Rate and risk factors of nocturnal enuresis in school going children

Sunayna Pandey, Harsh J. Oza, Hemang Shah, Ganpat K. Vankar

Department of Psychiatry, Dr. M. K. Shah Medical College and SMS Multispeciality Hospital, \(^1\)Department of Psychiatry, Dr. M. K. Shah and SMS Multispeciality Hospital, \(^2\)Department of Psychiatry, B.J. Medical College and Civil Hospital, Ahmedabad, Gujarat, \(^3\)Department of Psychiatry, Jawaharlal Nehru Medical College, Wardha, Maharashtra, India

**Purpose:** The purpose is to find out the rate of nocturnal enuresis in school going children (5–12 years) and the risk factors associated with it. **Materials and Methods:** The parents of children aged between 5 and 12 years studying in two primary schools in Ahmedabad completed a self-administered semi-structured questionnaire comprising of enuresis, sociodemographic profiles, and risk factors. Children with enuresis and those without were compared on demographic characteristics and risk factors using Chi-square and \(t\)-test for categorical and quantitative data respectively. The data were analyzed using SPSS version 17. **Results:** The response rate was 86.54% as 1904 responses were collected out of 2200. The overall rate of nocturnal enuresis was 6.7% (according to Diagnostic and Statistical Manual of Mental Disorders, 5\textsuperscript{th} Edition definition of nocturnal enuresis). As the age increased, the rate of nocturnal enuresis declined. A positive family history was seen in 36.6% of children with enuresis. Enuresis was found to be more frequently in lower socioeconomic class. It was a neglected problem, only 20.6% of children received some kind of treatment. **Conclusion:** The rate of nocturnal enuresis was 6.7% in school going children. Strong correlation was found with family history. Although the rate was high, most of the children with enuresis were not treated.

**Keywords:** Children, nocturnal enuresis, prevalence, risk factors

Access this article online

**Website:** www.industrialpsychiatry.org

**DOI:** 10.4103/ipj.ipj_15_18

According to the Diagnostic and Statistical Manual of Mental Disorders, 5\textsuperscript{th} Edition (DSM-5) nocturnal enuresis is defined as the repeated voiding of urine into the bed or clothes at least twice a week for at least three consecutive months in a child who is at least 5 years of age in the absence of congenital or acquired defects of the central nervous system.\(^1\)

Primary nocturnal enuresis is never having established urinary continence at night. Primary enuresis is often associated with a familial history of enuresis. Ninety percent of cases of enuresis are primary, and its prevalence usually changes with age. Nocturnal enuresis can cause a variety of psychological and behavioral problems including embarrassment, lack of self-esteem, aggression, and poor school performance. Enuresis has been an under-reported problem and even parents of children with enuresis do not see it as a major concern.
Monosymptomatic nocturnal enuresis is bedwetting occurring without any day-time enuresis or urological symptoms. Epidemiological studies across the world report varied prevalence rates of enuresis due to different definitions of enuresis. Studies report the prevalence of enuresis as 12%–25% in 4-year-old, 8%–10% in an 8-year-old and 2%–3% in 12 years old. There have been only few published studies in India that have reported the prevalence of enuresis being 4%–14% in school going children.\(^{[2,3]}\)

Most studies have consistently found that the risk factors for enuresis are male sex, less age, family history of enuresis, deep sleep, and various socioeconomic risk factors such as less income, lack of education in parents, crowded families, and environments of inferior social status. Enuresis has many causes including developmental differences such as differential growth of the urinary sphincters of a child, and diseases such as urinary tract infection, diabetes, emotional changes such as the birth of a new baby and scholastic stressful conditions, and emotional crisis such divorce, family conflicts. It is also common among institutionalized children. Genetic predisposition is also an important factor in the etiology. The chances of a child’s becoming enuretic if either one of the parents has the condition is 45% and the risk rises to 75%. It is as low as 15% where there is no family history.\(^{[4,4]}\)

It is a common problem among school going children and the reported prevalence varies across studies. Enuresis has been an under-reported problem and even parents of children with enuresis show little concern. There have been very few published studies in India that have reported the prevalence of enuresis in school going children.\(^{[2,7,8]}\) Considering the importance and consequences of nocturnal enuresis and lack of extensive studies in India, we conducted a study to determine the prevalence of nocturnal enuresis and risk factors associated with it.

All children aged 5–12 years, whose parents who volunteered to participate in the study were included. Children below age of 5 years and above the age of 12 years, and whose parents were unwilling to participate were excluded.

The aims of the study were explained to the teachers and the questionnaire was distributed to the children who got it filled by their parents at home and then they returned it to the teacher.

The questionnaire was based on a similar study by Hashem et al., in 2013.\(^{[9]}\) It consisted of 25 questions regarding the presence of enuresis and the frequency of enuresis, risk factors associated with it, sociodemographic factors and treatment. It usually took 10–15 min to complete. The parents also received two-page information regarding the causes, risk factors, and treatment of nocturnal enuresis.

**Materials and Methods**

Institutional ethical committee approved the proposed study, and “All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.”

It was an exploratory cross-sectional survey done in two primary schools of the urban area. Two thousand and two hundred questionnaires were distributed to school children between the ages of 5–12 years studying in primary school (standard 1–7). One thousand nine hundred and four 1904 responses were collected (response rate of 86.54%).

**Results**

Out of 2200 forms distributed among the children, 1904 forms were returned after being filled by their parents, with the response rate, 86.54%.

**Rate of enuresis**

Figure 1 shows that the rate of nocturnal enuresis in children aged 5–12 years old as per DSM-5 criteria was 6.67% (127 out of 1904 children). The rate was 17.65% (336 out of 1904 children), if any frequency of bed-wetting was considered as enuresis.

**Sociodemographic characteristics and enuresis**

Table 1 shows various sociodemographic characteristics. The rate of daytime enuresis was 3.3% (62 out of 1904), which is statistically significant (\(P < 0.000001\)). If any frequency is considered, the rate in boys was 18.15% and for girls, it was 16.96%. Two hundred and nine (62.2%) children with enuresis compared to had a family size of 5 or more, which was statistically significant (\(P = 0.02043\)).

**Parental characteristics and enuresis**

Table 2 shows parental information in both the groups. The low educational level was seen in 49.4% of fathers
and 65.5% of mothers. Enuretic children had more mothers who had not completed college education as compared to the nonenuretic group (65.5% vs. 57.5%). Enuresis was more frequently associated with mothers working outside the home (29.5% children with enuresis vs. 21.8% children without enuresis). More children with enuresis had mothers who consumed tobacco during pregnancy (2.1%). Enuresis was more frequent in children who have fathers with tobacco addiction than in children whose fathers did not have any addiction (24.4% vs. 11.5%). The difference was statistically significant ($P \leq 0.0000001$).

Eight out of 336 (2.4%) children had parents who had divorce which was statistically significant ($P < 0.04250$).

**Risk factors**

Table 3 shows risk factors associated with nocturnal enuresis. Of 336 children with nocturnal enuresis, 123 (36.6%) had positive family history, while out of 1568 nonenuretic children, only 77 (4.9%) had a positive family history. Other risk factors which were found significantly associated with enuresis were a history of recurrent urinary tract infection, febrile convulsions, and neonatal jaundice. In this study, parents of children with enuresis compared to parents of children without enuresis considered their children stubborn more often (52.4% vs. 23.8%).

**Age-wise rate of nocturnal enuresis**

Table 4 shows that as the age increases the rate of nocturnal enuresis decreases, i.e., as per DSM-5 definition, at the age of 5 years, 12.19% had enuresis while in children aged 12 years old only 2.31% had enuresis. If we do not consider frequency, the rate was 34.15% at the age 5 and 6.02% at the age 12 years.

**Treatment for enuresis**

Of all enuretic children ($n = 336$), 79.4% did not receive any kind of treatment, 19.9% of the parents of children...
with enuresis believed that it will improve with age. Only 20.6% were given some kind of treatment out of which 7.4% had some drug treatment whereas 13.2% had nonpharmacological treatment like giving some home remedies or behavioral therapy like alarm treatment or water restriction after evening time.

**DISCUSSION**

Nocturnal enuresis is widely prevalent among children but as it is still perceived as a shameful condition, it is kept as a secret and hence underreported. It may cause emotional and social problems for both, the child and the family. The aim of our study is to find out the rate of nocturnal enuresis and the various risk factors associated with it.

The rate of nocturnal enuresis in children aged 5–12-year-old as per DSM-5 diagnostic criteria was 6.67%. The prevalence of enuresis ranges from 5% to 10% in 5-year-old, 1.5%–5% in 9–10-year-old, and about 1% in adolescents 15 years or older.[10]

In the studies by De Sousa et al. and Srivastava et al., the prevalence of enuresis was 7.61% and 12.6%, respectively.[2,11] Different studies have used different criteria, which has led to the varied prevalence. According to various international studies, the range of nocturnal enuresis prevalence is 4.45%–18.7%.[9,12–25] This variation also could be due to sociocultural variations between the countries.

The rate of daytime enuresis was 3.3%. The rate of daytime enuresis was 17.9% in enuretic children as compared to 0.1% in nonenuretic children. This shows that daytime enuresis is more seen in children with nocturnal enuresis. This could be because of urinary tract infection or anatomical abnormalities of the urinary tract. Hashem et al. reported daytime incontinence in 5.5% children.[9]

According to De Sousa et al. daytime enuresis was present in 14.29%.[2] Out of 1904 children, 1102 were boys and 802 of them were girls. Out of 336 positive children, 200 (59.5%) were boys and 136 (49.5%) were girls. The rate for boys was 18.15% and for girls, it was 16.96%, the difference was not statistically significant. This result is similar to most reports in the literature. Hashem et al. found the prevalence of 20.9% in boys and 16.5% in girls.[9] De Sousa et al. reported a prevalence of enuresis among boys 9.02% and 3.61% among girls.[2] This could be because of variation in development in both sexes.

In this study, the rate of nocturnal enuresis tended to decrease as the age increased. According to DSM-5 definition of nocturnal enuresis, the rate at 5 years of age was 12.19% whereas it was 2.31% in the age of 12 years. This could be because with an increase in age, nervous

| Table 3: Risk factors associated with enuresis |
|---------------------------------------------|
| Risk factors                  | Present (n=336) | Absent (n=1568) | Chi-square test (P) |
|-------------------------------|-----------------|-----------------|---------------------|
| Urinary tract infection       |                 |                 |                     |
| Yes                           | 27 (8)          | 29 (1.8)        | <0.0000001*         |
| No                            | 309 (92)        | 1539 (98.2)     |                     |
| Neonatal jaundice             |                 |                 |                     |
| Yes                           | 47 (14)         | 112 (7.1)       | 0.0000985*          |
| No                            | 289 (86)        | 1456 (92.9)     |                     |
| Breast feeding (years)        |                 |                 |                     |
| >1                            | 169 (50.3)      | 723 (46.1)      | 0.1628              |
| <1                            | 167 (49.7)      | 845 (53.9)      |                     |
| Febrile convulsion            |                 |                 |                     |
| Yes                           | 31 (9.2)        | 64 (4.1)        | 0.00008478*         |
| No                            | 305 (90.8)      | 1504 (95.9)     |                     |
| Stubborn nature               |                 |                 |                     |
| Yes                           | 176 (52.4)      | 373 (23.8)      | <0.0000001*         |
| No                            | 160 (47.6)      | 1195 (76.2)     |                     |
| Family history                |                 |                 |                     |
| Yes                           | 123 (36.6)      | 77 (4.9)        | <0.0000001*         |
| No                            | 213 (63.4)      | 1491 (95.1)     |                     |

*P<0.05 (statistically significant)

| Table 4: Age-wise rate of nocturnal enuresis |
|---------------------------------------------|
| Age (years) | n=1904 | Enuresis (Present) | Present (DSM-5) | Absent | Rate (DSM-5) | Any frequency enuresisRate |
|-------------|--------|--------------------|-----------------|--------|--------------|----------------------------|
| 5           | 41 (2.1) | 14                 | 5               | 27     | 12.19        | 34.15                      |
| 6           | 300 (15.8) | 94                | 40              | 206    | 33.33        | 31.3                       |
| 7           | 250 (13.1) | 65                | 24              | 185    | 9.6          | 26                         |
| 8           | 281 (14.8) | 55                | 19              | 226    | 6.76         | 19.57                      |
| 9           | 270 (14.2) | 46                | 17              | 224    | 6.30         | 17.04                      |
| 10          | 286 (15.0) | 34                | 12              | 252    | 4.20         | 11.89                      |
| 11          | 260 (13.7) | 15                | 5               | 245    | 1.92         | 5.77                       |
| 12          | 216 (11.3) | 23                | 5               | 203    | 2.31         | 6.02                       |

DSM-5 – Diagnosis and Statistical Manual of Mental Disorders, 5th Edition
A strong positive correlation was seen between the presence of nocturnal enuresis in family members and its presence in children. Positive family history of enuresis was strongly associated with enuresis in this study \((P < 0.0000001)\). According to De Sousa et al., the rates of positive family history for siblings and family members was 28.5% and 19.6%, respectively. According to Hashem et al., the rate of history of enuresis in the parents was 30.8% in enuretic children and 11% in nonenuretic children. This shows that genetic predisposition is highly likely and could be one of the strongest risk factor associated with nocturnal enuresis.

According to Hashem et al., a low educational level was seen in 48.3% of fathers and 62.8% of mothers. Ozden et al. also found that enuresis was associated with a low educational level of parents. The study found that the children with enuresis had parents with low educational level, 49.4% of fathers and 65.5% of mothers had a low educational level. The number of mothers had not completed graduation in enuresis group than in nonenuresis group \((65.5\% \text{ vs } 57.5\%, P = 0.003508)\). This could be because of a low educational level having some impact on toilet training.

Our study shows 37.8% of the enuretics had a family size of 3–4 members whereas 62.2% of the enuretics had a family size of 5 or more. In the nonenuretics group, 55.3% had increased family size. One study also found that crowded family was another associated familial factor in enuretics. This could be because of more chances of having infections like pinworm infestation in crowded places. The same study also showed that single parent (divorced or parent’s death) and working mothers are important factors associated with enuresis. Our study showed 8 out of 336 children had parents who had divorce which was statistically significant \((P = 0.04250)\). Furthermore, enuresis was associated more with mothers who were working \((29.5\%)\). This could be because of lack of proper training due to nonavailability of time or also could be because children experience significant stress in such situations.

History of recurrent urinary tract infection was significantly associated with enuresis as 8% enuretics had a positive history of urinary tract infection. 20.9% enuretics had a positive history of urinary tract infection in Hashem et al. History of febrile convulsion \((9.2\%)\) and neonatal jaundice \((14\%)\) was more frequent in enuretics when compared to nonenuretics which were supported by the above study.

In this study, more number of children with enuresis were perceived by parents as stubborn \((52.4\%)\) as compared to nonenuretic children \((25\%)\). This could be because nocturnal enuresis impacts the child’s behavior. Research is missing in the area and exact reason cannot be delineated.

The rate of enuresis in two schools of Ahmedabad was similar to studies in other places having similar socioeconomic status. Low age, history of enuresis among parents and siblings, low educational level of the parents and increased number of family members, were the risk factors. Most of the children with enuresis had received no treatment.

CONCLUSION

The strength of the study is a good sample size. The limitation of the study is that we did not consider the type of enuresis, i.e., primary or secondary.
Acknowledgments
We would like to thank Dr Minakshi Parikh, Professor and Head of department of Psychiatry, B. J. Medical College, for her guidance. We also thank our colleagues, senior and junior residents and staff who helped us during the study.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. American Psychiatric Association. Diagnosis and Statistical Manual of Mental Disorders, (DSM-5). 5th ed. Washington, DC: American Psychiatric Association; 2013.
2. De Sousa A, Kapoor H, Jagtap J, Sen M. Prevalence and factors affecting enuresis amongst primary school children. Indian J Urol 2007;23:354-7.
3. Devlin JB. Prevalence and risk factors for childhood nocturnal enuresis. Ir Med J 1991;84:118-20.
4. Bayoumi RA, Eapen V, Al-Yahyae S, Al Barwani HS, Hill RS, Al Gazali L. The genetic basis of inherited primary nocturnal enuresis: A UAE study. J Psychosom Res 2006;61:317-20.
5. Ergüven M, Çelik Y, Deveci M. Etiological risk factors in primary nocturnal enuresis. Turk Arch Pediatr. 2004;39 (2):83-7.
6. Wang QW, Wen JG, Zhu QH, Zhang GX, Yang K, Wang Y, et al. The effect of familial aggregation on the children with primary nocturnal enuresis. Neurourol Urodyn 2009;28:423-6.
7. Deivasgamani T. Psychiatric comorbidity amongst school going children: An epidemiological study. Indian J Psyc 1990;32:235-40.
8. Jiloha RC, Murthy RS. An epidemiological study of psychiatric problems in primary school children. Child Psyc Q 1981;14:108-19.
9. Hashem M, Morteza A, Mohammad K, Ahmadi-Ali N. Prevalence of nocturnal enuresis in school aged children: The role of personal and parents related socio-economic and educational factors. Iran Arch Pediatr 2013;23:59-64.
10. Sadock BJ, Sadock VA, Ruiz P. Child psychiatry. In: Pataki CS, Sussman N, editors. Synopsis of Psychiatry. 11th ed. Philadelphia: Wolters Kluwer; 2015. p. 1214-16.
11. Srivastava S, Srivastava KL, Shingla S. Prevalence of monosymptomatic nocturnal enuresis and its correlates in school going children of Lucknow. Indian J Pediatr 2013;80:488-91.
12. Shreeram S, He JP, Kalaydjian A, Brothers S, Merikangas KR. Prevalence of enuresis and its association with attention-deficit/hyperactivity disorder among U.S. children: Results from a nationally representative study. J Am Acad Child Adolesc Psychiatry 2009;48:35-41.
13. Bower WF, Moore KH, Shepherd RB, Adams RD. The epidemiology of childhood enuresis in India. Br J Urol 1996;78:602-6.
14. Saliwani AN, Desai SG. Prevalence and risk factors of nocturnal enuresis among school-age children in rural areas. Int J Res Med Sci 2014;2:202-5.
15. Safarinejad MR. Prevalence of nocturnal enuresis, risk factors, associated familial factors and urinary pathology among school children in Iran. J Pediatr Urol 2007;3:443-52.
16. Merhi BA, Hammoud A, Ziaei F, Kamel R, Rajab M. Mono-symptomatic nocturnal enuresis in lebanese children: Prevalence, relation with obesity, and psychological effect. Clin Med Insights Pediatr 2014;8:5-9.
17. Baktiari K, Pournia Y, Ebrahimzadeh F, Farhadi A, Shafizadeh F, Hosseinzadadi R. Prevalence of nocturnal enuresis and its associated factors in primary school and preschool children of khorramabad in 2013. Int J Pediatr 2014;2014:120686.
18. Chang P, Chen WJ, Tsai WY, Chiu YN. An epidemiological study of nocturnal enuresis in Taiwanese children. BJU Int 2001;87:678-81.
19. Unalacak M, Sogut A, Aktunc E, Demircan N, Altin R. Enuresis nocturna prevalence and risk factors among school-age children in northwest turkey. Eur J Gen Med 2004;1:21-5.
20. Ozkan S, Durukan E, Iseri E, Gurocak S, Maral I, Ali Bumin M. Prevalence and risk factors of monosymptomatic nocturnal enuresis in Turkish children. Indian J Urol 2010;26:200-5.
21. Mithani S, Zaidi Z. Bed wetting in school children of Karachi. J Pak Med Assoc 2005;55:2-5.
22. Shah S, Ahmed A, Rehman SU, Rehman G. Prevalence and risk factors of monosymptomatic nocturnal enuresis in Pakistani children. JKMS 2011;3:16-20.
23. Etemad AA, Saleh MA, Salah G. Prevalence, risk factors and impact associated with nocturnal enuresis among children in some rural areas of Assiut Governorate: A cross-sectional study. Med J Cairo Univ 2011;79:61-9.
24. Mohammed AH, Saleh AG, Zohiry IA. The frequency of bedwetting among primary school in Behna City, Egypt. Egypt J Human Med Genet 2014;15:287-92.
25. Ozden C, Ozdal OL, Altinova S, Oguzulgen I, Urgancioglu G, Memis A. Prevalence and associated factors of enuresis in Turkish children. Int Braz J Urol 2007;33:216-22.