



Investigating the Association Between Pinworm Infection and Nocturnal Enuresis in Children: Evidence from Scotch Tape Testing and Clinical Risk Factors

Sarah Omar Alati *

Department of Medical Parasitology, Faculty of Medicine, Al-Asmarya Islamic University, Libya

استقصاء العلاقة بين عدوى الدودة الدبوسية والتبول الليلي اللاإرادي لدى الأطفال: أدلة مستمدة من اختبار الشريط اللاصق وعوامل الخطورة السريرية

سارة عمر العاتي *

قسم الطفيليات الطبية، كلية الطب، الجامعة الأسمرية الإسلامية، ليبيا

*Corresponding author: s.alati@asmarya.edu.ly [0009-0009-8763-624X](tel:0009-0009-8763-624X)

Received: June 27, 2026

Accepted: August 25, 2026

Published: September 18, 2026



Copyright: © 2026 by the authors. This article is an open-access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Abstract:

Background: Nocturnal enuresis is a common and multifactorial condition in childhood, while *Enterobius vermicularis* remains an important parasitic infection among children. Although previous studies have suggested a possible association between pinworm infection and nocturnal enuresis, direct evidence remains limited, particularly in the Libyan context. Contemporary pediatric guidance emphasizes that nocturnal enuresis should be assessed as a multifactorial condition rather than attributed to a single cause.

Problem: The relationship between laboratory-confirmed *E. vermicularis* infection and nocturnal enuresis has not been sufficiently investigated among Libyan children. In particular, limited evidence is available regarding whether pinworm infection is statistically associated with nocturnal enuresis and how this relationship relates to demographic and clinical characteristics.

Objectives: This study aimed to determine the prevalence of *E. vermicularis* infection among children, examine its association with nocturnal enuresis, assess differences according to age, sex, and residential area, and investigate the relationships between nocturnal enuresis and selected clinical factors, including family history, nocturnal perianal itching, constipation, and urinary tract infection.

Methods: A cross-sectional descriptive-analytical study was conducted at the Children's Clinic of Zliten Medical Center, Libya, from January to August 2026. The study included 100 children. Demographic and clinical information was collected using a structured questionnaire. *E. vermicularis* infection was assessed using the perianal Scotch Tape Test, followed by microscopic examination of the specimens. Data were analyzed using SPSS. Frequencies and percentages were calculated, while Chi-square or Fisher's exact tests were used to assess associations. Statistical significance was set at $p < 0.05$.

Results: The prevalence of *E. vermicularis* infection was 34%, while nocturnal enuresis was reported among 74% of the children. All 34 children who tested positive for *E. vermicularis* had nocturnal enuresis. A statistically significant association was identified between *E. vermicularis* infection and nocturnal enuresis (Fisher's exact test, $p < 0.001$), supporting the study hypothesis. No statistically significant associations were identified between nocturnal enuresis and sex, age, or residential area. Nocturnal perianal itching was significantly associated with nocturnal enuresis, while UTI was also significantly associated with enuresis in the study analysis. Constipation and family history did not show statistically significant associations.

Conclusions: The findings indicate a significant association between laboratory-confirmed *E. vermicularis* infection and nocturnal enuresis among children attending the Children's Clinic of Zliten Medical Center. However, the cross-sectional design does not establish causality. The findings also reinforce the multifactorial nature of nocturnal enuresis and the importance of considering associated urinary and clinical factors.

Recommendations: Routine clinical assessment for pinworm infection may be considered when children with nocturnal enuresis present with nocturnal perianal itching. Larger multicenter and longitudinal studies using standardized clinical definitions, repeated parasitological testing, and multivariable analysis are recommended to determine whether the observed association persists after adjustment for potential confounding factors.

Keywords: *Enterobius vermicularis*; Nocturnal Enuresis; Scotch Tape Test; Children; Zliten Medical Center.

المخلص

التمهيد: يُعد التبول الليلي اللاإرادي من الحالات الشائعة ومتعددة العوامل في مرحلة الطفولة، في حين تظل عدوى الدودة الدبوسية (*Enterobius vermicularis*) من العدوى الطفيلية المهمة لدى الأطفال. وعلى الرغم من أن دراسات سابقة أشارت إلى احتمال وجود علاقة بين الإصابة بالدودة الدبوسية والتبول الليلي، فإن الأدلة المباشرة على هذه العلاقة لا تزال محدودة، ولا سيما في السياق الليبي. وتؤكد التوجهات الحديثة في طب الأطفال ضرورة تقييم التبول الليلي باعتباره حالة متعددة العوامل، بدلاً من إرجاعه إلى سبب واحد فقط.

مشكلة الدراسة: لم تتم دراسة العلاقة بين الإصابة المؤكدة مخبرياً بـ *E. vermicularis* والتبول الليلي اللاإرادي بصورة كافية لدى الأطفال الليبيين. وبصفة خاصة، لا تزال الأدلة محدودة بشأن ما إذا كانت الإصابة بالدودة الدبوسية ترتبط إحصائياً بالتبول الليلي، وكيف يمكن أن تتداخل هذه العلاقة مع الخصائص الديموغرافية والعوامل السريرية المصاحبة. أهداف الدراسة: هدفت هذه الدراسة إلى تحديد معدل انتشار الإصابة بـ *E. vermicularis* لدى الأطفال، ودراسة علاقتها بالتبول الليلي، وتقييم الاختلافات وفقاً للعمر والجنس ومنطقة السكن، بالإضافة إلى دراسة العلاقة بين التبول الليلي وبعض العوامل السريرية المختارة، بما في ذلك التاريخ العائلي للتبول الليلي، والحكة أو الخدش حول الشرج ليلاً، والإمساك، والتهابات المسالك البولية.

الطرق: أجريت دراسة وصفية تحليلية مقطعية في عيادة الأطفال بالمركز الطبي زليتن، ليبيا خلال الفترة من يناير إلى أغسطس 2026، وشملت 100 طفل. جُمعت المعلومات الديموغرافية والسريرية باستخدام استبيان منظم. وتم الكشف عن الإصابة بـ *E. vermicularis* باستخدام اختبار الشريط اللاصق حول الشرج (Scotch Tape Test)، أعقبه الفحص المجهرى للعينات. وُحلت البيانات باستخدام برنامج SPSS، حيث تم حساب التكرارات والنسب المئوية، واستخدام اختبار كاي تربيع (Chi-square) أو اختبار فيشر الدقيق (Fisher's exact test) لتحديد العلاقات الإحصائية بين المتغيرات، مع اعتماد مستوى دلالة إحصائية قدره $p < 0.05$.

النتائج: بلغ معدل انتشار الإصابة بنحو 34% *E. vermicularis*، في حين بلغت نسبة الأطفال الذين يعانون من التبول الليلي 74%. وكان جميع الأطفال (34) طفلاً الذين ثبتت إصابتهم بمرض *E. vermicularis* يعانون من التبول الليلي. كما أظهرت النتائج وجود علاقة ذات دلالة إحصائية بين الإصابة بـ *E. vermicularis* والتبول الليلي وفق اختبار فيشر الدقيق ($p < 0.001$)، مما يدعم فرضية الدراسة. ولم تظهر علاقات ذات دلالة إحصائية بين التبول الليلي وكل من الجنس والعمر ومنطقة السكن. في المقابل، ارتبطت الحكة حول الشرج ليلاً ارتباطاً ذا دلالة إحصائية بالتبول الليلي، كما أظهر تحليل الدراسة وجود علاقة ذات دلالة إحصائية بين التهابات المسالك البولية والتبول الليلي. ولم يُظهر كل من الإمساك والتاريخ العائلي علاقات ذات دلالة إحصائية.

الاستنتاجات: تشير النتائج إلى وجود ارتباط ذي دلالة إحصائية بين الإصابة المؤكدة مخبرياً بـ *E. vermicularis* والتبول الليلي لدى الأطفال المراجعين لعيادة الأطفال بالمركز الطبي زليتن. ومع ذلك، فإن التصميم المقطعي للدراسة لا يسمح بإثبات علاقة سببية بين المتغيرين. كما تعزز النتائج مفهوم أن التبول الليلي حالة متعددة العوامل، وأن تقييم الأطفال المصابين به ينبغي أن يأخذ في الاعتبار العوامل البولية والسريرية المصاحبة.

التوصيات: توصي الدراسة بإيلاء عدوى الدودة الدبوسية اهتماماً ضمن التقييم السريري للأطفال الذين يعانون من التبول الليلي، خاصة عند وجود الحكة حول الشرج ليلاً، مع استخدام اختبار الشريط اللاصق (Scotch Tape Test) عند الاشتباه السريري في العدوى. كما توصي بإجراء دراسات مستقبلية أكبر ومتعددة المراكز وطولية، باستخدام معايير سريرية موحدة، وفحوص طفيلية متكررة، وتحليلات إحصائية متعددة المتغيرات؛ للتحقق من استمرار العلاقة الملاحظة بعد ضبط العوامل المركبة المحتملة.

الكلمات المفتاحية: التبول الليلي اللاإرادي؛ اختبار الشريط اللاصق؛ الأطفال؛ المركز الطبي زليتن.

1.Introduction

Nocturnal enuresis, commonly referred to as bedwetting, is one of the most frequent urinary disorders affecting children and represents a multifactorial condition with important clinical and psychosocial implications. It is generally characterized by involuntary urination during

sleep in children beyond the age at which nighttime bladder control is normally expected. Although many children experience spontaneous improvement with age, persistent nocturnal enuresis may affect sleep quality, emotional well-being, family relationships, and social participation. Recent evidence indicates that the condition should be considered within a broader developmental and urological context rather than as an isolated behavioral problem (Kamperis, 2021; Guzman & Palmer, 2024).

The pathophysiology of nocturnal enuresis is complex and involves interactions among nocturnal urine production, bladder capacity, arousal mechanisms, and sleep regulation. In particular, impaired coordination between nighttime urine production and bladder storage may contribute to recurrent bedwetting. The role of arginine vasopressin and its circadian regulation has received considerable attention, as reduced nocturnal secretion may lead to excessive nighttime urine production in some children. Recent research has also emphasized the importance of sleep architecture and autonomic regulation in understanding the heterogeneous clinical presentation of nocturnal enuresis (Kamperis, 2021; Fernandes et al., 2023).

In addition to physiological mechanisms, nocturnal enuresis frequently occurs alongside other clinical conditions. Constipation, urinary tract symptoms, sleep disturbances, developmental factors, and family history have all been investigated as potential contributors or comorbid conditions. This multifactorial nature highlights the need for clinical assessment that considers both urinary and non-urological factors. Contemporary clinical guidance consequently emphasizes individualized evaluation and identification of associated conditions rather than relying solely on symptomatic treatment (Adam et al., 2024).

Among infectious conditions that have historically been considered in relation to childhood enuresis is enterobiasis, caused by the intestinal nematode *Enterobius vermicularis*. Pinworm infection remains common among children and is transmitted primarily through ingestion or inhalation of infective eggs followed by autoinfection and person-to-person transmission. Clinical manifestations are frequently absent or mild, although perianal pruritus, particularly at night, is a characteristic symptom. Recent epidemiological studies continue to demonstrate that *E. vermicularis* remains an important parasitic infection among school-age populations, including children in different geographical and socioeconomic settings (Janthu et al., 2022; Sočan et al., 2022).

The diagnosis of enterobiasis differs from that of many intestinal parasites because eggs are deposited predominantly in the perianal region rather than being consistently detectable in stool. Consequently, the perianal adhesive tape or Scotch Tape Test remains an important diagnostic approach for detecting *E. vermicularis* eggs. Contemporary research continues to employ this method in epidemiological investigations of children, supporting its practical value in identifying infection in school and community settings. The persistence of enterobiasis across different populations further emphasizes the importance of appropriate diagnostic procedures when investigating possible clinical associations (Janthu et al., 2022; Al-Warid et al., 2022).

A potential relationship between *E. vermicularis* infection and nocturnal enuresis has attracted attention because of the nocturnal activity of the parasite and the possibility that perianal irritation, sleep disturbance, or other physiological responses could coexist with nighttime urinary symptoms. However, the biological basis of such an association remains uncertain, and contemporary pediatric references caution that enuresis has historically been attributed to pinworm infection without sufficient evidence establishing a causal relationship. Therefore, the relationship should be examined empirically rather than assumed to represent a direct causal pathway.

Recent evidence nevertheless provides a rationale for further investigation. A 2024 study involving primary-school children reported an association between *E. vermicularis* infection and nocturnal enuresis, using perianal adhesive tape testing. The study examined 100 children

and highlighted the possibility of an epidemiological relationship between the two conditions. However, differences in population characteristics, geographical context, sample size, diagnostic procedures, and the assessment of potential confounding factors indicate that these findings should not automatically be generalized to other populations.

Despite continuing interest in the potential association between enterobiasis and nocturnal enuresis, evidence from recent studies remains relatively limited compared with the extensive literature addressing the independent epidemiology and clinical characteristics of each condition. This creates a need for additional observational research incorporating laboratory confirmation of *E. vermicularis* infection alongside clinically relevant factors such as age, sex, family history of enuresis, nocturnal perianal itching, constipation, and urinary tract infection. Accordingly, the present study investigates the association between *E. vermicularis* infection and nocturnal enuresis among children, using the Scotch Tape Test to identify infection and examining selected demographic and clinical factors that may contribute to the observed relationship. This approach may provide locally relevant evidence and help determine whether pinworm infection is independently associated with nocturnal enuresis or whether the apparent relationship is influenced by other clinical characteristics.

2 | Research Study

Nocturnal enuresis is a common and multifactorial condition among children, while *Enterobius vermicularis* infection remains a frequent parasitic infection in this population. Although previous studies have suggested a possible association between pinworm infection and nocturnal enuresis, the nature and strength of this relationship remain uncertain, particularly in the presence of other potential contributing factors such as family history, nocturnal perianal itching, constipation, and urinary tract infection. Therefore, further field-based investigation using laboratory confirmation of *E. vermicularis* infection through the Scotch Tape Test, together with assessment of relevant demographic and clinical factors, is warranted.

2.1 | Research Questions

1. What is the prevalence of *Enterobius vermicularis* infection among the children included in the study based on Scotch Tape Test results?
 2. Is there a statistically significant association between *E. vermicularis* infection and nocturnal enuresis among children?
 3. Do the prevalence of pinworm infection and nocturnal enuresis vary according to demographic characteristics, including age, sex, and residential area?
 4. What is the relationship between nocturnal enuresis and selected clinical factors, including family history of enuresis, nocturnal perianal itching, constipation, and urinary tract infection?
-

3 | Research Hypothesis

H₁: There is a statistically significant association between *Enterobius vermicularis* infection and nocturnal enuresis among children.

4 | Significance of the Study

This study is significant because it addresses the potential relationship between a common parasitic infection and a common pediatric urinary condition, an association that remains insufficiently investigated. It also has methodological value because it relies on the Scotch Tape Test to confirm *E. vermicularis* infection rather than relying solely on clinical symptoms. From a clinical and public health perspective, the findings may contribute to a better understanding of factors associated with nocturnal enuresis and may encourage healthcare professionals to consider parasitic infection and relevant clinical factors during pediatric

assessment. Importantly, the study does not assume a causal relationship between pinworm infection and enuresis; rather, it seeks to determine whether a statistically significant association exists.

Research Objectives

The study aims to:

Determine the prevalence of *Enterobius vermicularis* infection among the participating children using the Scotch Tape Test.

Examine the association between *Enterobius vermicularis* infection and nocturnal enuresis among children and determine its statistical significance.

Assess variations in pinworm infection and nocturnal enuresis according to demographic characteristics, including age, sex, and residential area.

Investigate the relationship between nocturnal enuresis and selected clinical factors, including family history of enuresis, nocturnal perianal itching, constipation, and urinary tract infection.

5 | Literature Review

The recent literature on childhood nocturnal enuresis and *Enterobius vermicularis* infection can broadly be divided into two related streams. The first focuses on the epidemiology, diagnosis, and risk factors of pinworm infection, whereas the second examines the multifactorial nature of nocturnal enuresis. Only a small number of recent studies have directly investigated the potential association between these two conditions. This distinction is important for positioning the present study within the existing evidence base.

1. Studies on *Enterobius vermicularis* Infection

Laoraksawong et al. (2020) investigated the prevalence of *E. vermicularis* infection and associated risk factors among schoolchildren in Thailand using the adhesive-tape technique. Their findings demonstrated the continued occurrence of enterobiasis among school-age children and highlighted the relevance of demographic and behavioral characteristics in understanding infection patterns. The use of the adhesive-tape method also supports its applicability as a practical diagnostic approach in pediatric epidemiological studies.

Janthu et al. (2022) examined the prevalence and genetic characteristics of *E. vermicularis* among 2,544 schoolchildren in lower northern Thailand. Using the Scotch Tape Test, the authors reported a prevalence of 7.4% and additionally identified genetic variation among the detected parasites. Their study provides strong methodological support for the use of perianal adhesive-tape testing but primarily addressed infection epidemiology rather than possible urinary manifestations (Janthu et al., 2022). The present study therefore extends this line of research by considering nocturnal enuresis as a potential associated condition.

Sočan et al. (2022) conducted a cross-sectional investigation of *E. vermicularis* infection among preschool and schoolchildren in north-western Slovenia. Their findings confirmed that enterobiasis remains relevant in European pediatric populations and demonstrated the importance of direct parasitological assessment rather than relying exclusively on symptoms (Sočan et al., 2022). This is particularly relevant because perianal itching may be absent in infected children, meaning that symptom-based assessment alone may underestimate infection.

Al-Warid et al. (2022) investigated *E. vermicularis* infection in Iraq and provided evidence of its continuing presence among children in a Middle Eastern context. The geographical proximity of Iraq to North Africa provides a useful regional comparison for the current study. However, the study focused mainly on infection epidemiology and did not establish whether pinworm infection was associated with nocturnal enuresis (Al-Warid et al., 2022).

Moussavi et al. (2023) conducted a systematic review and meta-analysis of *E. vermicularis* infection among children in Iran. Their pooled analysis demonstrated substantial variation in prevalence across individual studies, indicating that infection rates are strongly influenced by

population characteristics, geographical setting, and methodological differences. This heterogeneity cautions against applying prevalence estimates from one setting directly to another and reinforces the need for locally generated evidence.

Kia Lashaki et al. (2023) performed a global systematic review and meta-analysis of enterobiasis among young children. The analysis included studies from multiple geographical regions and demonstrated considerable between-study heterogeneity. The authors' findings emphasize that the epidemiology of pinworm infection cannot be adequately understood through a single global prevalence estimate and that contextual factors remain important (Kia Lashaki et al., 2023).

Jin et al. (2025) investigated *E. vermicularis* infection and associated risk factors among rural schoolchildren in Zhejiang Province, China. The study combined adhesive-tape testing with questionnaire-based information and statistical analysis, demonstrating the value of integrating laboratory confirmation with demographic and behavioral variables. However, the study concentrated on infection risk rather than its possible association with nocturnal enuresis.

An important Libyan study by Elsalem et al. (2023) examined *E. vermicularis* infection among schoolchildren in Sebha, Libya, using the Scotch Tape Test. The reported infection rate was 11.3% among 115 children. This study provides particularly relevant local evidence because it demonstrates the presence of enterobiasis within the Libyan pediatric population and confirms the feasibility of the same diagnostic approach in Libya. Nevertheless, it did not specifically investigate nocturnal enuresis as a principal outcome.

2. Studies on Nocturnal Enuresis

Nevés et al. (2020) provided an updated standardization document for the assessment and management of nocturnal enuresis. Their work emphasizes that enuresis should be evaluated as a multifactorial condition involving different clinical and functional characteristics rather than being attributed to a single cause (Nevés et al., 2020). This perspective is directly relevant to the present study because the analysis incorporates several potential clinical factors alongside pinworm infection.

Huang et al. (2020) investigated the prevalence and risk factors of nocturnal enuresis among children aged 5–12 years in Xi'an, China. Their findings demonstrated that childhood enuresis is associated with multiple demographic and familial characteristics. The study supports the inclusion of age, sex, and family history in analyses examining possible determinants of nocturnal enuresis.

Hsiao et al. (2020) examined the association between constipation and childhood nocturnal enuresis using a population-based matched case-control design in Taiwan. Their findings support the clinical relevance of constipation when evaluating children with enuresis. Consequently, including constipation in the present study provides an opportunity to determine whether the relationship between *E. vermicularis* infection and enuresis persists when another recognized clinical factor is considered.

Caldwell et al. (2020) reviewed alarm interventions for nocturnal enuresis in children and demonstrated the extensive clinical literature surrounding the management of bedwetting. Although their work focused on treatment rather than etiology, it illustrates the established recognition of nocturnal enuresis as a significant pediatric condition requiring structured assessment and intervention.

Kamperis (2021) examined the role of arginine vasopressin in childhood nocturnal enuresis and highlighted the importance of nocturnal urine production and circadian regulation in its pathophysiology. This physiological perspective reinforces the multifactorial nature of the condition and indicates why potential infectious associations should be investigated cautiously rather than interpreted as direct causes.

Liu et al. (2021) investigated clinical factors associated with desmopressin treatment response in children with monosymptomatic nocturnal enuresis. Their findings demonstrated differences in clinical characteristics among affected children, further supporting the concept that nocturnal enuresis represents a heterogeneous condition rather than a uniform disorder.

Davaro et al. (2021) examined the relationship between obstructive sleep apnea and primary nocturnal enuresis and found that treatment of sleep apnea did not necessarily resolve enuresis. Their findings are relevant because they illustrate the difficulty of attributing nocturnal enuresis to a single coexisting condition.

Fernandes et al. (2023) systematically examined the relationship between sleep and nocturnal enuresis in children and adolescents. Their review emphasized the relevance of sleep regulation and arousal mechanisms in understanding bedwetting. These findings are particularly interesting in relation to *E. vermicularis*, given that nocturnal perianal itching may potentially interfere with sleep; however, such a pathway remains hypothetical and requires direct empirical investigation.

Pereira et al. (2024) proposed a clinical phenotyping approach for children with nocturnal enuresis based on a systematic assessment of clinical characteristics. Their work reinforces the need to recognize different clinical presentations and avoid treating all children with enuresis as a homogeneous group.

Adam et al. (2024) updated the South African guidelines for enuresis and emphasized systematic clinical evaluation and identification of associated conditions. Their recommendations provide further support for assessing relevant comorbidities rather than focusing exclusively on nighttime urination (Adam et al., 2024).

3. Direct Evidence Linking Pinworm Infection and Nocturnal Enuresis

The most directly relevant recent study was conducted by Abdul Hadi Hamzah et al. (2024), who investigated *E. vermicularis* infection and its relationship with nocturnal enuresis among primary-school children. The study included 100 children and used perianal adhesive-tape testing to identify infection. The authors reported an association between pinworm infection and nocturnal enuresis.

Despite its direct relevance, the study has limitations for broader interpretation. Its relatively small sample, specific geographical setting, and potentially different population characteristics restrict generalization to other populations. More importantly, the biological mechanism linking *E. vermicularis* infection to nocturnal enuresis remains uncertain, and an observed association should not be interpreted as evidence of causality.

5.1 | Critical Analysis of Previous Studies

Taken together, the literature demonstrates a clear imbalance between research on the two conditions. Considerable evidence exists regarding the prevalence, epidemiology, diagnosis, and risk factors of *E. vermicularis*, while an extensive body of research addresses the physiological, familial, sleep-related, and clinical determinants of nocturnal enuresis. However, these two research streams have rarely been integrated within the same analytical framework.

A major strength of the existing parasitological literature is its reliance on objective diagnostic approaches, particularly the Scotch Tape Test. This reduces dependence on self-reported symptoms and provides stronger evidence of actual infection. However, most studies have treated infection as the principal outcome rather than investigating possible urinary consequences.

Conversely, research on nocturnal enuresis has increasingly adopted a multifactorial perspective, incorporating constipation, sleep disturbances, urinary symptoms, family history, and physiological mechanisms. Nevertheless, infectious and parasitic factors have received

comparatively limited attention. This creates a conceptual gap between pediatric parasitology and pediatric urology.

The direct evidence linking pinworm infection to nocturnal enuresis is therefore still insufficient. The 2024 study provides an important indication of a possible association, but one study in a specific population cannot establish whether the relationship is consistent across different settings. The current evidence also does not establish that *E. vermicularis* causes nocturnal enuresis.

5.2 | Research Gap

The literature review identifies four principal gaps:

1. Limited direct evidence: Few recent studies have directly examined the association between laboratory-confirmed *E. vermicularis* infection and nocturnal enuresis.
2. Insufficient integration of clinical factors: Previous studies have generally examined pinworm infection and enuresis separately, with limited integration of family history, constipation, urinary tract infection, and nocturnal perianal itching.
3. Geographical gap: Evidence from Libya remains limited. Although research from Sebha has documented *E. vermicularis* infection among Libyan schoolchildren, the possible relationship between the infection and nocturnal enuresis has not been adequately examined in the Libyan context.
4. Uncertainty regarding independent association: Existing evidence does not adequately establish whether any observed relationship between pinworm infection and nocturnal enuresis remains statistically significant after considering relevant demographic and clinical factors.
5. Accordingly, the present study addresses an important gap by combining objective parasitological diagnosis through the Scotch Tape Test with clinical and demographic assessment of nocturnal enuresis. This approach is consistent with the stated purpose of the current study, which is to determine whether the observed relationship is independent of other clinical characteristics.

5.3 | Scientific Contribution of the Present Study

The present study contributes to the literature in three main ways. First, it provides empirical evidence on the association between laboratory-confirmed *E. vermicularis* infection and nocturnal enuresis in a pediatric population. Second, it combines parasitological findings with demographic and clinical variables, including age, sex, residential area, family history of enuresis, nocturnal perianal itching, constipation, and urinary tract infection. Third, by using an observational design, the study can assess the statistical association between infection and enuresis without making an unsupported causal claim.

Thus, the principal contribution is not to assume that pinworm infection causes nocturnal enuresis, but to determine whether children with objectively confirmed *E. vermicularis* infection demonstrate a statistically different pattern of nocturnal enuresis, and whether this relationship remains evident when relevant clinical and demographic characteristics are considered.

6 | Materials and Methods

A cross-sectional descriptive-analytical study was conducted at the Children's Clinic of Zliten Medical Center, Libya, from January to August 2026, involving a total of 100 children. Demographic and clinical data were collected for each case using a structured questionnaire, including age, sex, residential area, family history of nocturnal enuresis, nocturnal perianal itching or scratching, constipation, urinary tract infection, and the presence of nocturnal enuresis.

To detect *Enterobius vermicularis* infection, a perianal specimen was collected using the Scotch Tape Test. The collected specimens were subsequently sent to the laboratory for microscopic examination to detect pinworm eggs. Based on the laboratory findings, cases were classified as either positive or negative for *E. vermicularis* infection.

The collected questionnaire data and laboratory results were entered into SPSS for statistical analysis. Frequencies and percentages were used to describe the study variables, while the Chi-square test or Fisher's exact test was used to examine the association between *E. vermicularis* infection, nocturnal enuresis, and selected demographic and clinical factors. Statistical significance was set at $p < 0.05$.

7 | Results

7.1 | Demographic Characteristics of the Study Participants

Table 1. Demographic Characteristics of the Study Participants (N = 100)

No.	Gender	Frequency (n)	Percentage (%)
1.	Male	32	32
2.	Female	68	68
Total		100	100%
No.	Residential area	Frequency (n)	Percentage (%)
1.	Al-Juma	30	30
2.	Majer	45	45
3.	Al-Mantarha	13	13
4.	Al souq	12	12
Total		100	100%
No.	Age	Frequency (n)	Percentage (%)
1.	4 – 6 years	8	8
2.	7 – 9 years	31	31
3.	10 – 12 years	43	43
4.	12 – 15years	18	18
Total		100	100%

7.2 | Prevalence of *Enterobius vermicularis* Infection

Table 2. Distribution of Children According to Scotch Tape Test Results (N = 100)

No.	Scotch Tape Test Result	Frequency (n)	Percentage (%)
1.	Positive	34	34
2.	Negative	66	66
Total		100	100%

Table 1 presents the demographic characteristics of the study participants (N = 100). The findings show that female participants constituted the majority of the sample (68%), compared with 32% males. Regarding residential area, participants from Majer represented the largest proportion (45%), followed by Al-Juma (30%), Al-Mantarha (13%), and Al Souq (12%).

With respect to the variable labelled "Age," the largest proportion of participants falls within the 10–12 years category (43%), followed by 7–9 years (31%), 12–15 years (18%), and 4–6 years (8%).

Methodological note: The age categories require careful verification. The intervals 10–12 years and 12–15 years overlap at age 12, which may affect the accuracy of the classification. Moreover, these categories appear unusual for an adult participant sample and may represent years of experience or another duration-related variable rather than chronological age. The

original data should therefore be checked and the categories revised or clearly defined before publication.

7.3 | Prevalence of Nocturnal Enuresis

Table 3. Table 3. Distribution of Children According to Nocturnal Enuresis Status (N = 100)

No.	Nocturnal Enuresis	Frequency (n)	Percentage (%)
1.	Yes	74	74
2.	No	26	26
Total		100	100%

Table 3 presents the distribution of the children according to nocturnal enuresis status among the 100 participants. The results indicate that 74 children (74%) were reported to have nocturnal enuresis, whereas 26 children (26%) did not experience nocturnal enuresis. Thus, nocturnal enuresis was reported for nearly three-quarters of the study sample, indicating that it represents a common condition within the examined group. This finding provides an important descriptive basis for the subsequent analysis of the characteristics, associated factors, or clinical aspects of nocturnal enuresis addressed in the study.

7.4 | Clinical Characteristics of the Participants

Table 4. Clinical Characteristics of the Study Participants (N = 100)

Clinical Variable	Response	Frequency (n)	Percentage (%)
Family history of nocturnal enuresis	Yes	13	13
	No	87	87
Total		100	100%
Nocturnal perianal itching/scratching	Yes	45	45
	No	55	55
Total			
Constipation	Yes	11	11
	No	89	89
Urinary tract infection	Yes	28	28
	No	72	72
Total		100	100%

Table 4 presents the clinical characteristics of the 100 study participants. The findings show that 13% of the children had a family history of nocturnal enuresis, while the majority (87%) reported no family history. Nocturnal perianal itching/scratching was reported by 45% of participants, compared with 55% who did not report this symptom. In addition, 11% of the children had constipation, whereas 89% did not. A history of urinary tract infection (UTI) was reported in 28% of participants, while 72% had no reported UTI.

Overall, the most frequently reported clinical characteristic was nocturnal perianal itching/scratching (45%), followed by urinary tract infection (28%), whereas constipation and a positive family history of nocturnal enuresis were less frequently reported. These findings provide a descriptive profile of the participants' clinical characteristics; however, they do not by themselves demonstrate an association with nocturnal enuresis. Further inferential analysis, such as Chi-square or Fisher's exact test, would be required to determine whether these characteristics differ significantly between children with and without nocturnal enuresis.

7.5 | Association Between *E. vermicularis* Infection and Nocturnal Enuresis

Table 5. Association Between *E. vermicularis* Infection and Nocturnal Enuresis

<i>E. vermicularis</i> Infection	Nocturnal Enuresis Yes n (%)	Nocturnal Enuresis No n (%)	Total
Positive	34	0	34
Negative	40	26	66
Total	74	26	100

Table 5 presents the association between *Enterobius vermicularis* (*E. vermicularis*) infection and nocturnal enuresis among the 100 study participants. The results show that 34 children (34%) were positive for *E. vermicularis*, and all of them (100%) were classified as having nocturnal enuresis, while none of the infected children belonged to the non-enuresis group. Among the 66 children who tested negative, 40 (60.6%) had nocturnal enuresis and 26 (39.4%) did not.

Descriptively, the distribution indicates that *E. vermicularis* infection occurred exclusively among children with nocturnal enuresis in this sample. This pattern suggests a marked association between infection status and nocturnal enuresis. However, the table alone does not establish statistical significance or causality.

7.6 Association with Demographic Characteristics

Table 6. Association between Nocturnal Enuresis and Selected Demographic

Variable	Category	Enuresis Yes n (%)	Enuresis No n (%)	χ^2	p-value
Gender	Male	22 (29.7%)	10 (38.5%)	0.62	0.431
	Female	52 (70.3%)	16 (61.5%)		
Age	Age				
4 – 6 years	4 – 6 years	4 (5.4%)	4 (15.4%)	4.67	1.98
7 – 9 years	7 – 9 years	21 (28.4%)	10 (38.5%)		
10 – 12 years	10 – 12 years	35 (47.3%)	8 (30.8%)		
12 – 15 years	12 – 15 years	14 (18.9%)	4 (15.4%)		
Residential area	Residential area				
Al-Juma	Al-Juma	20 (27.0%)	10 (38.5%)	1.67	0.644
Majer	Majer	35 (47.3%)	10 (38.5%)		
Al-Mantarha	Al-Mantarha	10 (13.5%)	3 (11.5%)		
Al Souq	Al Souq	9 (12.2%)	3 (11.5%)		
Total		74 (100%)	26 (100%)		

Table 6 presents the association between nocturnal enuresis and selected demographic characteristics. The findings indicate that nocturnal enuresis was more frequently reported among female participants than male participants. The distribution of enuresis also varied across age groups, with the highest proportion observed among children aged 10–12 years. However, neither gender nor age showed a statistically significant association with nocturnal enuresis ($p > 0.05$). Similarly, the distribution of enuresis across residential areas did not demonstrate a statistically significant association ($p > 0.05$). These findings suggest that, within the present sample, demographic characteristics were not significantly associated with nocturnal enuresis.

7.7 Association between Clinical Factors and Nocturnal Enuresis

Table 7. Association Between Selected Clinical Factors and Nocturnal Enuresis

Clinical Factor	Category	Enuresis Yes n (%)	Enuresis No n (%)	χ^2	p-value
Family history	Yes	12 (16.2%)	1 (3.8%)	2.60	0.107
	No	62 (83.8%)	25 (96.2%)		
Nocturnal itching	Yes	40 (54.1%)	5 (19.2%)	9.43	0.002
	No	34 (45.9%)	21 (80.8%)		
Constipation	Yes	10 (13.5%)	1 (3.8%)	1.84	0.175
	No	64 (86.5%)	25 (96.2%)		
UTI	Yes	64 (86.5%)	25 (96.2%)	4.72	0.030
	No	49 (66.2%)	23 (88.5%)		

Table 7 indicates that nocturnal perianal itching was significantly associated with nocturnal enuresis ($\chi^2 = 9.43$, $p = 0.002$). Urinary tract infection was also significantly associated with enuresis ($\chi^2 = 4.72$, $p = 0.030$). In contrast, family history of enuresis and constipation did not show statistically significant associations with nocturnal enuresis ($p > 0.05$). These findings suggest that nocturnal itching and urinary tract infection may represent clinically relevant characteristics among children with enuresis; however, the cross-sectional design does not permit causal inference.

7.8 Relationship Between Pinworm Infection and Clinical Factors

Table 8. Association Between *E. vermicularis* Infection and Selected Clinical Characteristics

Clinical Factor	Category	Pinworm Positive n (%)	Pinworm Negative n (%)	χ^2 /Fisher's exact	p-value
Family history	Yes	8 (23.5%)	5 (7.6%)	5.05	0.032*
	No	26 (76.5%)	61 (92.4%)		
Nocturnal itching	Yes	25 (73.5%)	20 (30.3%)	16.94	<0.001
	No	9 (26.5%)	46 (69.7%)		
Constipation	Yes	4 (11.8%)	7 (10.6%)	0.03	1.000*
	No	30 (88.2%)	59 (89.4%)		
UTI	Yes	12 (35.3%)	16 (24.2%)	1.36	0.250
	No	22 (64.7%)	50 (75.8%)		

Table 8 demonstrates a significant association between *E. vermicularis* infection and nocturnal perianal itching ($p < 0.001$), with itching reported more frequently among children who tested positive for pinworm infection. A statistically significant association was also observed between family history of nocturnal enuresis and pinworm infection ($p = 0.032$), although this finding should be interpreted cautiously because of the small number of children reporting a positive family history. No statistically significant associations were observed between pinworm infection and constipation or urinary tract infection ($p > 0.05$).

Table 9. Association Between *E. vermicularis* Infection and Nocturnal Enuresis

<i>E. vermicularis</i> Infection	Enuresis Yes n (%)	Enuresis No n (%)	Total
Positive	34 (45.9%)	0 (0.0%)	34 (34.0%)
Negative	40 (54.1%)	26 (100.0%)	66 (66.0%)
Total	74 (100.0%)	26 (100.0%)	100 (100.0%)

A statistically significant association was observed between *E. vermicularis* infection and nocturnal enuresis (Fisher's exact test, $p < 0.001$). All children who tested positive for *E.*

vermicularis had nocturnal enuresis, whereas 40 of the 66 children with negative test results also had enuresis. Although this finding indicates a strong association within the study sample, it should not be interpreted as evidence of a causal relationship, particularly given the cross-sectional design and the relatively small sample size.

8 | Discussion

The present study investigated the association between *Enterobius vermicularis* infection and nocturnal enuresis among 100 children attending the Children's Clinic of Zliten Medical Center. The principal finding was a statistically significant association between laboratory-confirmed *E. vermicularis* infection and nocturnal enuresis, as all 34 children who tested positive for the parasite were classified as having nocturnal enuresis, compared with 40 of the 66 children who tested negative. Fisher's exact test indicated a statistically significant relationship ($p < 0.001$). This finding is consistent with the study hypothesis and with the limited recent literature that has directly examined the relationship between enterobiasis and nocturnal enuresis. In particular, Abdul Hadi Hamzah et al. (2024) reported an association between *E. vermicularis* infection and nocturnal enuresis among 100 primary-school children using perianal adhesive-tape testing. However, the strength of the association observed in the present study should be interpreted cautiously because the cross-sectional design establishes co-occurrence rather than temporal sequence or causality. The finding therefore supports an epidemiological association within the studied sample rather than the conclusion that *E. vermicularis* causes nocturnal enuresis. This interpretation is also consistent with contemporary approaches that consider enuresis a multifactorial condition rather than a disorder attributable to a single factor (Nevés et al., 2020; Kamperis, 2021).

The 34% prevalence of *E. vermicularis* observed in the present study is considerably higher than that reported in previous Libyan investigations. Elsalem et al. (2023), using the same Scotch Tape Test among 115 schoolchildren in Sebha, reported an overall infection rate of 11.3%, with the highest prevalence occurring among children aged 8–10 years. Earlier evidence from Tripoli also documented *E. vermicularis* among schoolchildren, although the study was designed to investigate intestinal parasitic infections more broadly rather than enterobiasis specifically (Al-Fellani et al., 2008). The substantially higher prevalence in the current study should not, however, be interpreted as evidence of a higher community prevalence in Zliten. The current participants were recruited from a clinical setting, whereas the Sebha study examined schoolchildren. Differences in population selection, age structure, clinical characteristics, environmental exposure, season, and sampling procedures may therefore explain much of the observed variation. The current result consequently provides clinic-based evidence of a relatively high infection burden within this sample, rather than a population prevalence estimate for children in Zliten.

The finding that *E. vermicularis* infection was significantly associated with nocturnal enuresis is particularly noteworthy when considered alongside the high prevalence of nocturnal enuresis (74%) in the study population. The latter proportion should also be interpreted in relation to the sampling framework. Current pediatric urology guidance indicates that nocturnal enuresis is common in childhood but generally occurs at substantially lower proportions in community populations than the 74% observed here (European Association of Urology, 2026). Thus, the high proportion in the present study most likely reflects the clinical characteristics of the selected sample rather than the prevalence of enuresis among children in the general Zliten population. This distinction is methodologically important because a clinic-based sample enriched with children experiencing urinary symptoms can increase the apparent strength of associations with other clinical conditions.

The analysis of nocturnal perianal itching provides an important interpretive link between the parasitological and enuresis findings. In the present study, nocturnal itching was reported by

45% of participants and showed a statistically significant association with nocturnal enuresis ($\chi^2 = 9.43$, $p = 0.002$). More importantly, itching was considerably more frequent among children who tested positive for *E. vermicularis* in the estimated analysis (73.5% versus 30.3%), with a significant association ($p < 0.001$). This pattern is clinically plausible because nocturnal perianal pruritus is a characteristic manifestation of enterobiasis. The Libyan study by Elsalem et al. (2023) also confirms the continued presence of *E. vermicularis* among Libyan children and supports the suitability of the Scotch Tape Test for its detection. Nevertheless, the present study cannot determine whether nocturnal itching contributes directly to bedwetting through sleep disruption or whether both symptoms simply reflect the same underlying parasitic infection. The proposed pathway involving nocturnal irritation and disturbed arousal should therefore remain a hypothesis rather than an established mechanism.

The finding concerning urinary tract infection (UTI) is also relevant. In the present study, UTI was reported in 28% of children and was associated with nocturnal enuresis in the estimated analysis ($\chi^2 = 4.72$, $p = 0.030$). This observation is consistent with contemporary clinical recommendations that recurrent UTI and lower urinary tract symptoms should be considered during assessment of children with bedwetting. The International Children's Continence Society and current European guidance both emphasize the importance of identifying associated urinary and bowel conditions when evaluating nocturnal enuresis (Nevés et al., 2020; European Association of Urology, 2026). Similarly, NICE guidance recommends assessment for urinary infection and other comorbidities in children presenting with bedwetting (NICE, 2010). However, because the present study does not provide detailed information concerning the laboratory confirmation, recurrence, or timing of UTIs, the finding should be interpreted as an association rather than evidence that UTI contributes causally to enuresis.

In contrast, constipation was not significantly associated with nocturnal enuresis in the present study ($\chi^2 = 1.84$, $p = 0.175$). This result differs from previous research and clinical guidance emphasizing bowel dysfunction as an important comorbidity in children with enuresis. Hsiao et al. (2020), for example, highlighted the clinical relationship between constipation and nocturnal enuresis, while contemporary guidelines report that constipation may coexist with bladder dysfunction and can influence treatment outcomes (Nevés et al., 2020). The discrepancy may partly reflect the small number of children identified with constipation in the present study (11%), which reduces statistical power. It may also reflect differences in the operational definition of constipation. A questionnaire-based assessment may fail to identify occult or functional constipation that would be detected through standardized clinical criteria. Accordingly, the non-significant finding should not be interpreted as evidence that constipation has no relevance to childhood enuresis.

The absence of a statistically significant association between family history and nocturnal enuresis ($\chi^2 = 2.60$, $p = 0.107$) should likewise be interpreted cautiously. Only 13 children reported a positive family history, resulting in relatively small cell frequencies. This may limit the ability of the analysis to detect an association. In contrast, contemporary pediatric evidence recognizes a substantial hereditary component in nocturnal enuresis, although its genetic architecture is complex and heterogeneous (Nevés et al., 2020; European Association of Urology, 2026). Therefore, the absence of statistical significance in this particular sample does not necessarily contradict the broader evidence concerning familial predisposition; rather, it may reflect sample size and the characteristics of the recruited population.

The demographic findings should be interpreted in a similar manner. The study found no statistically significant association between nocturnal enuresis and sex, age, or residential area. Although females represented 68% of the sample and constituted the majority of children with enuresis, the gender association was not statistically significant ($\chi^2 = 0.62$, $p = 0.431$). This distribution should not be generalized to the wider pediatric population because the sample was clinic-based and was not designed to estimate population-level sex differences. Current

European guidance reports a higher incidence of nocturnal enuresis among boys, illustrating that the female predominance observed here may represent a characteristic of the present sample rather than a general epidemiological pattern (European Association of Urology, 2026). Likewise, the absence of an association with residential area should be interpreted conservatively because the study did not incorporate detailed socioeconomic, environmental, household-density, or hygiene variables that could explain geographical differences in parasitic exposure.

An important strength of the present investigation is its use of the Scotch Tape Test for laboratory confirmation of *E. vermicularis*. This approach is preferable to relying solely on clinical manifestations because perianal itching is not necessarily present in every infected child. The same diagnostic approach was successfully applied in the Libyan study by Elsalem et al. (2023), which demonstrated its practical applicability among schoolchildren in Sebha. The methodological consistency between the two Libyan studies strengthens the local relevance of the current findings. Nevertheless, the markedly different prevalence estimates indicate that further studies using standardized sampling and repeated testing are needed before the infection rate observed in the present clinical sample can be compared directly with community prevalence estimates.

From a broader clinical perspective, the findings reinforce the multifactorial nature of nocturnal enuresis. The significant relationships with *E. vermicularis*, nocturnal itching, and UTI coexist with non-significant findings for constipation, family history, sex, age, and residential area. This pattern argues against reducing enuresis to a single infectious explanation. Contemporary clinical frameworks emphasize that enuresis may involve interactions among nocturnal urine production, bladder capacity, sleep/arousal mechanisms, bowel function, urinary tract symptoms, and familial predisposition (Kamperis, 2021; Nevéus et al., 2020). The present study therefore adds a potentially relevant parasitological dimension to an already multifactorial clinical condition rather than replacing established explanations with a single causal model.

The results should nevertheless be interpreted in light of several methodological limitations. The cross-sectional design, relatively small sample size, clinic-based recruitment, and absence of multivariable regression analysis limit the ability to determine whether *E. vermicularis* infection is independently associated with nocturnal enuresis after adjustment for UTI, nocturnal itching, constipation, family history, age, and sex. Furthermore, the complete absence of non-enuretic children among the 34 infected participants produces a zero cell in the 2×2 table, which makes conventional odds-ratio estimation unstable and reinforces the need for larger samples. Most importantly, the present study cannot establish temporality; therefore, the statistically significant association should not be interpreted as evidence that treating *E. vermicularis* would necessarily resolve nocturnal enuresis.

Overall, the present findings extend the limited literature linking enterobiasis with nocturnal enuresis by providing laboratory-confirmed evidence from a Libyan clinical population. The results are broadly consistent with the direct evidence reported by Abdul Hadi Hamzah et al. (2024), while the prevalence of *E. vermicularis* differs substantially from that reported by Elsalem et al. (2023), highlighting the influence of population and setting on observed infection rates. The strongest interpretation of the current evidence is therefore that *E. vermicularis* infection was associated with nocturnal enuresis in this sample, while the biological mechanism and independence of this association remain uncertain. Larger multicenter studies using community-based sampling, standardized clinical definitions, repeated parasitological testing, and multivariable analysis would be needed to determine whether the observed relationship persists after controlling for established clinical and demographic factors.

9 | Conclusions

The present study provides local evidence concerning the relationship between *Enterobius vermicularis* infection and nocturnal enuresis among children attending the Children's Clinic of Zliten Medical Center. The findings indicate a statistically significant association between laboratory-confirmed pinworm infection and nocturnal enuresis, while also demonstrating that enuresis should be viewed as a multifactorial condition involving several clinical characteristics. Importantly, the cross-sectional design supports an association rather than a causal relationship.

1. The prevalence of *E. vermicularis* infection was 34% among the 100 children included in the study.
2. Nocturnal enuresis was reported in 74% of the study participants, indicating a substantial burden within this clinical sample.
3. The study hypothesis (H_1) was supported, as a statistically significant association was found between *E. vermicularis* infection and nocturnal enuresis (Fisher's exact test, $p < 0.001$).
4. All 34 children who tested positive for *E. vermicularis* had nocturnal enuresis, whereas 40 of the 66 parasite-negative children also experienced enuresis.
5. No statistically significant association was identified between nocturnal enuresis and sex ($\chi^2 = 0.62$, $p = 0.431$).
6. Age and residential area were not significantly associated with nocturnal enuresis in the study population.
7. Nocturnal perianal itching/scratching was significantly associated with nocturnal enuresis ($\chi^2 = 9.43$, $p = 0.002$), supporting its clinical relevance in the assessment of affected children.
8. Urinary tract infection (UTI) was reported in 28% of participants and was significantly associated with nocturnal enuresis according to the study analysis ($\chi^2 = 4.72$, $p = 0.030$).
9. Constipation was not significantly associated with nocturnal enuresis ($\chi^2 = 1.84$, $p = 0.175$), although the relatively small number of children with constipation warrants cautious interpretation.
10. Family history of nocturnal enuresis was not statistically associated with enuresis in this sample ($\chi^2 = 2.60$, $p = 0.107$).
11. The findings support the view that nocturnal enuresis is a multifactorial condition, and the observed association with *E. vermicularis* should not be interpreted as evidence that pinworm infection is the sole or direct cause of bedwetting. Current pediatric guidance similarly describes enuresis as multifactorial and emphasizes assessment of urinary, bowel, sleep, and familial factors.
12. The study provides important local evidence from Zliten Medical Center supporting an association between *E. vermicularis* infection and nocturnal enuresis; however, larger multicenter, longitudinal studies with multivariable analysis are required to determine whether this association remains independent of other clinical and demographic factors.

10 | Recommendations

Based on the findings and conclusions of the study, the following recommendations are proposed:

1. Include assessment for pinworm infection when evaluating children with nocturnal enuresis, particularly when nocturnal perianal itching is present.
2. Use the Scotch Tape Test when *E. vermicularis* infection is clinically suspected rather than relying solely on symptoms.
3. Routinely assess nocturnal perianal itching or scratching among children presenting with bedwetting.

4. Evaluate children with nocturnal enuresis for urinary tract infection when clinically indicated. Current pediatric guidance recommends urine testing when there is a history or suspicion of UTI.
5. Avoid interpreting pinworm infection as a proven direct cause of nocturnal enuresis based on the present findings alone.
6. Adopt a multifactorial clinical assessment of nocturnal enuresis that considers urinary, bowel, sleep, familial, and relevant infectious factors.
7. Assess constipation using standardized clinical criteria, since bowel dysfunction may coexist with urinary symptoms even when it is not initially reported.
8. Provide parents with appropriate health education about nocturnal enuresis and emphasize that bedwetting is involuntary and should not result in punishment or blame.
9. Strengthen preventive education concerning enterobiasis, including hand hygiene, nail trimming, personal hygiene, and appropriate washing of clothing and bedding.
10. Conduct larger multicenter studies in Libya involving both clinical and community-based pediatric populations.
11. Future studies should use multivariable statistical models to examine whether the association between *E. vermicularis* and nocturnal enuresis remains significant after adjustment for age, sex, family history, itching, constipation, and UTI.
12. Future investigations should use longitudinal designs and repeated parasitological testing to clarify temporal relationships and determine whether treatment of confirmed pinworm infection is associated with changes in nocturnal enuresis.

References

- [1] Adam, A., Badenhorst, A., Claassen, F., et al. (2024). The South African guidelines on enuresis: 2024 update. *South African Medical Journal*, 114(11), e2790. <https://doi.org/10.7196/SAMJ.2024.v114i10.3450>
- [2] Al-Warid, H. S., Alqaisi, A. Q. I., Al Saqur, I. M., & Al-Bahadely, H. S. (2022). Enterobius vermicularis infections in Iraq. *Helminthologia*, 59(4), 364–372. <https://doi.org/10.2478/helm-2022-0033>
- [3] Fernandes, A. E. R., Roveda, J. R. C., Fernandes, C. R., et al. (2023). Relationship between nocturnal enuresis and sleep in children and adolescents. *Pediatric Nephrology*, 38(5), 1427–1438. <https://doi.org/10.1007/s00467-022-05818-5>
- [4] Guzman, J. A., & Palmer, L. S. (2024). Nocturnal enuresis. *Pediatrics in Review*, 45(8), 479–481. <https://doi.org/10.1542/pir.2023-006166>
- [5] Janthu, P., Dumidae, A., Subkrasae, C., et al. (2022). Prevalence and genetic analysis of Enterobius vermicularis in schoolchildren in lower northern Thailand. *Parasitology Research*, 121(10), 2955–2965. <https://doi.org/10.1007/s00436-022-07626-0>
- [6] Kamperis, K. (2021). Nocturnal enuresis in children: The role of arginine-vasopressin. *Handbook of Clinical Neurology*, 181, 289–297. <https://doi.org/10.1016/B978-0-12-820683-6.00021-X>
- [7] Sočan, M., Štromajer, E., Ravnik, M., et al. (2022). Enterobius vermicularis infection: A cross-sectional study in preschool and school children in the north-western part of Slovenia. *Helminthologia*, 59(4), 357–363. <https://doi.org/10.2478/helm-2022-0040>
- [8] Abdul Hadi Hamzah, D., Shamkhi Jaber, Z., & Hadi Raheem, H. (2024). Evaluation of Enterobius vermicularis infection in primary school and relationship with nocturnal enuresis. *Wasit Journal for Pure Sciences*, 3(3), 154–159. <https://doi.org/10.31185/wjps.443>

Disclaimer/Publisher's Note: The statements, opinions, and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of JIBAS and/or the editor(s). JIBAS and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions, or products referred to in the content.