



ORIGINAL ARTICLE

OPEN ACCESS

Prevalence of Nocturnal Enuresis among Schoolchildren in Sana'a City, Yemen

Lutf M. Al-Zubairi^{1,*}, Adel A. Al-Emad², Mabrook Bin Mohanna¹, Tawfik H. Al-Bada'ani³

¹Department of Pediatrics, Faculty of Medicine & Health Sciences, Sana'a University, Sana'a, Yemen

²Department of Community Medicine, Faculty of Medicine & Health Sciences, Sana'a University, Sana'a, Yemen

³Department of Urology, Faculty of Medicine & Health Sciences, Sana'a University, Sana'a, Yemen

ABSTRACT

Objective: To estimate the prevalence, frequency and time of nocturnal enuresis (NE) among primary schoolchildren in Sana'a city, Yemen.

Methods: This was a cross-sectional study was conducted among 2689 schoolchildren in the primary schools of four randomly selected districts in Sana'a city in the period from September 2012 to December 2013. Data about sociodemographic characteristics, frequency, time, psycho-social effects and the factors possibly associated with NE among children were collected using a pre-designed questionnaire and analyzed using appropriate statistical tests.

Results: The overall prevalence of NE was 11.2%, which was significantly higher among males than females (13.0% vs. 10.0%, respectively; $P = 0.044$) and decreased significantly with increasing age ($P < 0.001$). More than half of children (55.3%) in Sana'a city had the habits of drinking excess fluids and tea at night and/or deep sleeping. Of physical and health disorders, difficulty in breathing and urinary tract infections were the two most frequent conditions among children with NE, being observed among 29.6% and 23.9% of cases, respectively. However, urogenital anomalies and mental retardation were the least frequent conditions in children with NE, being observed among 5.8% and 1.3% of cases, respectively. On the other hand, marital problems (24.8%) and arrival of a new baby (17.9%) were the most frequently observed social conditions among children with NE, while death in the family (8.5%) and parental separation (6.0%) were the least frequently observed conditions.

Conclusions: NE is prevalent among 11.2% of schoolchildren in Sana'a city with a significantly higher, though slight, rate among males. This rate is lower than the rates reported from Aden and Mukalla cities in the country and from Saudi Arabia and Turkey. However, it is higher than those reported from Iran and Malaysia. About a third of children experience nightly NE, whereas the lowest proportion of children experience NE twice a month. The habits of drinking excess fluid and tea at night and/or deep sleeping, the disorders of difficulty in breathing and urinary tract infections and the social conditions of marital problems and arrival of a new baby are the most frequent observations among children with NE in Sana'a city.

Keywords: Nocturnal enuresis, Schoolchildren, Sana'a

* Corresponding author: L. M. Al-Zubairi (zubairilutf@gmail.com)



1. Introduction

Nocturnal enuresis (NE) is an involuntary and undesirable bedwetting despite the absence of congenital or acquired defects of the central nervous system or the urinary tract in children five years or over, especially boys. Although NE is not a serious medical disorder, it is a common problem of childhood and can be very difficult to live with. NE may interfere with a child's socialization and can lead to significant stress within the family (1). Primary nocturnal enuresis (PNE) is the most common form and is usually limited to children who have never gained complete nighttime control. Secondary nocturnal enuresis (SNE) refers to nighttime bedwetting after an extended period of night dryness (2). NE has a variable frequency, but it is usually present among 15–20% of five-year-old children, 5% of ten-year-old children and 1% of teenagers, with a variation in its gender frequency despite being more frequent among boys (3).

Parental concerns about NE begin when their child reaches the age of 5 to 6 years when being prepared for school enrollment. Approximately 80–85% of children with NE are mono-symptomatic, while 5–10% of cases meet the definition of PNE, with daytime wetting or other bladder symptoms (4). NE is most commonly attributed to delayed neurological development, while a small proportion of cases are due to the insufficient production of the anti-diuretic hormone (5). Genetic predisposition is the most frequently supported etiologic variable (6). However, deep sleep, moving to a new town, parent conflict or divorce, arrival of a new baby, loss of a loved one or pet are found to be risk factors that can contribute to returning NE (5). There is a lack of data on NE in Yemen. Therefore, the present study aimed to determine the prevalence of NE among schoolchildren enrolled in primary schools in Sana'a city, Yemen.

2. Methods

2.1. Study design and population

This cross-sectional study was conducted in the primary schools of four randomly selected districts in Sana'a city in the period from September 2012 to December 2013. The study population included school children (boys and girls) aged between 6 and 12 years.

2.2. Sample size and sampling strategy

A total of 2689 questionnaires were distributed to school children from 20% of randomly selected schools in each district to estimate prevalence with acceptable response and accuracy.

2.3. Data collection

Data were collected from parents and children using a pre-designed questionnaire by visiting the schools several times. The questionnaire was modified after being pretested on 100 students not included in data analysis. It included questions data about sociodemographic characteristics, frequency, time, psycho-social effects and the factors possibly associated with NE among children.

2.4. Data analysis

Data were analyzed using the IBM SPSS Statistics for Windows®, version 22 (IBM corp., Armonk, NY, USA). The differences and associations between categorical variables were tested using Pearson's chi-square test. Differences were considered statistically significant at P values <0.05 .

3. Results

3.1. Prevalence of NE among schoolchildren in Sana'a city

Table (1) shows that the response rate was 75.0% (2026/2689), where 61.5% (1245/2026) of respondents were females and 41.0%



(831/2026) aged less than 8 years. The overall prevalence of NE was 11.2%, which was significantly higher among males than females (13.0% vs. 10.0%, respectively; $P = 0.044$) and decreased significantly with increasing age ($P < 0.001$).

Table 1. Prevalence of nocturnal enuresis among schoolchildren in Sana'a city, Yemen (2012–2013)

Characteristic	N	Nocturnal enuresis		P value
		n (%)	95% CI	
Overall prevalence	2026	226 (11.2)	9.8–12.6	
Gender				
Female	1245	125 (10.0)	8.4–11.8	0.044
Male	781	101 (13.0)	10.7–15.5	
Age (years)				
<8	831	120 (14.4)	12.1 – 17.0	<0.001
8–10	729	71 (9.72)	7.7 – 12.1	
>10	466	35 (7.51)	5.3 – 10.3	

3.2. Frequency and time of NE among schoolchildren in Sana'a city

Of 226 children with NE, the highest proportion of children (33.6%) had nightly NE followed by those having NE for two to four times a week (22.1%). However, the lowest proportion of children (8.9%) had NE twice a month. On the other hand, more than half of children experienced NE during the late hours of sleep followed by those wetting beds anytime or in the early hours of sleep, being 38.1% and 10.6%, respectively (Table 2).

Table 2. Frequency and time of nocturnal enuresis among schoolchildren in Sana'a city, Yemen (2012–2013) (N = 226)

Item	n (%)
Frequency	
Once a month	41 (18.1)
Twice a month	20 (8.9)
Once a week	39 (17.3)
2-4 times a week	50 (22.1)
Every night	76 (33.6)
Time of occurring	
Early hours of sleep	24 (10.6)
Late hours of sleep	116 (51.3)
Anytime	86 (38.1)

3.3. Psychosocial impact of NE on children in Sana'a city

Table (3) shows that the majority of children with NE (92.9%) had feelings of embarrassment and fear of friends followed by sibling annoyance (66.8%) and parental punishment (45.5%).

Table 3. Psychosocial effects of nocturnal enuresis on children in Sana'a city (N = 226)

Effect*	n (%)
Embarrassment	196 (92.9)
Fear of friends	196 (92.9)
Sibling annoyance	141 (66.8)
Parental punishment	96 (45.5)

*A child might experience more than one effect.

3.4. Habitual, physical and social factors observed among schoolchildren with NE

Table (4) shows that more than half of children (55.3%) in Sana'a city had the habits of drinking excess fluids and tea at night and/or deep sleeping. Of physical and health disorders, difficulty in breathing and urinary tract infections were the two most frequent conditions among children with NE, being observed in 29.6% and 23.9% of cases, respectively. In addition, constipation and developmental delay were equally observed among 15.5% of cases, while urogenital anomalies and mental retardation were the least frequent conditions in children with NE, being observed among 5.8% and 1.3% of cases, respectively. On the other hand, marital problems (24.8%) and arrival of a new baby (17.9%) were the most frequently observed social conditions among children with NE, while death in the family (8.5%) and parental separation (6.0%) were the least frequently observed conditions (Table 4).



Table 4. Factors observed among children with nocturnal enuresis in Sana'a city (N = 226)

Factors*	n (%)
Habitual factors	
Excess fluid and tea drinking	125 (55.3)
Deep sleeping	125 (55.3)
Physical and health disorders	
Difficulty in breathing	67 (29.6)
Urinary tract infection	54 (23.9)
Constipation	35 (15.5)
Developmental delay	35 (15.5)
Urogenital anomaly	13 (5.8)
Mental retardation	3 (1.3)
Social factors	
Moving to another city	15 (12.8)
Marital problems	29 (24.8)
Parental separation	7 (6.0)
Arrival of a new baby	21 (17.9)
Death in the family	10 (8.5)

*A child may be exposed to more than one factor.

4. Discussion

NE is one of the most common developmental disorders during childhood that often causes considerable distress to affected children and their parents. Generally speaking, studies show that 15-20% of children have some degree of NE at the age of 5 years, with a spontaneous resolution rate of approximately 15% (7). In the present study, the overall prevalence of NE (11.1%) is lower than that reported among schoolchildren from Mukalla city, Hadhramout governorate (28.6%) and from Aden city (17.2%) (8, 9). In addition, it is lower than the rates reported from Turkey (13%) and Saudi Arabia (15%) (10, 11). However, it is higher than that reported from Malaysia (8%) and Iran (7%) (12, 13).

The present study shows a decrease in the prevalence of NE with increasing age, which is consistent with the findings reported elsewhere (9, 2, 14). In contrast to the inconsistency with the findings of studies from Mukalla and Aden (8, 9), the significantly higher prevalence of NE in boys (13%) than in girls (10%) in the

present study is consistent with those reported elsewhere (10–16). This could be attributed to the faster developmental maturity and, hence, general continence in females than in males.

The finding that the majority of children with NE in Sana'a are deep sleepers is in line with the patterns of enuretic children reported elsewhere (7, 18). It is also consistent with the finding that enuretic children were approximately twice more likely to face difficulty waking up than non-enuretic children in Mukalla (8). In contrast, only 25.6% of enuretic children were described as deep sleepers in Aden (9). It is noteworthy that poor sleep quality may play a role in the continuation of NE, and a vicious cycle of sleep fragmentation could increase arousal threshold, which, in turn, leads to failure to respond to full-bladder signals and continuation of NE (19). The relationship between the difficulty to wake up and NE remains controversial. No differences or only nonspecific changes have been demonstrated in children with and without NE by sleep electroencephalography in most studies. However, parents consistently describe their children with NE as "deep sleepers" (5).

In the present study, about a third of cases had difficulty in breathing, which is less than that reported in enuretic children from Aden and Mukalla, being 37.3% and 41.2% of cases, respectively (8, 9). On the other hand, the habit of drinking tea and fluids at night by more than half of children with NE in the present study is supported by a finding among enuretic children from Aden (9). Although there is little data to support this approach, restricting fluids could be an easy way to control NE.

In the present study, embarrassment and fear of friends were the two psychosocial effects encountered among schoolchildren with NE in Sana'a city followed by sibling annoyance. However, paternal punishment was found among less than half of enuretic children. This is higher than that was reported among Jordanian chil-



dren with PNE, where only 14.0% of children had been reacted with anger and punished (20). In the United States (21), parents with a grade school level of education were found to punish their enuretic children at twice the rate of high school- and college-educated parents. Punishing or shaming enuretic children frequently worsens the situation and lessens their self-confidence.

5. Conclusions

NE is prevalent among 11.2% of school children in Sana'a city with a significantly higher, though slight, rate among males. This rate is lower than the rates reported from Aden and Mukalla cities in the country and from Saudi Arabia and Turkey. However, it is higher than those reported from Iran and Malaysia. About a third of children experience nightly NE followed by those having NE for two to four times a week, whereas the lowest proportion of children experience NE twice a month. The habits of drinking excess fluid and tea at night and/or deep sleeping, the disorders of difficulty in breathing and urinary tract infections and the social conditions of marital problems and arrival of a new baby are the most frequent observations among children with NE in Sana'a city.

Acknowledgments

The authors acknowledge the cooperation of schoolchildren and their families who consented to participate in this study and the schoolteachers who helped them in the study.

Authors' contributions

LMA and AAA designed the study. LMA and AAA collected data. LMA and AAA analyzed and interpreted the data. LMA drafted the manuscript. LMA, AAA, MBM and THA revised the manuscript. All authors approved the final submission

Competing interests

The authors declare that they have no competing interests associated with this article.

Ethical approval

The protocol of this study was ethically approved by the Research Ethics Committee of the Faculty of Medicine and Health Sciences, Sana'a University. Informed consent was obtained from the families of the participating schoolchildren, and informed assent was also obtained from the schoolchildren to participate voluntarily.

References

1. Nøgaard JP, van Gool JD, Hjalmas K, Djurhuus JC, Hellstrom AL. Standardization and definitions in lower urinary tract dysfunction in children. International Children's Continence Society. *Br J Urol* 1998; 81 (Suppl 3): 1–16. [PubMed](#) • [DOI](#) • [Google Scholar](#)
2. Robson WL. Clinical practice: evaluation and management of enuresis. *N Engl J Med* 2009; 360: 1429–36. [PubMed](#) • [DOI](#) • [Google Scholar](#)
3. Karničnik K, Koren A, Kos N, Marčun Varda N. Prevalence and quality of life of Slovenian children with primary nocturnal enuresis. *Int J Nephrol* 2012; 2012: e509012. [PubMed](#) • [DOI](#) • [Google Scholar](#)
4. Lawless MR, McElderry DH. Nocturnal enuresis: current concepts. *Pediatr Rev* 2001; 22: 399–407. [PubMed](#) • [DOI](#) • [Google Scholar](#)
5. Thiedke CC. Nocturnal enuresis. *Am Fam Physician* 2003; 67: 1499–506. [PubMed](#) • [Google Scholar](#)
6. Nøgaard JP, Djurhuus JC, Watanabe H, Stenberg A, Lettgen B. Experience and current status of research into the pathophysiology of nocturnal enuresis. *Br J Urol* 1997; 79: 825–35. [PubMed](#) • [DOI](#) • [Google Scholar](#)
7. Kiddoo DA. Nocturnal enuresis. *BMJ Clin Evid* 2007; pii: 305. [PubMed](#) • [Google Scholar](#)
8. Aljefri HM, Basurreh OA, Yunus F, Bawazir AA. Nocturnal enuresis among primary school children, Mukalla, Yemen. *Saudi J Kidney Dis Transplant* 2013; 24: 1233–41. [PubMed](#) • [DOI](#) • [Google Scholar](#)
9. Yousef KA, Basaleem HO, bin Yahya MT. Epidemiology of nocturnal enuresis in basic schoolchildren in Aden Governorate, Yemen. *Saudi J Kidney Dis Transplant* 2011; 22: 167–73. [PubMed](#) • [Google Scholar](#)
10. Gümüş B, Vurgun N, Lekili M, Işcan A, Müezzinoğlu T, Büyüksu C. Prevalence of nocturnal enuresis and accompanying factors in children aged 7-11 years in Turkey. *Acta Paediatr* 1999; 88: 1369–72. [PubMed](#) • [DOI](#) • [Google Scholar](#)
11. Kalo BB, Bella H. Enuresis: prevalence and associated factors among primary school children in Saudi Arabia. *Acta Paediatr* 1996; 85: 1217–22. [PubMed](#) • [DOI](#) • [Google Scholar](#)
12. Kanaheswari Y. Epidemiology of childhood nocturnal enuresis in Malaysia. *J Paediatr Child Health* 2003; 39: 118–23. [PubMed](#) • [DOI](#) • [Google Scholar](#)
13. Azhir A, Frajadegan Z, Adibi A, Hedayatpoor B, Fazel A, Divband A. An epidemiological study of enuresis among primary school children in Isfahan, Iran. *Saudi Med J* 2006; 27: 1572–7. [PubMed](#) • [Google Scholar](#)



14. Eapen V, Mabrouk AM. Prevalence and correlates of nocturnal enuresis in the United Arab Emirates. *Saudi Med J* 2003; 24: 49–51. [PubMed](#) • [Google Scholar](#)
15. Bakhtiar K, Pournia Y, Ebrahimzadeh F, Farhadi A, Shafizadeh F, Hosseinabadi R. Prevalence of nocturnal enuresis and its associated factors in primary school and pre-school children of Khorramabad in 2013. *Int J Pediatr* 2014; 2014: 120686. [PubMed](#) • [DOI](#) • [Google Scholar](#)
16. Ismail A, Abdelbasser K, Abdel-moneim M. Prevalence and risk factors of primary nocturnal enuresis in primary school children in Qena Governorate - Egypt. *Egypt J Neurol Psychiatry Neurosurg* 2013; 50: 2. [Google Scholar](#)
17. Byrd RS, Weitzman M, Lanphear NE, Auinger P. Bedwetting in US children: epidemiology and related behavior problems. *Pediatrics* 1996; 98: 414–9. [PubMed](#) • [Google Scholar](#)
18. Aloni MN, Ekila MB, Ekulu PM, Aloni ML, Magoga K. Nocturnal enuresis in children in Kinshasa, Democratic Republic of Congo. *Acta Paediatr* 2012; 101: e475–8. [PubMed](#) • [DOI](#) • [Google Scholar](#)
19. Dhondt K, Raes A, Hoebeke P, Van Laecke E, Van Herzeele C, Vande Walle J. Abnormal sleep architecture and refractory nocturnal enuresis. *J Urol* 2009; 182 (4 Suppl): 1961–5. [PubMed](#) • [DOI](#) • [Google Scholar](#)
20. Hazza I, Tarawneh H. Primary nocturnal enuresis among school children in Jordan. *Saudi J Kidney Dis Transplant* 2002; 13: 478–80. [PubMed](#) • [Google Scholar](#)
21. Haque M, Ellerstein NS, Gundy JH, Shelov SP, Weiss JC, McIntire MS, et al. Parental perceptions of enuresis. A collaborative study. *Am J Dis Child* 1981; 135: 809–11. [PubMed](#) • [DOI](#) • [Google Scholar](#)

