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Current Perspectives on the Etiology and Management of Nocturnal Enuresis in Children: A Review

Lalit Gargiya[1], Keshav Gautam[2], Girish Kumar Vyas[3]

[1] Senior QA Manager, GeBBS Healthcare Solutions, Mumbai

[2] Assistant Professor, Alwar College of Pharmacy, Alwar, Rajasthan

[3] Associate Professor, School of Pharmacy, Career Point University, Kota, Rajasthan

Correspondence Author: gargiyalalit@gmail.com, Keshav.gautam04@gmail.com, girishvyas10@gmail.com

Abstract

Nocturnal enuresis (NE), or bed-wetting, is a common paediatric condition characterized by involuntary urination during sleep in children aged five and older, impacting approximately 15-20% of children at this age and declining with maturation. NE's multifactorial etiology encompasses genetic, physiological, and psychological factors, which complicates its management. This review aims to consolidate current knowledge on NE, examining its types, risk factors, pathophysiology, impact on quality of life, diagnostic methods, and therapeutic options. Behavioral interventions, bed-wetting alarms, and pharmacotherapy, including desmopressin, are standard treatments, while combination therapies and personalized approaches show promising efficacy. Emerging treatments focusing on genetic and physiological insights highlight the potential for targeted management. Further research into the complex interplay of genetic and environmental factors, as well as the long-term effects of treatment modalities, is essential for reducing the social and psychological impact of NE and improving outcomes for affected children and their families.

Keywords: Nocturnal enuresis, paediatric urology, bed-wetting treatment, pathophysiology, quality of life.

1. Introduction

Nocturnal enuresis (NE), commonly referred to as bed-wetting, is an involuntary urination during sleep in children aged five and older. NE affects approximately 15-20% of children at age five and gradually declines with age, persisting in about 1-2% of adolescents and young adults. It is classified as a paediatric condition, although its impact extends to psychological and social domains, affecting self-esteem and quality of life.

Despite its prevalence, the exact mechanisms remain unclear, and treatment approaches vary widely, ranging from behavioral interventions to pharmacotherapy. Understanding the multifactorial etiology, pathophysiology, and effective management strategies is crucial for clinicians and researchers working with affected children and their families (1-3, 5).

2. Objective of This Review

- To Summarize the current understanding of nocturnal enuresis, including its types, risk factors, and pathophysiology.
- Outline available diagnostic criteria and methods.
- Examine the impact of NE on quality of life.
- Discuss current treatment options and emerging therapies.
- Identify areas requiring further research and potential advancements in personalized treatment approaches (3-5).

3. Material and Methods

This review was conducted by analyzing published literature on nocturnal enuresis from reputable databases such as PubMed, Scopus, and Google Scholar. Keywords included "nocturnal enuresis," "bed-wetting," "paediatricurology," "pathophysiology of nocturnal enuresis," and "treatment of bed-wetting." Articles from 2000 to 2023 were prioritized to provide a current understanding of NE. Both original research articles and systematic reviews were included. Studies focusing on primary NE in children aged 5 and older were emphasized, with limited inclusion of studies on secondary NE or NE in adult populations (2-5).

4. Results

Types of Nocturnal Enuresis

NE can be classified into:

- Primary Nocturnal Enuresis (PNE): When a child has never achieved nighttime dryness.
- Secondary Nocturnal Enuresis (SNE): When bed-wetting resumes after a period of dryness of six months or longer.

Additionally, NE is categorized as:

- Monosymptomatic NE (MNE): Enuresis without other urinary symptoms.

- Non-monosymptomatic NE (NMNE): Enuresis accompanied by other urinary symptoms, such as urgency or frequency during the day (2,3).

Etiology and Risk Factors

NE has a multifactorial etiology with contributions from:

- Genetic Predisposition: Family history strongly influences the likelihood of NE, with children having a 75% chance of NE if both parents were affected.
- Developmental Factors: Delayed maturation of bladder control mechanisms.
- Psychological Factors: NE may be linked to stress or trauma, particularly in cases of secondary NE.
- Bladder Dysfunction and ADH Levels: Reduced nocturnal bladder capacity and inadequate secretion of antidiuretic hormone (ADH) during sleep.
- Sleep Disorders: Some studies suggest that children with NE have altered sleep patterns or deeper sleep stages, reducing their ability to respond to bladder fullness (4,5).

Impact on Quality of Life

Children with NE may experience psychological distress, low self-esteem, and social embarrassment, particularly as they approach adolescence. The condition can impact family dynamics and lead to academic challenges due to sleep disturbances and related stress. Treatment Approaches are given below:

1. Behavioral Therapy: Including fluid restriction, bladder training, and motivational therapies.
2. Bed-Wetting Alarms: Effective in conditioning the child to wake up at the sensation of a full bladder.
3. Pharmacotherapy: Desmopressin (an ADH analog) and anticholinergic drugs are commonly used, with desmopressin being the first-line pharmacological treatment for monosymptomatic NE.
4. Combination Therapy: Behavioral therapy combined with pharmacological treatments has shown higher success rates.
5. Emerging Treatments: Current research is exploring the role of genetics in treatment customization and new pharmacological agents targeting underlying physiological mechanisms (3-6).

5. Discussion

Nocturnal enuresis is a complex condition with a variety of contributing factors. The categorization of NE into primary/secondary and monosymptomatic/non-monosymptomatic forms has allowed more targeted research and treatment approaches. Current evidence supports the role of genetic predisposition, as children with a family history of NE have a higher risk. However, the interplay between genetic, developmental, and environmental factors remains incompletely understood.

The pathophysiology of NE highlights a deficiency in ADH secretion at night, resulting in high nocturnal urine production. Combined with a smaller functional bladder capacity and potential sleep arousal issues, these factors contribute to the inability to maintain nighttime dryness. Diagnostic evaluation should include a thorough history and physical examination to identify any underlying urinary tract disorders or other contributing medical conditions (4,5).

Treatment of NE has evolved significantly, moving from punitive measures to evidence-based behavioral therapies and medication. Behavioral interventions, especially when paired with bed-wetting alarms, have shown long-term success. Pharmacological treatments like desmopressin offer relief for children with monosymptomatic NE but may not be suitable for all cases, particularly if underlying bladder dysfunction is present. While combination therapies and personalized treatment approaches are promising, more research is required to better understand the role of emerging therapies and to explore the long-term effects of pharmacological interventions on children (5,6).

6. Conclusion

Nocturnal enuresis is a prevalent condition that impacts not only physical health but also psychological and social well-being. Understanding its multifactorial etiology, including genetic and physiological contributors, is essential for developing effective treatment strategies. While behavioral interventions and pharmacotherapy remain the primary management approaches, recent advances in understanding NE's pathophysiology and the role of sleep and bladder function may lead to more targeted therapies. Future research should focus on personalized treatment approaches, exploring genetic markers, and developing novel therapeutic agents to reduce the burden of nocturnal enuresis on affected children and their families.

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