

PATTERN OF PRIMARY NOCTURNAL ENURESIS IN PRIMARY SCHOOL CHILDREN (FIRST GRADE) IN ASSIUT CITY

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Objectives : To assess the prevalence of nocturnal enuresis in primary school children, first grade (6-7 years old) in Assiut City and study its pattern and risk factors.

Patients and Methods: A random cross-sectional study including 1519 children was conducted in 10 primary schools in Assiut City throughout a period of six months. A self-administered questionnaire was completed voluntarily by the parents. Children reporting two or more incidents of nocturnal enuresis per month during the preceding year were considered positive responders and were subjected to further evaluation. The control group consisting of 100 age-matched non-enuretic children presenting for other urologic or non-urologic problems mandating a plain abdominal X-ray, was subjected to the same evaluation. In these children the possible detection of spina bifida was the point of concern.

Results: The response rate to the questionnaire was 79%. The prevalence of enuresis was 20.2%. Out of the enuretic children, 87.6% complained of nocturnal enuresis only; 72.1% of them were primary enuretics. Monosymptomatic enuresis was observed in 46.3% of the cases. Marked enu-

resis (every night) affected 52% of the total number of enuretic children. Statistically significant risk factors were deep sleep and a high educational level of the parents. Primary nocturnal enuresis was insignificantly associated with a positive family history, family size or birth rank. In primary nocturnal enuretics the results of the urogenital and neurological examinations were normal in 91.5% and 80.6%, respectively, and only 4% received a specific treatment. A large amount of post-void residual urine was observed in 7.4%. Spina bifida occulta was observed in 10.8% of primary nocturnal enuretics and in 11% of the control group.

Conclusions: This is the first large population-based study of the prevalence of age-related enuresis in Assiut, but it does not differ much from those reported in other parts of the world. Enuretic children and their parents are mildly concerned about enuresis. Investigations for monosymptomatic primary nocturnal enuresis are not of significant diagnostic value or cost effectiveness.

Key Words: primary, nocturnal enuresis, children, spina bifida

INTRODUCTION

Nocturnal enuresis is the involuntary passage of urine during sleep occurring after the age at which bladder control would normally be anticipated. It is a widespread and potentially disabling disorder for children. It may carry emotional stigmata that can interfere with normal development, and because of these emotional factors along with social inconvenience this disorder requires treatment¹. When referred to the urologist the majority of children have already undergone previous evaluation and failed trials of therapy.

Careful consideration should be given to the work-up of nocturnal enuresis since there may be concurrent symptoms that require attention either before or in conjunction with the treatment. Unlike other medical problems, this particular one needs a close and intimate cooperation of both the child and all his family members².

Nocturnal enuresis is probably the most common developmental disorder in children, affecting 15-20% of all six-year-olds, and its pathophysiology remains unclear. Most existing trials of descriptive epidemiology of

Table 1: Prevalence Rates of the Explanatory Variables in 194 Children with Primary Nocturnal Enuresis

Variables	Prevalence	P-Value
Deep Sleep	65.7%	<0.01**
High education level of parents	56.0%	<0.05*
Positive family history	14.9%	>0.05
Negative impact on child	36.6%	>0.05
Negative impact on family	41.7%	>0.05
Urgency	43.3%	>0.05
History of convulsions	5.1%	>0.05
Genital abnormalities (males)	9.5%	<0.01**
Abnormal neurological examination	15.5%	<0.01**
Abnormal urine analysis	18.9%	<0.01**
Abnormal lumbosacral spine	10.8%	<0.01**

U/S = ultrasound

* = significant; ** = highly significant

enuresis have a selection bias. Also sample sizes have frequently been too small to allow any definite conclusion. Many prevalence studies of enuresis are flawed by imprecise definitions. Thus, the reported prevalence rates of enuresis vary widely because there is no standard terminology³.

Since an epidemiological study of enuresis has not been carried out in Assiut so far, the aim of this study was to assess the prevalence of nocturnal enuresis in first-grade primary school children (6-7 years old) in Assiut city and study its pattern, risk and precipitating factors. The study included both urologic and neuropsychiatric assessment.

PATIENTS AND METHODS

This randomly selected cross-sectional study was carried out from October 2000 through March 2001 on 1519 children in first grade, primary school, representing 21.2% of all first-grade primary school children in Assiut city. The age of the selected students was 6-7 years. Ten primary mainstream schools were selected representing all social classes and all

sectors in Assiut city. Special educational schools for children with mental retardation, behavioural problems or physical disabilities were not included. A self-administered questionnaire prepared specifically for the study (Appendix 1) was given (with the co-operation of the teachers) to each child in the selected schools. It was completed by the parents on a voluntary basis. Children reporting two or more incidents of nocturnal enuresis per month during the past year were considered positive responders and were subjected to further evaluation including general, urological and neurological examination. Investigations included complete urinalysis, abdominal ultrasound and plain X-ray of the abdomen and lumbosacral region.

One hundred age-matched children who presented for urologic problems other than enuresis or non-urologic problems requiring a plain abdominal X-ray served as a control group and were subjected to the same evaluation. In these children, special attention was turned to a possible occurrence of spina bifida.

Enuresis was considered "mild" when wetting had occurred once or more often every two weeks during the past four weeks. A frequency of two or more incidents of enuresis per week was assigned as "moderate" while daily enuresis was termed as "marked". Secondary enuresis was considered in cases where enuretic children had previously been dry for at least six months. In all other cases enuresis was considered primary. Diurnal frequency was considered significant when it occurred more than five times, while nocturia was significant when it occurred twice.

The neuropsychiatric assessment entailed an inquiry for a possible history of convulsions, speech and auditory problems and the determination of the intelligence quotient. An examination of the lumbosacral spine and an assessment of the sensory, motor and reflex function of the lower extremities were done. The rectal sphincter tone and perianal sensation were evaluated as well. No special psychiatric assessment was done. We merely concentrated on the psychological impact of the disorder on both the child and his/her family.

The data were analyzed using the Advanced Statistical Analysis Package (ASAP). Pearson chi-square tests were used to determine the statistical significance of differences between distributions of the categorical data.

RESULTS

The overall response rate to the questionnaire was 79% (n=1519). Males accounted for 53.3% (n=809) while females accounted for 46.7% (n=710) with a male-to-female ratio of 1.14:1. Enuresis was found in 307 out of 1519 children (20.2%); 166 were males (10.9%) and 141 were females (9.3%). Of the affected children 87.6% (269/307) complained of nocturnal enuresis only; 150 (55.7%) of them were boys. Enuresis during day and night was recorded in 38 children representing 12.4% of all enuretics; 21 (55.3%) of them were girls. Marked (daily) enuresis was found in 53.7% of all enuretics (n=165); 51.5% (n=85) of them were females. The males outnumbered the females in the categories of moderate and mild enuresis (56/92 = 60.5% males and 31/50 = 62% males, respectively).

Among the children with nocturnal enuresis 194/269 (72.1%) had primary and 75/269 (27.9%) secondary enuresis. Marked nocturnal enuresis was observed in 101 children (52%) with primary enuresis and in 44 (58.6%) of those with secondary enuresis. Males significantly outnumbered females in primary enuresis (106/194 = 54.6% versus 88/194 = 45.4%), while females significantly prevailed as secondary enuretics (50/75 = 66.7% versus 25/75 = 33.3%).

A subjective study of the depth of sleep among the enuretic children revealed that deep sleepers constituted 65.5% (127/194) of our primary enuretics. Boys were affected to a larger extent than girls. It was also observed that deep sleep tended to be found more often in high-frequency enuretics (n = 116, 70.3%).

A high educational level of the parents was significantly more frequent among children with primary enuresis (109/194, 56%, $p < 0.05$). Primary nocturnal enuresis was insignificantly associated with a positive family history in 29 children (14.9%; $p > 0.05$). The enuresis rate was not affected by family size or birth rank. The family and the child were troubled by enuresis in 41.7% and 36.6%, respectively. Marked enuresis burdened the family and the child in 47.6% (primary marked enuresis, n=48/101) and 52.6% (secondary marked enuresis, n=23/44), while mild enuresis had a troublesome effect on the child and family in 19% of the cases only which was statistically insignificant ($p > 0.01$). Only 8 out of the 194

(4%) children with primary nocturnal enuresis received a specific therapy for enuresis.

One hundred and four (53.7%) of our primary nocturnal enuretics were polysymptomatic, while 90 (46.3%) were monosymptomatic. Urgency was the most frequent urological complaint in the primary enuretics (84/194, 43.3%). Girls complained of diurnal frequency, nocturia, urgency and dysuria, while boys rather complained of a change of urine color. A history of convulsions was encountered in 10 (5.1%) primary nocturnal enuretics.

The height of the children with primary nocturnal enuresis ranged from 99 to 123 cm with their weight ranging from 18 to 27 kg. No major abnormalities in hearing, talking or breathing were detected. The genital examination was normal in 97 out of 106 boys with primary nocturnal enuresis (91.5%). The most frequent abnormal finding on genital examination was inguinal hernia found in eight patients (4.2%). Urethral meatal stenosis was noticed in only one case. An exaggeration of the deep reflexes of the lower limbs was detected in 23 children (11.8%) with primary nocturnal enuresis while hyporeflexia was observed in seven (3.7%). In all cases, the back examination did not reveal any abnormalities.

Urine analysis proved to be normal in 249/307 (81.1%) cases. Only two cases with marked primary nocturnal enuresis had a low urine specific gravity (≤ 1010). Crystalluria was detected in 56/307 (18.2%) enuretic children. It was significantly more frequent in females than in males with primary enuresis (60.7% vs. 39.3%).

Abdominal ultrasound was normal in the majority of our patients (92%). A high post-void residue was observed in 23 (7.4%) patients; sixteen of them had marked enuresis. Spina bifida occulta was observed in 21 (10.8%) of our children with primary nocturnal enuresis and in 11 (11%) of the control group with the male-to-female ratio being more or less equal. In the enuretic group, the affected vertebrae were L5 and S1 (Table 1).

DISCUSSION

This study was carried out on 6- to 7-year-old children in order to assess the problem of enuresis at its greatest extent⁴. This is the age of obligatory school entry, and at the same

Table 2: Results of Different Questionnaire-Based Studies on Enuresis

Author	Sample Type	Sample Size	Age (years)	% of Responders	Prevalence of Enuresis		Total Prevalence of Enuresis at 6 – 7 years
					males	females	
Bower (1996) ¹²	Elementary school students	3111	5 – 12	74%	12.6%	8.4%	Not recorded as a separate item
Wekke (1998) ¹¹	Mainstream education	5360	5-15	96%	4.1%	2.1%	14.5%
Wekke (1998) ¹¹	Special education	2571	5-15	97%	8.0%	4.5%	25.1%
Chiozza (1998) ⁵	Elementary school students	9086	6-14	77.2%	2.1%	1.7%	8.7%
Lee (2000) ³	Elementary school students	12570	7-12	55.8%	8.5%	4.3%	20.4%
Present study (2003)	Elementary school students	1519	6-7	79%	10.9%	9.3%	20.2%

time it is the minimal age at which treatment of enuresis is allowed¹.

A self-administered questionnaire was given to the children, but it was completed by the parents because they would offer more precise data than their offspring. At the same time any embarrassment or shame to the child by his or her direct interrogation was minimized. The authors are fully aware of the fact that the response to any questionnaire is quite subjective, and that our questionnaire itself has some intrinsic biases regarding the father's educational level. Such biases are somewhat unavoidable since the educational spectrum in our area is very diverse and depends on multiple variables including documented certificates, self-education and type of education. In such a screening study, the questionnaire is actually considered a crude assessment and serves as an indirect indicator of the family's social, financial as well as cultural status.

Pupils from special educational schools for children with mental retardation, behavioural problems or physical disabilities were not included to avoid biases in the results.

Compared with other studies³, the number of the present study population (1519) is small. The selected sample represents 21.2% of all first-grade primary school children in Assiut city and, thus, is statistically valid.

The relatively high response to the questionnaire (79%) probably reflects the impact of the problem on both child and family and indicates a better co-operation than that shown in other studies. Studies from many countries showed that the prevalence rate of enuresis varied according to the geographical areas involved, the composition of the population studied, the definitions in use for enuresis addressing both the frequency of wetting and the child's age. It is still unknown whether differences in genetic predisposition and environmental factors (like cold weather and parents' attitudes) can account for the difference in enuresis prevalence between different ethnic groups (Table 2).

Lee and colleagues³ who carried out a study on 12,570 elementary school children stated that 67.2% of their enuretics showed only nocturnal wetting, 19.1% had only diurnal wetting while 13.7% reported combined day and night wetting. Our study confirms the high incidence of nocturnal enuresis only – it proved to be the commonest pattern among our enuretic children.

Chiozza and co-workers⁵ found that the most frequent category of bedwetting was less than once a week. In our study, the high percentage of 'marked enuresis' should attract the attention toward the great severity of this problem in our society. One of the underlying fac-

tors is the minimal interest to seek medical advice. Only 4% of the affected children in our study population had received specific treatment.

In our study enuresis was insignificantly related to either the family size or birth rank, although Rona et al.⁶ stated that enuresis was found more often in the second or third-born in the family than in the first-born, whereas Hanafin⁷ had observed that the large family size and low ordinal position of the child were both statistically associated with the incidence of nocturnal enuresis.

Historically, enuresis has been considered a disorder of sleep and more precisely a consequence of deep sleep or awakening difficulty⁸. Our study supports the fixed concept about deep sleep and enuresis. The sleep of the enuretic children did not differ to a large extent from that of the controls. The only significant differences were that enuretic children spent a slightly longer time in bed and had an increased number of sleep cycles⁹. Despite the mixed results in sleep studies, sleep is a factor to be considered when paediatric interviews focus on nocturnal enuresis. Many parents believe that enuresis is linked to deep sleep¹⁰. Other authors suggest however that enuresis may not only be related to sleep but rather to changes in the nocturnal arginine vasopressin (AVP) level. Chiozza and coworkers⁵ found that children with nocturnal enuresis had a significant decrease in the nocturnal AVP level compared to controls.

In the present study, the educational level of the parents was roughly estimated. Primary nocturnal enuresis was observed significantly more often among children of parents with a high educational level. This might, however, be due to the fact that in our society parents of a higher educational and socioeconomic level might be more likely to answer the survey, and even more likely, if their child has enuresis. On the other hand, in a study carried out by Weeke et al.¹¹, nocturnal enuresis was detected in 71.9% of children from parents with a low educational level; 52.6% of them complained of marked enuresis. And also in a study on Italian children the prevalence of enuresis was higher when the child was from a family of low socio-economic status despite the age of the child⁵. This indicates that the presence of nocturnal enuresis does not necessarily point to a certain educational level of the

parents. In fact, the attitude of the parents towards the problem is more important than the educational or socio-economic level.

Lee et al.³ found enuretic children and their parents to be significantly distressed by enuresis (55.6% and 57% respectively). In the present study the corresponding figures were 36.6% and 41.7%. In a study carried out on Australian children, the families did not report a high level of concern about enuresis, even in older children¹².

Enuresis was classified subjectively into a monosymptomatic and a polysymptomatic type according to the diurnal abnormal voiding habits and/or the presence of convulsions¹³. Polysymptomatic enuresis was observed in 53.7% of our cases and in 65.1% of the cases of Chiozza and his coworkers⁵.

In all our studied cases, back examination was normal. Boop et al. recommended that any child having a mid-line lumbar cutaneous abnormality, such as a haemangioma, lipoma, hair patch or dimple, be evaluated to rule out tethering of the spinal cord¹⁴. Both hyper- and hypo-reflexia in our study can be attributed to a lack of cooperation of the child rather than indicating a neurological illness since no other neurological deficits were found. The above data confirm that organic causes among enuretics are rare (about 1%). Excluding bladder instability, most children with monosymptomatic nocturnal enuresis do not have an organic urinary tract cause for their wetting¹⁵.

In most cases, investigations were normal. In the study of Cayan et al.¹⁶ urinary tract infection was detected in two children (1.88%) of the nocturnal enuresis group and in none of the control group (no statistical significance). Also the bladder wall thickness and post-void residual volume showed no statistically significant difference between children with primary nocturnal enuresis and the control group.

Kalra et al.¹⁷ observed spina bifida occulta in 86.6% of children with persistent functional enuresis. This strong association of spina bifida occulta with functional enuresis is higher than the reported incidence in normal children (16.5% - 34%). So, routine investigation may be unnecessary in the evaluation of children with monosymptomatic primary nocturnal enuresis after obtaining a careful and complete history of the voiding function.

Appendix 1: Questionnaire about the Pattern of Enuresis

1. Identification

Child name: _____

Child gender: male () female ()

Child age: years () months ()

Number of brothers () and sisters ()

Order of child among his/her siblings: ()

Child's sleep: deep () light ()

Parents' educational level: high () low ()

2. Has your child been wet during the night in the last year? Yes () No ()

If you answered "yes" to question 2, please continue.

3. How often does your child wet the bed? (Please tick)

every night () twice or more per week ()

once per fortnight () once per month ()

4. Has your child been wet during the day (while awake)? Yes () No ()

5. Before wetting started, had your child been dry for at least 6 months?

Yes () No ()

6. Does your child suffer from urological symptoms, such as:

Frequency: diurnal or nocturnal yes () no ()

and how many times? day () night ()

Urgency: yes () no ()

Dysuria: yes () no ()

Change in colour of urine: yes () no ()

7. Is your child suffering from epilepsy (convulsions) or loss of consciousness?

Yes () No ()

8. Family history of nocturnal enuresis? yes () no ()

mention the relation to the child

9. How much has your child's wetting concerned you?

Not at all () to some extent () a great deal ()

10. How much distress has wetting caused your child?

Not at all () to some extent () a great deal ()

11. Has your child received treatment for nocturnal enuresis? Yes () No ()

12. If your child has received treatment:

when was treatment started: ()

the drug: name () dose ()

administration: regular () irregular ()

after this, what was your child's response to treatment?

Not improved at all () some improvement () completely dry for every ()

In conclusion, this is the first large population-based study of the prevalence of age-related enuresis in Assiut, Egypt. It suggests that the prevalence of enuresis in Egypt is similar to that reported in many other parts of the world. Enuretic children and their parents are mildly concerned about enuresis. Physical examination usually proves to be normal. Investigations for monosymptomatic primary nocturnal enuresis are not of significant diagnostic value or cost effectiveness. They should be reserved for polysymptomatic, resistant or complicated cases.

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RESUME

Caractères de l'Enurésie Nocturne chez des Enfants élevés à l'Ecole Primaire dans la Ville d'Assiut

Objectifs: Apprécier la prévalence de l'énurésie nocturne chez des enfants élevés à l'école primaire (âgés de 6 à 7 ans) dans la ville d'Assiut et d'apprécier ses caractères et ses facteurs de risque. **Patients et Méthodes:** Une étude randomisée incluant 1519 enfants a été réalisée dans 10 écoles primaires de la ville d'Assiut durant une période de six mois. Un questionnaire auto administré a été rempli volontairement par les parents. Les enfants ayant rapporté deux ou plus de deux épisodes d'énurésie par mois durant les deux années précédentes avaient été considérés comme répondeurs positifs et avaient été sujets à des évaluations approfondies. Le groupe témoin constitué de 100 enfants d'âges croisés, non énurétiques consultant pour des problèmes urologiques ou non, et ayant bénéficié d'une radiographie abdominale était sujet aux mêmes évaluations. Chez ces enfants la possibilité de détection d'un spina bifida revêtait une importance capitale. **Résultats:** Le taux de réponse positive au questionnaire était de 79%. La prévalence de l'énurésie était de 20,2%. Parmi les enfants énurétiques, 8,7% se plaignaient seulement d'énurésie nocturne; 72,1% d'entre eux présentaient une

énurésie primaire. Une énurésie isolée a été notée chez 46,3% des cas. Une énurésie marquée (toutes les nuits) était retrouvée dans une proportion de 52% du nombre des enfants énurétiques. Les facteurs de risque significatifs étaient le sommeil profond et le haut niveau d'éducation des parents. L'énurésie nocturne primaire était associée d'une manière insignifiante à des antécédents familiaux, à la taille de la famille ou au rang occupé dans la fratrie. Chez les enfants présentant une énurésie nocturne primaire l'examen urogénital et neurologique était normal respectivement dans 91,5% et 80,6% des cas et seuls 4% d'entre eux avaient bénéficié d'un traitement spécifique. Un résidu post-mictionnel important a été noté dans 7,4% des cas. Une spina bifida occulta a été retrouvée dans une proportion de 10,8% des cas d'énurésie primaire nocturne et de 11% du groupe contrôle. **Conclusions:** Ce travail est le premier à étudier la prévalence de l'énurésie suivant l'âge sur une grande échelle de population à Assiut, mais les résultats ne diffèrent pas beaucoup de ceux rapportés dans d'autres parties du monde. Les enfants énurétiques et leurs parents sont modérément intéressés par l'énurésie. Les investigations en cas d'énurésie primaire nocturne isolée ne sont pas d'un grand apport diagnostique et sont coûteuses.

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