Prevalence of nocturnal enuresis and associated factors in schoolchildren in Western Turkey

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YAZICI CM, NALBANTOGLU B, TOPCU B, DOGAN C. Prevalence of nocturnal enuresis and associated factors in schoolchildren in Western Turkey. *Can J Urol* 2012;19(4):6383-6388.

Introduction: *The prevalence of nocturnal enuresis (NE) in pediatric populations varies between 1% to 20%. The aim of this study was to determine the prevalence of NE in schoolchildren living in Tekirdag, a city in Western Turkey.*

Materials and methods: *We distributed a questionnaire to 11324 schoolchildren aged 7 to 14 years who were living in Tekirdag. The questionnaires were filled in by the children's parents. The main study endpoints were the prevalence of NE, and its association with sociodemographic factors of the children and their parents.*

Results: *The results from 9210 children (81.4%) who returned fully completed questionnaires were included in the study. The prevalence of NE was 7.5%. Another 579 children (6.2%) had NE that had resolved at the time of study. Prevalence rates decreased with increasing age, reaching 1.4% by age 14 years. NE was more prevalent among boys than girls, but the rates became similar by age 12 years. There was a strong relationship between NE and family history of childhood NE. More than half of the parents who had a child with NE were using traditional techniques for treatment.*

Conclusions: *The prevalence of NE in schoolchildren in Tekirdag, a city in Western Turkey was 7.5%. Having a family history of childhood NE was the one of main risk factors for NE.*

Key Words: nocturnal enuresis, pediatric population, questionnaires

Introduction

Nocturnal enuresis (NE) is common throughout the world. Several epidemiological studies from different countries have reported NE prevalence rates ranging from 1.2% to 20%.[1-13] Epidemiological studies in Turkey have reported different NE prevalence rates ranging from 11.6% to 20.8%,[5,14] possibly due to different definitions of NE.

According to the definition of NE from the International Children's Continence Society (ICSS), NE is any bed-wetting episode in children over 5 years old that occurs in discrete amounts during sleep.[15] The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) defines NE as an involuntary voiding of urine during sleep, with a frequency of at

Accepted for publication May 2012

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least twice a week in children over 5 years old in the absence of congenital or acquired defects of the central nervous system.[16] These different definitions might explain the differences in reported prevalence rates. To avoid confusion in interpreting different studies of NE, Vande Walle and Van Laeche suggested that the ICSS definition should be the gold standard definition and used as a frame of reference by all authors.[17]

NE can be classified as monosymptomatic or non-monosymptomatic depending on whether it coexists with daytime lower urinary tract symptoms (LUTS). Enuresis without LUTS or a history of bladder dysfunction is classified as monosymptomatic, whereas enuresis with LUTS is classified as non-monosymptomatic.[15]

NE can also be classified as primary or secondary. NE is defined as primary when the child has never been dry at nights for a prolonged period. Secondary NE is defined as NE in a child who had a previous dry period that lasted 6 months. The exact etiology of NE is unknown, although it has been suggested that sleep arousal disorder, nocturnal polyuria, and reduced nocturnal bladder capacity may play a role. NE is a self limiting disease with a high remission rate. However, it may cause important social limitations and psychological problems for the child and his or her parents.

The primary aim of this study was to determine the prevalence of NE in children aged 7 to 14 years old living in Tekirdag, Turkey. The secondary aims of the study were to determine the relationship between NE and familial sociodemographic factors, and to better understand how NE is viewed in the Turkish population.

Materials and methods

We used a cross-sectional study design to determine the prevalence of enuresis and to investigate the effect of sociodemographic factors on enuresis in Tekirdag, a city in Western Turkey. The study design called for distributing a questionnaire to all children aged 7 to 14 years old who attended 32 primary schools in Tekirdag in 2011. The study was approved by the local government and by the Ethical Committee of Namik Kemal University.

Teachers distributed the questionnaires in closed envelopes to all the students, and the children were instructed to bring the envelopes home to their parents. The envelopes contained the questionnaire, a description of the voluntary nature of study, and an informed-consent sheet for parents to sign. The teachers collected the filled in questionnaires after 1 week.

The questionnaire consisted of two parts. The first part collected information about sociodemographic characteristics including age, sex, parents' education and work status, family size, number of siblings, family history of childhood NE, and the presence of NE in the child. The second part collected information about the severity of the enuresis, and whether it was associated with LUTS such as urgency, frequency, and daytime incontinence. The questionnaire also included questions about the medical care of children with NE, and about how the families viewed this disease. The ICSS definition was used to define NE. Severe NE was defined as having enuresis two or more nights a week.

SPSS statistical software (SPSS PASW statistics 18.0) was used for the statistical analyses. Dual comparisons between groups exhibiting significant values were evaluated with the chi-square (χ^2) test.

Results

We distributed 11314 questionnaires, and 9412 filled in questionnaires were returned. We excluded 202 incomplete questionnaires, which left 9210 questionnaires (81.4%) that were included in the study. The study population included 4516 boys (49%) and 4694 girls (51%) who had a median age of 10.3 years. Table 1 shows the prevalence of NE, according to different parameters. Based on the ICSS definition of NE, 685 children (7.5 %) had NE. If we had used the DSM-IV definition of NE, the prevalence would have been lower: 454 children (4.9%). A total of 395 boys (8.7%) and 290 girls (6.1%; $p < 0.001$) had NE.

Figure 1 shows the prevalence of NE according to age and gender. Until age 12, the prevalence of NE was higher in boys; after that, it was equal in both genders.

There were 579 children (6.2%) whose NE had resolved at the time of study. Among the children with NE, 98 children (14.3%) had daytime frequency, 93 children (13.6%) had daytime urgency, and 25 children (3.6%) had daytime incontinence.

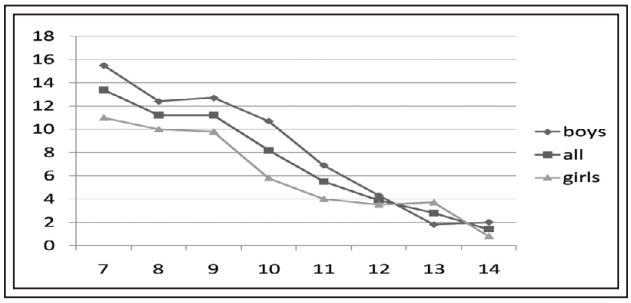

Figure 1. Prevalence of nocturnal enuresis according to gender and age groups.

TABLE 1. **Prevalence of nocturnal enuresis according to different parameters**

	Nocturnal enuresis (-)	**Nocturnal enuresis (+)**	**Total**
Total	8525 (92.5%)	685 (7.5%)	9210 (100%)
Boys	4121 (91.3%)	395 (8.7%)	4516 (49%)
Girls	4404 (93.9%)	290 (6.1%)	4694 (51%)
		p < 0.001	
Age			
7	844 (86.6%)	131 (13.4%)	975 (10.5%)
8	1095 (88.8%)	139 (11.2%)	1234 (13.4%)
9	1176 (88.8%)	149 (11.2%)	1325 (14.4%)
10	1237 (91.8%)	111 (8.2%)	1348 (14.6%)
11	1221 (94.5%)	71 (5.5%)	1292 (14.1%)
12	1037 (96.1%)	42 (3.9)	1079 (11.7%)
13	1000 (97.2%)	29 (2.8%)	1029 (11.2%)
14	915 (98.6%)	13 (1.4%)	928(10.1%)
		p < 0.001	
Family history (+)	607 (7.1%)	374 (54.6%)	981 (10.6)
Family history (-)	7918 (92.9%)	311 (45.4%)	8229 (89.4%)
		p < 0.001	
Family education			
Parents graduated from high school	3153 (95.4%)	154 (4.6%)	3307 (35.9%)
Father graduated from high school	1788 (91.5%)	16 7(8.5%)	1955 (21.2%)
Mother graduated from high school	569 (93.1%)	42 (6.9%)	611 (6.6%)
No parent graduated from high school	3015 (90.4%)	322 (9.6%)	3337 (36.2%)
		p < 0.01*	

*p value indicates the relationship between nocturnal enuresis and education according to subgroups where parents were graduates from high school or not graduates from high school.

The frequency of bed-wetting was every night for 204 children (29.8%), two or more nights a week for 250 children (36.5%), one night a week for 66 children (9.6%), less than one night a week for 64 children (9.3%), and less than one night a month for 101 children (14.8%). Thus, 66.3% of enuretic children had severe bed-wetting, defined as bed-wetting two or more nights a week. There was no statistically significant gender difference in the prevalence of severe NE ($p = 0.165$).

Among children with NE, 374 children (54.6%) had at least one family member with a history of childhood enuresis; among the children without NE, 607 children (7.1%) had at least one family member with this history ($p < 0.001$). One in five children with enuresis (137 of 685 children; or 20%) had a sibling with enuresis. A total of 60.6% children with severe NE had a family member with childhood enuresis or a history of this, whereas only 42.8% of children who had infrequent bedwetting had a family member with this history ($p < 0.001$).

We classified parental education into three categories: primary school or some high school, high school graduate, or at least some university education. A total of 3307 children in the study (35.9%) had two parents who had at least a high school education, whereas 3337 children (36.2%) had two parents who had not graduated from high school. Among children with NE, those percentages were 22.4% and 47%, respectively. There was a statistically significant difference between NE and parental education; NE was seen more frequently among children whose parents had not graduated from high school ($p < 0.001$). A total of 254 of the children with severe enuresis (66%) versus only 110 of the children with infrequent NE (47.6%) had parents who had not graduated from high school ($p < 0.01$).

A total of 8720 children (94.7%) had married parents who were living together, 350 children (3.8%) had divorced parents who were living apart, 98 children (1%) had married parents who were living apart, 20 children (0.2%) had divorced parents who were living

together, and 22 children (0.2%) had lost one or both parents. A total of 42 of 685 children with NE (6.1%) and 426 of 8525 children without NE (5%) were living apart from one of their parents. NE was seen more frequently among the children who were living apart from one or more parent (p = 0.014).

Among the children with NE, parents of 287 children (41.9%) reported that they had sought medical care for NE for their children, whereas the parents of 398 children (58.1%) reported that they did not do this. Most commonly, the children had been seen by pediatricians (43.5%), followed by urologists (28.6%), and family doctors (11.8%). A total of 24 other children (8.3%) had been seen by psychiatrists, pediatric surgeons, neurologists, or even gynecologists. Not surprisingly, among children who had never seen a doctor for NE, 307 children (81.2%) were not receiving any treatment, and 71 children (18.8%) were receiving conservative treatments from their parents. Among children who had received medical care for NE, 140 children (45.6%) were not receiving any treatment, 108 children (35.2%) were being woken by their parents at night, 7 children (2.3%) were being treated using an enuresis alarm, and 52 children (16.9%) were receiving medication, most commonly desmopressin.

Discussion

NE is a common problem among children, with physiological and social aspects that affect both the children and their families. Several studies from different countries have reported prevalence rates ranging from 1.2% to 20.8%, Table 2.[1-13] Although the reported prevalence rates of NE in Turkey have ranged from 11.6% to 20.8%, we found a prevalence rate of 7.5% in the current study, which might be related to social

TABLE 2. **Results of different epidemiological studies about nocturnal enuresis (NE)**

Author (year)	Country	Age group	Definition of NE	Study population	Response rate	No. of NE	% of NE
Chiozza et al (1998)	Italy	6-14	DMS III DMS IV	7012	75.8%	250 112	3.5% 1.5%
Gumus et al (1999)	Turkey	7-11	≥ 2 per week	1703	85.1%	234	13.7%
Lee et al (2000)	Korea	7-12	All NE > 1 per month > 1 per week	7012	55.8%	900	12.8% 9.4% 1.6%
Oge et al (2001)	Turkey	4-12	≥ 1 per week	2300	267	11.6%	
Chang et al (2001)	Taiwan	6-11	≥ 1 per 6 months	1176	70%	92	8%
Kanaheswari et al (2003)	Malaysia	7-12	ICD 10 DMS IV	2487	73.8%	200	8% 3.7%
Ozkan et al (2004)	Turkey	6-11	DMS IV	3449	88.1%	447	12.9%
Ozden et al (2007)	Turkey	6-12	≥ 1 per month	1339	89%	234	17.5%
Carman et al (2008)	Turkey	6-12	Any NE	2589	86.3%	539	20.8%
Gunes et al (2009)	Turkey	6-16	ICD 10	562	100%	84	14.9%
Miskulin et al (2010)	Crotia	6-7	≥ 1 per week	3011	100%	35	1.2%
Our study (2011)	Turkey	7-14	ICSS	9210	81.4%	685	7.5%

and cultural differences throughout the country.[2,5,9-11] The differences in NE prevalence may also be due to the lack of a standard definition of NE. The ICSS and DSM-IV definitions of NE, where are very different, have both been used to define NE. This terminological difference can result in variable rates of prevalence of NE. For example, in our study, the NE prevalence was 7.5% according to the ICSS definition and 4.9% according to the DSM-IV definition. Vande Walle and Van Laeche proposed that "ICSS terminology will be the gold standard and should be used as a frame of reference by all authors in the future."[17] We agree, and thus we used the ICSS definition for NE in our study.

There relationship between age and NE is well documented: prevalence tends to decrease with increasing age. In a large British cohort study, the authors observed a steady decline in the prevalence of NE from about 30% at 54 months to 9.5% at 115 months.[18] Gunes et al reported that the prevalence of NE was 32% in 6- to 7-year-old children, but only 2.3% in 14-year-olds.[11] We observed a similar decrease in the prevalence of NE with increasing age: 13.4% in 7-year-olds and 1.4% in 14-year-olds, Figure 1. NE is a self limiting disease that has a spontaneous resolution over time. Similar to the findings in a study by Forsythe et al, we detected a spontaneous resolution rate of about 13.6% per year.[19]

Several studies have reported that 30% to 76% of children with NE had at least one family member who had childhood NE.[2,7,8,10,11,13] This percentage also varies within the Turkish population, ranging 43.7% to 76.5%.[2,8] Ozden et al reported that 30.8% of children with enuresis had a family members with childhood NE, while only 11% of children without this condition had family members with this history.[10] In our study, we also found a statistically significant relationship between having NE and having a family member with a history of childhood NE; this history was present in 54.6% of children with NE versus 7.1% of children without NE. One in five children with enuresis (137 of 685 children; or 20%) had a sibling with enuresis. As in other studies, this statistically significant difference points to a genetic predisposition for having NE. Although, the enuresis gene (ENUR1) has been detected on the long branch of 12q, 13q and 22q chromosomes, more studies must be designed to identify the exact genetic predisposition of NE.[20,21]

As reported in several epidemiological studies, NE is seen more frequently in boys.[2,7,8,10,11,13] As in an Australian study and a Turkish study, we also detected a significant male predominance of NE, with a ratio of 1.42:1.[2,22] Since the gender difference decreases with age, this may point to latent maturation of the bladder in boys.

Different definitions have been used to define NE severity in various patient series. Butler and Heron defined severe NE as enuresis two or more nights a week. They used the term "infrequent NE" for patients who had bed-wetting less than two nights a week.[18] A NE frequency of two or more nights a week may be a reference point that can be used to define the NE severity. This reference point is also used in DSM-IV terminology to define NE. According to this definition, 66.3% of patients with NE had severe enuresis in our group.

The relationship between NE in a child and the child's parents' marital status has also been studied.[1,2,23] Chang et al reported that having separated or divorced parents was an important factor for NE.[6] Gumus et al also reported a significant relationship between NE and having divorced parents.[2] The only significant relationship between parental marital status and NE in our series was that NE was significantly present among children whose parents were living apart.

The relationship between parental educational status and NE is controversial. While Ozden et al and Gumus et al reported a significant relationship between NE and low education level, Gunes et al reported no relationship between these factors.[2,8,11] In the current study, we also found a statistically significant relationship between NE and a low education level of the parents.

More than half of the parents (55.2%) in our study reported that they did not seek any medical care for their children with NE, even though 34% of them had at least a high school education. Previous studies from Turkey showed that 70%-85% of parents had never sought medical care for their children with NE.[2,5,8,10] Although, we expected awareness of the need for medical care in NE to be higher, especially among parents with a higher education level , we still found that many parents still used traditional methods. Perhaps surprisingly, 68% of parents who had not sought medical care for their children with NE included information about where they could be contacted. These data suggest that parents would welcome education to learn more about NE, and, as a result, more children with NE might be evaluated by clinicians.

Conclusions

In conclusion, the prevalence of NE was 7.5% among schoolchildren aged 7 to 14 years living in Tekirdag, Turkey. NE was seen 1.42-times more often in boys than in girls. A family history of childhood NE is an important factor that correlates with having NE, and this suggests that children may have a genetic predisposition for this condition. The importance of treating NE is not well understood by parents, and educational approaches to increase awareness for this entity may be a way to ensure that more children with NE receive medical care. □

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