks. Follow-up evaluation was performed using the same clinical and symptom-related parameters recorded at baseline. Changes in LUTS severity, nocturia frequency, urgency episodes, daytime urinary frequency, and quality of life scores were assessed to determine treatment response. Significant clinical improvement was considered as a substantial reduction in symptom severity along with improvement in IPSS following the intervention.

Statistical Analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 26.0. Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables were presented as frequencies and percentages. Paired t-test was used to compare continuous variables before and after intervention. Chi-square test was used for categorical variables where appropriate. Multivariate logistic regression analysis was performed to identify predictors of significant improvement in LUTS. A p-value of <0.05 was considered statistically significant.

III. Result

The mean age was 63.4 ± 9.1 years, and the mean BMI was 26.1 ± 3.7 kg/m². The largest age group was 60-69 years (35.00%), followed by 50-59 years (28.33%), ≥70 years (21.67%), and 40-49 years (15.00%). Males constituted 68.33% of the group, while females represented 31.67%. Hypertension was present in 45.00% of participants, benign prostatic enlargement in 38.33%, diabetes mellitus in 32.50%, and chronic kidney disease in 9.17% (Table 1). Regarding LUTS duration, 46.67% reported symptoms for 1-3 years, 35.83% for >3 years, and 17.50% for <1 year (Figure 1). Table 2 shows that baseline urinary symptoms were predominantly increased daytime frequency (78.33%) and nocturia (73.33%), followed by urgency (65.83%), weak urinary stream (43.33%), incomplete emptying sensation (39.17%), hesitancy (36.67%), urge incontinence (25.83%), and dysuria (15.83%) (Table 2). Table 3 presents that the mean total daily water intake decreased from 3.1 ± 0.8 to 2.1 ± 0.5 L/day, evening fluid intake after 6 PM from 980 ± 310 to 420 ± 180 mL, caffeinated beverage intake from 2.4 ± 1.1 to 1.1 ± 0.7 drinks/day, and night-time water intake from 540 ± 190 to 210 ± 120 mL. All analyses were statistically significant (all p<0.001) (Table 3). IPSS declined from 18.6 ± 5.4 to 11.2 ± 4.3, daytime voiding frequency from 11.1 ± 2.8 to 7.8 ± 2.1 episodes/day, nocturia from 3.4 ± 1.2 to 1.7 ± 0.9 episodes/night, urgency episodes from 10.8 ± 4.7 to 5.2 ± 3.1 per week, and quality of life score from 4.9 ± 1.1 to 2.8 ± 1.0 (all p<0.001) (Table 4). Clinically, 61.67% achieved significant symptom improvement, 25.83% showed mild improvement, and 12.50% had no substantial improvement. Reduction in nocturia by ≥50% occurred in 57.50% cases, improved sleep quality in 60.00%, and overall patient satisfaction with the intervention in 67.50% (Table 5). Multivariate analysis identified compliance with water optimization (adjusted OR 4.82, 95% CI 2.01-11.56; p<0.001), reduced evening fluid intake (adjusted OR 3.44, 95% CI 1.48-8.02; p=0.004), and reduced caffeine consumption (adjusted OR 2.91, 95% CI 1.23-6.85; p=0.015) as significant predictors of LUTS improvement. In contrast, age ≥65 years (adjusted OR 0.63, p=0.251) and diabetes mellitus (adjusted OR 0.54, p=0.164) were not significantly associated with improvement in LUTS (Table 6).

Table 1: Baseline characteristics of study participants (n=120)

Variable	Frequency (n)	Percentage (%)
Age group (years)		
40-49	18	15.00
50-59	34	28.33
60-69	42	35.00
≥70	26	21.67
Mean age ± SD	63.4 ± 9.1	
Gender		
Male	82	68.33
Female	38	31.67
BMI (kg/m ²)	26.1 ± 3.7	
Comorbidities		
Hypertension	54	45.00
Diabetes mellitus	39	32.50
Chronic kidney disease	11	9.17
Benign prostatic enlargement	46	38.33

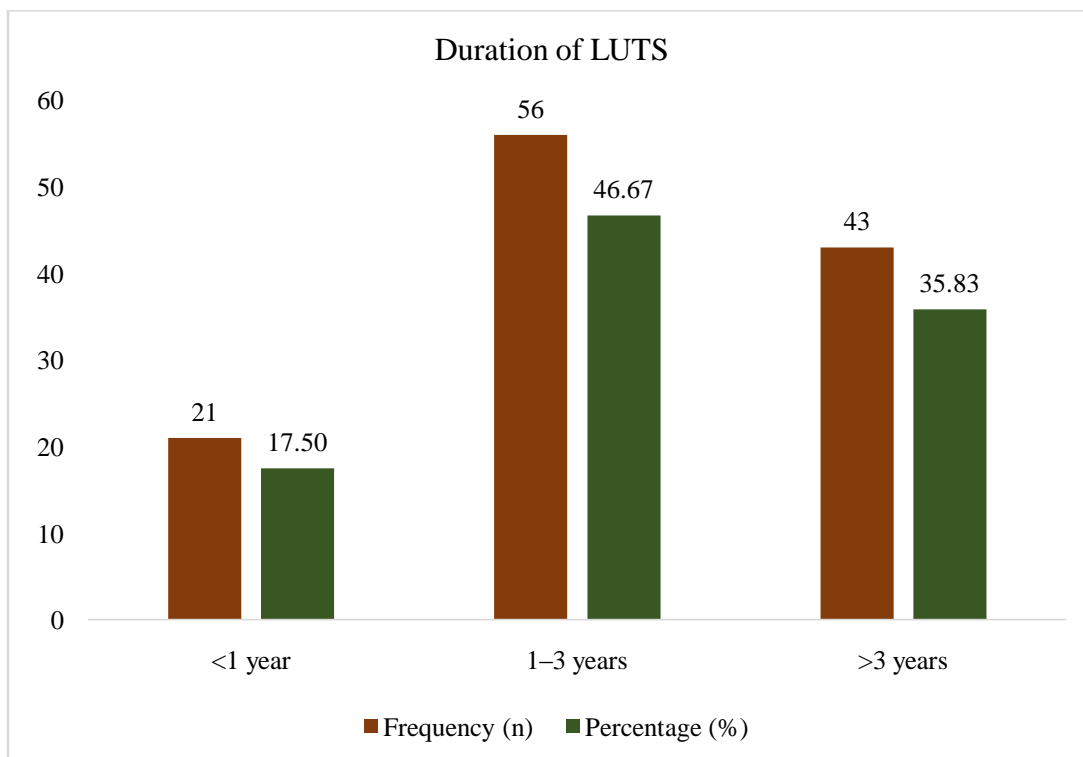


Figure 1: Duration of LUTS among patients (n=120)

Table 2: Baseline lower urinary tract symptoms before water optimization (n=120)

Symptom	Frequency (n)	Percentage (%)
Increased daytime frequency	94	78.33
Nocturia	88	73.33
Urgency	79	65.83
Urge incontinence	31	25.83
Weak urinary stream	52	43.33
Hesitancy	44	36.67
Incomplete emptying sensation	47	39.17
Dysuria	19	15.83

Table 3: Daily water intake pattern before and after intervention

Variable	Baseline	After 8 Weeks	p-value
Total daily water intake (L/day)	3.1 ± 0.8	2.1 ± 0.5	<0.001
Evening fluid intake after 6 PM (mL)	980 ± 310	420 ± 180	<0.001
Caffeinated beverages per day	2.4 ± 1.1	1.1 ± 0.7	<0.001
Night-time water intake (mL)	540 ± 190	210 ± 120	<0.001

Table 4: Changes in LUTS severity following water optimization (n=120)

Variable	Baseline	After 8 Weeks	p-value
International Prostate Symptom Score (IPSS)	18.6 ± 5.4	11.2 ± 4.3	<0.001
Daytime voiding frequency per day	11.1 ± 2.8	7.8 ± 2.1	<0.001
Nocturia episodes per night	3.4 ± 1.2	1.7 ± 0.9	<0.001
Urgency episodes per week	10.8 ± 4.7	5.2 ± 3.1	<0.001
Quality of life score	4.9 ± 1.1	2.8 ± 1.0	<0.001

Table 5: Clinical response to water optimization strategy (n=120)

Clinical outcome	Frequency (n)	Percentage (%)
Significant symptom improvement	74	61.67
Mild improvement	31	25.83
No significant improvement	15	12.50
Reduction of nocturia ≥50%	69	57.50
Improved sleep quality	72	60.00
Patient satisfaction with intervention	81	67.50

Table 6: Multivariate logistic regression analysis for predictors of significant LUTS improvement

Variable	Adjusted OR	95% CI	p-value
Compliance with water optimization	4.82	2.01–11.56	<0.001
Reduced evening fluid intake	3.44	1.48–8.02	0.004
Reduced caffeine consumption	2.91	1.23–6.85	0.015
Age \geq 65 years	0.63	0.28–1.39	0.251
Diabetes mellitus	0.54	0.22–1.29	0.164

IV. Discussion

Lower urinary tract symptoms (LUTS) represent a major clinical burden among older adults, substantially affecting urinary function, sleep quality, and overall quality of life; therefore, non-pharmacological strategies such as water optimization and fluid-behavior modification have gained increasing attention as effective, low-cost interventions for symptom control and long-term management [15]. The mean age was 63.4 ± 9.1 years, and male predominance was (68.33%). Matthiesen reported a similar mean age among men with LUTS and nocturia, emphasizing the increasing prevalence of nocturnal urinary symptoms in older adults with benign prostatic obstruction and nocturnal polyuria [16]. Likewise, Fukunaga demonstrated that LUTS severity progressively increased with aging and sleep disturbance in individuals older than 50 years, supporting our observation that most participants belonged to the 60-69 years age group [17]. In our study, LUTS duration was predominantly 1-3 years (46.67%), followed by >3 years (35.83%), indicating that most participants experienced persistent and chronic symptoms before intervention. Xue observed persistent nocturia despite conventional therapy in patients with LUTS/BPH, highlighting the importance of lifestyle and behavioral modifications in symptom control [18]. The most prevalent baseline symptoms in our study were increased daytime frequency (78.33%), nocturia (73.33%), and urgency (65.83%). These findings parallel the results of Hirayama, who reported that nocturia and urgency were strongly associated with nocturnal polyuria and detrusor overactivity in LUTS patients [19]. Similarly, the LURN observational study demonstrated that urgency and urinary frequency were among the most bothersome symptoms in patients with LUTS, particularly in those consuming bladder irritants such as caffeine [10]. Doo also documented a high prevalence of nocturia in patients with moderate-to-severe LUTS, reinforcing the close relationship between storage symptoms and impaired sleep quality [20]. Singam identified nocturia as the most persistent symptom in men with benign prostatic hyperplasia (BPH), reporting a prevalence of 96.7%, which supports our finding that nocturia is a nearly universal and highly bothersome LUTS component [21]. One of the major findings of the present study was the substantial reduction in total daily water intake, evening fluid intake, caffeinated beverage consumption, and night-time water intake after 8 weeks of intervention (all $p < 0.001$). These findings are highly comparable with the study by Tani, who demonstrated that guided water intake restriction significantly reduced nocturnal urinary frequency in patients with nocturia, with 67% of patients showing clinically meaningful improvement [22]. Furthermore, the systematic review by Park concluded that fluid and caffeine restriction effectively improved urinary frequency, urgency, and overall LUTS-related quality of life [23]. Similar observations were reported in the LURN study, where individuals with urgency symptoms frequently modified caffeine and fluid intake as a self-management strategy [10]. IPSS decreased significantly from 18.6 ± 5.4 to 11.2 ± 4.3 , while nocturia episodes were reduced from 3.4 ± 1.2 to 1.7 ± 0.9 per night. Comparable reductions in nocturia and symptom burden were described by Tani, who found a strong correlation between decreased nocturnal urine volume and symptomatic improvement following water intake guidance [22]. Likewise, Xue reported that excessive nighttime water intake was significantly associated with persistent nocturia, suggesting that controlled fluid intake may improve therapeutic outcomes in LUTS/BPH patients [18]. Our baseline frequency of daytime voids (11.1 per day) is consistent with the baseline data from Park, who reported 11.4 voids per 24 hours in patients seeking behavioral intervention [23]. Our observed IPSS improvement is remarkably consistent with the BEST study results reported by Krieger, which showed a mean IPSS reduction of 6.32 to 9.56 points following a multimodal digital lifestyle therapy [24]. Clinically, 61.67% of our participants achieved significant symptom improvement, and 67.50% reported satisfaction with the intervention. Recent evidence on lifestyle modification, including salt and fluid restriction, also showed improvements in nocturia frequency, urgency, and quality of life among compliant patients [25]. Voudoukis confirmed that nocturia frequency is inversely correlated with quality of life (N-QOL), validating our choice of nocturia reduction as a primary metric for overall patient satisfaction [26]. Water optimization was the strongest predictor of LUTS improvement (adjusted OR 4.82, $p < 0.001$). Reduced evening fluid intake and reduced caffeine consumption were also significant predictors, emphasizing the importance of behavioral adherence. Similar conclusions were reported in the systematic review by Park, where caffeine restriction and fluid management were independently associated with reductions in urinary frequency and urgency [23]. In contrast, older age and diabetes mellitus were not independently associated with significant improvement in our study. This observation aligns with prior evidence suggesting that modifiable lifestyle factors may exert greater short-term influence on LUTS outcomes than demographic

characteristics alone [17]. Lee suggested a nutri-environmental model for LUTS, positing that evening caffeine management is critical because of its long half-life, which supports our finding that caffeine reduction was a statistically significant predictor of improvement (OR 2.91, $p=0.015$) [27].

Limitations of the study:

- Fluid intake and urinary symptoms were partially based on self-reported patient information, which may introduce recall bias.
- The study lacked a control or comparison group, limiting causal interpretation of the intervention effect.

V. Conclusion And Recommendations

Water optimization and fluid-behavior modification significantly improved lower urinary tract symptoms, including urinary frequency, nocturia, urgency, and quality of life among patients with LUTS. Reduction of excessive daily fluid intake, limitation of evening and night-time water consumption, and decreased caffeine intake were associated with meaningful clinical improvement. Compliance with water optimization strategies emerged as the strongest predictor of symptomatic benefit. These findings highlight the importance of simple, non-pharmacological lifestyle interventions as effective, affordable, and easily applicable first-line management approaches for LUTS patients. Further multicenter studies with larger sample sizes and longer follow-up periods are recommended to validate these findings and assess long-term outcomes.

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