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Original Article

Clinical Evaluation and Management of Pediatric Enuresis: A Study at BMU

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Abstract

Background: Pediatric enuresis affects millions of children worldwide, causing significant psychological distress. However, clinical evaluation and management data from low-resource settings like Bangladesh remain limited. Objective: To evaluate the clinical presentation and management outcomes of pediatric enuresis in children attending a tertiary care hospital in Bangladesh.

Methods: This prospective cohort study was conducted at Bangladesh Medical University (BMU), Dhaka, Bangladesh, from January 2020 to December 2025. A total of 357 children aged 5–16 years with enuresis were enrolled using purposive sampling. Standardized clinical evaluation included history, physical examination, urinalysis, and bladder diary. Management followed a stepwise approach comprising behavioral modifications, alarm therapy, and pharmacotherapy (desmopressin or imipramine) as indicated. Data were analyzed using SPSS version 23.0

Results: Of 357 children (59.4% male, mean age 8.7±2.4 years), 69.5% had monosymptomatic nocturnal enuresis. After six months of stepwise management, complete response (≥90% reduction in wet nights) was achieved in 231 (64.7%) children, partial response in 86 (24.1%), and no response in 40 (11.2%). Children with monosymptomatic enuresis showed significantly higher complete response than those with non-monosymptomatic enuresis (71.8% vs. 48.6%, p=0.001). Adverse effects occurred in 23 (6.4%) children, all mild and transient.

Conclusion: A structured stepwise approach to pediatric enuresis yields favorable outcomes in the majority of children. Clinical evaluation and management are feasible in Bangladeshi tertiary care settings. Larger community-based studies are recommended.

Keywords: Alarm therapy, Behavioral modification, Childhood, Enuresis, Urinary incontinence

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Introduction

Nocturnal enuresis, commonly referred to as bed wetting, represents one of the most frequent pediatric conditions encountered in clinical practice worldwide. Defined as involuntary voiding during sleep in children aged five years and older, this condition, although somatically benign, carries substantial psychosocial consequences for affected children and their families [1]. The prevalence of enuresis decreases with advancing age, affecting approximately 15–20% of five-year-olds, 5–10% of seven-year-olds, and 1–2% of adolescents and young adults [2]. Despite its high prevalence, enuresis remains underrecognized and undertreated in many healthcare settings, particularly in low- and middle-income countries where awareness gaps persist among caregivers and even primary care providers [3]. The pathophysiology of enuresis is complex and multifactorial, involving three core mechanisms: nocturnal polyuria (excessive urine production during sleep), reduced nocturnal bladder capacity, and impaired arousal from sleep in response to full bladder signals [4]. Contemporary under

standing emphasizes that no single mechanism operates in isolation; rather, enuresis typically results from the interplay of these factors, often with a strong genetic predisposition [5]. Studies have consistently demonstrated that children with a positive family history face a significantly elevated risk of enuresis, with heritability estimates approaching 70–80% in twin studies [6]. Sleep architecture abnormalities, particularly alterations in sleep microstructure and impaired arousal responses, have been increasingly recognized as contributory factors, challenging the outdated notion that enuretic children are simply "deep sleepers" [4]. The clinical impact of enuresis extends far beyond the nocturnal episodes themselves. Affected children frequently experience diminished self-esteem, social isolation, and academic difficulties [7]. Fear of peer discovery often leads to avoidance of overnight social activities such as sleepovers and school camps, compromising normal childhood psychosocial development [1]. Parental frustration, punitive responses, and misconceptions regarding the condition as a behavioral problem rather than a medical disorder compound the emotional burden on the child [3]. In resource-limited settings, additional barriers such as lack of access to washing machines or affordable diapers further strain family dynamics and tolerance toward affected children [8]. International guidelines from the International Children's Continence Society (ICCS) recommend active intervention for enuresis beginning at age six years, although treatment may be considered earlier if the condition causes significant distress to the child or family [9]. First-line treatment modalities include the enuresis alarm, which promotes conditioned arousal response to bladder fullness, and desmopressin, a synthetic analogue of antidiuretic hormone that reduces nocturnal urine production [10]. Alarm therapy offers superior long-term sustained response and lower relapse rates, while desmopressin provides more rapid initial control, making it particularly suitable for short-term situational use such as sleepovers or summer camps [11,12]. For children with non-monosymptomatic enuresis—those accompanied by daytime lower urinary tract symptoms—addressing comorbid conditions such as constipation and bladder overactivity is essential before or alongside targeted enuresis therapy [9]. Despite the availability of evidence-based treatment protocols, significant knowledge-to-practice gaps persist globally. In Bangladesh and other South Asian nations, data on clinical presentation patterns, treatment responses, and barriers to effective management remain remarkably sparse [13]. Most published literature originates from high-income countries with different healthcare infrastructures, cultural attitudes toward bedwetting, and access to treatment resources. This prospective cohort study was therefore designed to evaluate the clinical characteristics, management approaches, and treatment outcomes of pediatric enuresis at a tertiary care hospital in Dhaka, Bangladesh, to inform locally relevant clinical practice and identify areas for healthcare system improvement.

Methodology

This prospective cohort study was conducted at Bangladesh Medical University (BMU), Dhaka, Bangladesh, from January 2020 to December 2025. A total of 357 children aged 5–16 years diagnosed with enuresis were enrolled using purposive sampling. All participants were recruited from the pediatric nephrology and urology outpatient clinics of BMU.

Inclusion criteria: Children of either sex aged 5–16 years with at least one wet night per week over the preceding three consecutive months were included. Only children whose parents or legal guardians provided written informed consent were enrolled.

Exclusion criteria: Children with known urinary tract malformations, neurogenic bladder, spinal dysraphism, diabetes mellitus, diabetes insipidus, sickle cell disease, or ongoing urinary tract infection were excluded. Those with prior surgical intervention for enuresis or current use of anticholinergic medications were also excluded.

Study procedure: All enrolled children underwent standardized clinical evaluation, including detailed history, physical examination, urinalysis, and a three-day bladder diary. Enuresis subtype was classified according to International Children's Continence Society (ICCS) standardization criteria [9]. Nocturnal bladder capacity was assessed using a validated frequency-volume chart, and children with bladder capacity below 65% of expected for age were categorized as having reduced functional bladder capacity [1]. Management followed a stepwise protocol: first-line behavioral modifications (evening fluid restriction and scheduled voiding before bedtime), followed by enuresis alarm therapy for non-responders after eight weeks, and desmopressin (120–240 mcg sublingually at bedtime) for alarm failures or families preferring pharmacotherapy [2].

Steps	Intervention	Details	Indication / Timing
Step 1	Behavioral modifications	Evening fluid restriction, scheduled voiding before bedtime	All children at initial presentation
Step 2	Enuresis alarm therapy	Conditioned arousal response to bladder fullness	For non-responders after 8 weeks of Step 1
Step 3	Pharmacotherapy	120–240 mcg sublingually at bedtime	For alarm failures OR families preferring medication over alarm therapy
Optional	Imipramine	Not detailed in the protocol, but mentioned in the abstract as an alternative	Reserved for refractory cases (not routinely used in this study)

Data analysis: Data were entered and analyzed using SPSS version 23.0. Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequencies and percentages. Response rates were calculated at 3 and 6 months. A p-value <0.05 was considered statistically significant.

Result

In this study, data from a total of 357 children with pediatric enuresis who completed the six-month follow-up period were analyzed. Among the 357 participants, 212 (59.4%) were male, and 145 (40.6%) were female, yielding a male-to-female ratio of 1.46:1. The mean age of the study population was 8.7 ± 2.4 years (range: 5–16 years). The majority of children (64.4%) belonged to the 5–9 years age group, while 28.9% were aged 10–14 years, and only 6.7% were aged 15–16 years. Family history of enuresis was positive in 201 children (56.3%). The mean age at which children first sought medical consultation was 7.9 ± 2.1 years, representing a mean delay of 2.4 ± 1.6 years from the age of five years (the recognized threshold for intervention). Monosymptomatic nocturnal enuresis (MNE) was identified in 248 children (69.5%), while non-monosymptomatic enuresis (NMNE) was present in 109 children (30.5%). Among children with NMNE, the most common daytime symptoms were urgency (58.7%), frequency (45.0%), and voiding postponement (22.9%). Reduced nocturnal bladder capacity (defined as <65% of expected for age) was observed in 143 children (40.1%). Nocturnal polyuria was present in 189 children (52.9%). Constipation, assessed by the Rome IV criteria, was documented in 98 children (27.5%). After six months of stepwise management, a complete response (≥90% reduction in wet nights) was achieved in 231 children (64.7%). Partial response (50–89% reduction) was observed in 86 children (24.1%), while 40 children (11.2%) showed no response (<50% reduction). Among the 248 children with MNE, complete response was achieved in 178 (71.8%) compared to 53 of 109 (48.6%) with NMNE, a difference that was statistically significant. The mean number of wet nights per week decreased from baseline 5.2 ± 1.4 to 1.4 ± 1.8 at six months. Adverse effects were reported in 23 children (6.4%). All adverse events were mild and transient. Nasal discomfort (related to desmopressin administration) occurred in 12 children (3.4%), headache in 7 (2.0%), and mild abdominal pain in 4 (1.1%). No serious adverse events requiring hospitalization or treatment discontinuation were documented. Children with positive family history showed a lower complete response rate compared to those without family history (58.2% vs. 73.1%). Younger age (5–9 years) was associated with higher complete response rates (70.4%) compared to older age groups (10–14 years: 56.3%; 15–16 years: 41.7%). The presence of nocturnal polyuria and reduced bladder capacity both negatively influenced treatment response.

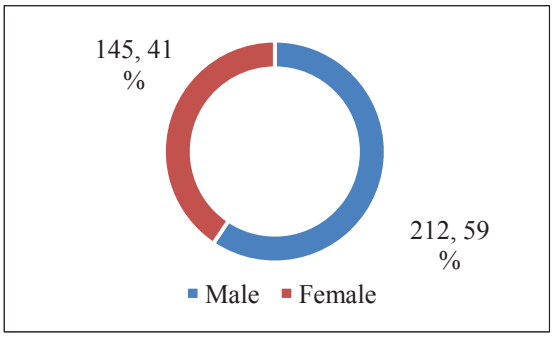


Figure 1: Gender distribution of study participants (N=357)

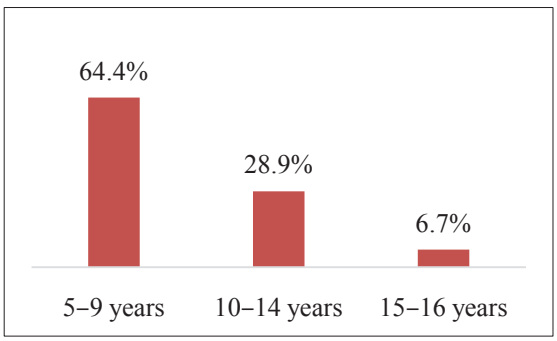


Figure 2: Age distribution of cases

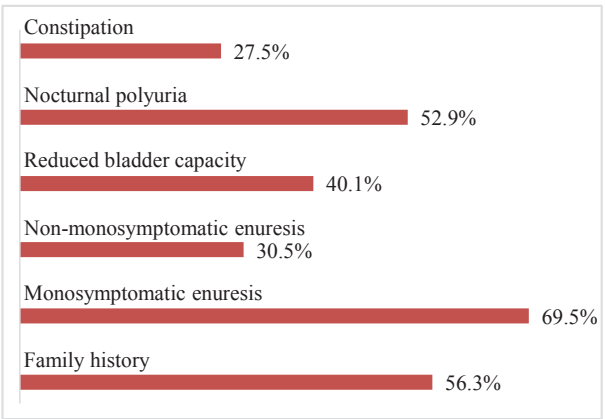


Figure 3: Baseline clinical characteristics of study participants (N=357)

Table 2: Distribution of daytime symptoms among children with non-monosymptomatic enuresis (N=109)

Daytime symptom	n	(%)
Urgency	64	58.7
Frequency (≥8 voids/day)	49	45
Voiding postponement	25	22.9
Hesitancy	11	10.1
Straining	7	6.4
Feeling of incomplete emptying	5	4.6

Note: Some children presented with more than one daytime symptom; therefore, percentages do not sum to 100%.

Table 3: Treatment response at six months stratified by enuresis subtype

Enuresis subtype	n	Complete response	Partial response	No response
		n (%)		
Monosymptomatic (MNE)	248	178 (71.8)	51 (20.6)	19 (7.7)
Non-monosymptomatic (NMNE)	109	53 (48.6)	35 (32.1)	21 (19.3)
Total	357	231 (64.7)	86 (24.1)	40 (11.2)

Statistical test: The chi-square test was used to compare response distributions between MNE and NMNE groups. $\chi^2 = 18.92$, $p = 0.001$.

Table 4: Treatment response at six months stratified by age group

Age group (years)	n	Complete response	Partial response	No response
		n (%)		
5–9	230	162 (70.4)	48 (20.9)	20 (8.7)
10–14	103	58 (56.3)	29 (28.2)	16 (15.5)
15–16	24	10 (41.7)	9 (37.5)	5 (20.8)

Statistical test: Chi-square test for trend was used to assess the association between age group and complete response. $\chi^2 = 12.96$, $p = 0.002$.

Table 5: Factors associated with complete treatment response (bivariate analysis)

Factor	Category	Complete response	No complete response	p-value
		n/N (%)		
Sex	Male	150/212 (70.8)	62/212 (29.2)	0.012
	Female	81/145 (55.9)	64/145 (44.1)	
Family history	Positive	117/201 (58.2)	84/201 (41.8)	0.008
	Negative	114/156 (73.1)	42/156 (26.9)	
Nocturnal polyuria	Present	109/189 (57.7)	80/189 (42.3)	0.003
	Absent	122/168 (72.6)	46/168 (27.4)	
Reduced bladder capacity	Present	80/143 (55.9)	63/143 (44.1)	0.005
	Absent	151/214 (70.6)	63/214 (29.4)	
Constipation	Present	53/98 (54.1)	45/98 (45.9)	0.01
	Absent	178/259 (68.7)	81/259 (31.3)	

Statistical test: The chi-square test was used for each comparison. Degrees of freedom = 1 for all comparisons.

Table 6: Adverse events reported during the study period

Adverse event	n	%
Nasal discomfort	12	3.4
Headache	7	2.0
Mild abdominal pain	4	1.1
Children with any adverse event	23	6.4

Note: Some children experienced more than one adverse event.

Discussion

This prospective cohort study of 357 children with pediatric enuresis demonstrates that a structured stepwise management approach yields favorable outcomes in a tertiary care setting in Bangladesh, with nearly two-thirds of children achieving complete response after six months. These findings are comparable to those reported from high-income countries, suggesting that evidence-based enuresis management is feasible and effective even in resource-limited South Asian contexts [14]. The observed male predominance (59.4%) aligns with global epidemiological data, which consistently report a higher prevalence of enuresis among boys compared to girls [15]. The mean age of presentation (8.7 years) and the substantial delay (approximately 2.4 years) between the recognized intervention threshold and first medical consultation highlight a critical knowledge-to-practice gap in the Bangladeshi healthcare system. Similar delays have been documented in other low- and middle-income countries, where misconceptions regarding enuresis as a self-limiting condition or behavioral problem remain prevalent [3,8]. The distribution of enuresis subtypes in this cohort (69.5% monosymptomatic, 30.5% non-monosymptomatic) closely mirrors international estimates, which typically report MNE in 60–80% of affected children [16]. Several factors emerged as significant predictors of poor treatment response, including positive family history, older age, nocturnal polyuria, reduced bladder capacity, and constipation. The association between positive family history and lower response rates has been previously described, suggesting a possible genetic predisposition toward more severe or treatment-resistant enuresis [5,6]. Older age being associated with poorer response is clinically plausible, as these children have longer-standing conditioning and potentially more entrenched behavioral patterns [17]. The negative impact of nocturnal polyuria and reduced bladder capacity on treatment outcomes confirms the pathophysiological relevance of these mechanisms, as established in earlier mechanistic

studies [4]. The overall complete response rate of 64.7% at six months is consistent with published systematic reviews of combination therapy approaches. A large meta-analysis reported pooled complete response rates of 60–70% with structured alarm or desmopressin-based protocols [11]. However, direct comparisons are challenging due to heterogeneity in study designs, outcome definitions, and treatment durations across different trials [2]. Adverse events were infrequent (6.4%) and mild, predominantly nasal discomfort and headache associated with desmopressin administration. This safety profile is consistent with large pharmacovigilance databases, which report desmopressin-related adverse events in 5–10% of treated children, almost always mild and self-limited [18]. The absence of hyponatremia or other serious adverse events in this cohort reflects appropriate patient selection and adherence to fluid restriction guidelines [19]. This study has several limitations. First, the purposive sampling technique may introduce selection bias, as participants were recruited from a single tertiary care center, potentially limiting generalizability to community or primary care settings. Second, the absence of a control group precludes definitive conclusions regarding the comparative effectiveness of individual treatment modalities, as the stepwise protocol did not randomize children to specific interventions [20]. Third, the six-month follow-up period, while adequate for assessing initial response, does not capture long-term relapse rates, which are known to be higher following desmopressin discontinuation compared to alarm therapy [12]. Fourth, bladder diary data relied on parental and child reporting, introducing potential recall bias despite standardized instructions [21]. Fifth, this study did not formally assess psychological comorbidities or quality of life using validated instruments, which would have enriched the clinical characterization [7]. Despite these limitations, this study provides valuable real-world data from a South Asian population, an underrepresented demographic in the enuresis literature. Most published randomized controlled trials originate from European, North American, or East Asian populations, with uncertain applicability to Bangladeshi children given differences in genetics, diet, fluid intake patterns, and cultural attitudes toward bedwetting [22,23]. Future multicenter prospective studies with longer follow-up periods, inclusion of health economic analyses, and community-based validation of findings are warranted.

Limitations

This single-center study used purposive sampling, which may limit generalizability. The absence of a control group and six-month follow-up precludes long-term relapse assessment. Recall bias from parent-reported bladder diaries is also possible.

Conclusion

A structured stepwise approach to pediatric enuresis, incorporating behavioral modifications, alarm therapy, and desmopressin as indicated, achieves favorable outcomes in over 80% of children in a Bangladeshi tertiary care setting. Early recognition, accurate subtype classification, and addressing modifiable factors such as constipation and nocturnal polyuria are essential for optimal response. Larger community-based studies with extended follow-up are warranted.

Recommendation

Clinicians should routinely screen for enuresis in children aged five years and older. Referral for structured evaluation and stepwise management is recommended. Public awareness campaigns and training of primary care physicians on evidence-based enuresis protocols should be prioritized nationwide.

Conflict of Interest Statement: The authors declare no conflicts of interest. No funding was received for this study. The corresponding author had full access to all data and final responsibility for the decision to submit for publication.

Ai Declaration

Artificial intelligence tools contributed marginally to manuscript preparation and development. All core scientific content was human-verified.

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