The Prevalence and Sociodemographic Risk Factors of Enuresis Nocturna among Elementary School-age Children

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Abstract

Introduction and Aim: Many etiological reasons are blamed for enuresis nocturna (EN). The aim of this study was to research prevalence and severity of EN among elementary school-age children and sociodemographic risk factors related to it. **Materials and Methods:** The study was performed in three elementary schools in Ankara, Turkey between January and May 2011. It was planned to have 2500 students of 6–14 ages in the study. The questionnaire, which consisted of questions, aiming to evaluate the EN condition of participants and their characteristics, were distributed to the parents. It was observed that 2314 participants' questionnaires (92.56%) were in accordance with evaluation criteria. **Statistical Analysis:** The relation between EN and the sociodemographic factors was evaluated through Chi-square test and logistic regression analysis. **Results:** The mean age of 2314 participants was 9.21 ± 2.08. 48.5% (n = 1123) of the students were male and 51.5% (n = 1191) were female. While the general EN prevalence was 9.9% (n = 230); 10.7% (n = 120) for males, as 9.2% (n = 110) for females. Statistical significant difference was determined between the two groups, with EN and without EN, regarding age groups (P < 0.001), education level of parents (P < 0.001, P < 0.001), and the number of sibling (P = 0.002), income level (P < 0.001), and positive family history (P < 0.001). However, logistic regression analysis revealed that there was a significant difference only between EN and age groups (odds ratio [OR] =4.42, P < 0.001), education level of mother (OR = 2.13, P = 0.017) and family history (OR = 0.12, P < 0.001). **Conclusions:** As a consequence, such factors as age groups, education level of parents, positive family history could be accepted as a risk of concerning EN. It is important to perform a detailed evaluation on population, carrying risk of having EN.

Keywords: Children, nocturnal enuresis, risk factors

Introduction

Enuresis nocturna (EN) is involuntary recurrent urination during the night in a sleep, which is common among children at the age of 5 or above.[1] Another description of enuresis is as follows: It is unconscious urination after the age, at which bladder control usually occurs. Enuresis is a common clinical problem, which impairs the quality of lives of both the students and the parents. Consequently, emotional and learning problems occur due to the disease affecting the social life.[2]

It is thought that the different pathophysiological mechanisms such as genetic susceptibility, sleep disorders, developmental defects of central nervous system, malformations of the urinary system, and environmental, behavioral and psychological problems, which are blamed for EN, result in urinary dysfunction.[3] The studies indicate that two probable physiological defects would cause EN. One of them is bladder function impairment while the other one is the maturational delay in nocturnal arginine vasopressin secretion. The children with primary enuresis have never had a period of being dry in their lives; while in secondary enuresis, children could start bed-wetting again after a minimum 6 months period of being dry.[4]

The EN prevalence differs by age group, adopted description of enuresis, geographical region, demographic characteristics of people in the study group, method of the study, and selection criteria for participants. Different prevalence rates have been determined over the world. EN prevalence rates changing from

Access this article online

Quick Response Code:

Website: www.jfmpc.com

DOI: 10.4103/2249-4863.152250

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3.5% to 56.4% have been determined in different geographical regions and countries.[5,6]

The aim of this study was to determine the prevalence and severity of EN among elementary school-age children and to reveal the sociodemographic risk factors, related to EN.

Materials and Methods

Study group

This observational study, designed as cross-sectional type, was performed during January–May 2011 periods, with the participation of 3 elementary schools in Ankara. Study sample was planned to comprise 2500 randomly selected students, aged between 6 and 14 years. The questionnaires regarding the study were distributed to parents and then were collected, as a result of the evaluation, it was detected that 2314 questionnaires were filled-in conformity with the standards.

It was defined as urinary incontinence while asleep more than once in a month in children over 5 years old, without any symptoms related to EN. However, enuresis diurna (ED) is described as daytime urinary incontinence of children over 3 years old. EN could be divided into two as primary EN (80%) and secondary EN (20%). Primary EN is a lifelong urinary incontinence; while secondary EN is a type of urinary incontinence begins after at least a 6 months of staying dry. Secondary EN is described as a disruption of urinary continence depending on the underlying reason. In this study, secondary EN cases were excluded, and only information about the participants with primary EN was evaluated. Participants with/without EN were described as EN (+) and EN (−).

Questionnaire

Questionnaires composed of the questions aiming to evaluate sociodemographic characteristics of participants and their EN status, were distributed to the students invited to the study in order for them to give their parents. In the questionnaire, information about age, gender, educational and working status of parents, total monthly income, number of sibling, urinary incontinence while awake/asleep, the amount of liquids taken before sleep at night, and if there is a problem in awakening in the morning was questioned.

In the study, EN prevalence was classified as "once a week," "twice a week," "3–4 times a week," and "almost every day." Regarding the total income of the family, "<549$" was determined as "bad," "549–1098$" as "mean" and ">1098$" as "good," Participants were divided into three groups, as Group I composed of 6–8-year-old students (n = 958), as Group II composed of 9–11-year-old students (n = 1014), and Group III of 12–14-year-old students (n = 342).

Ethical approval

The parents of students were informed; their written consent to the study was taken. The ethical committee approval for the study was received from the local ethics committee, and then permission was obtained from Provincial Directorate of National Education.

Statistical analysis

While evaluating the data obtained from the study, the SPSS 15.0 for Windows (Chicago-USA) was used. Descriptive statistical methods were given in numbers and percentages for categorical variables and as mean ± standard deviation or median (minimum-maximum) for continuous variables. The conformity of data to a normal distribution was analyzed using Kolmogorov–Simirnov test. Chi-square test was used to analyze and compare discrete variables. The statistical significance was accepted as $P < 0.05$. The factors considered affecting EN were evaluated using logistic regression model.

Results

A total of 2500 elementary school students between 6 and 14 years old was to be included in this study. From the questionnaires delivered to parents, 2314 were filled completely and in accordance with the rules. The mean age of the study group of 2314 students was determined as 9.21 ± 2.08. From the study group, 48.5% (n = 1123) were male, 51.5% (n = 1191) were female.

While general EN prevalence was 9.9% (n = 230), the prevalence of EN and ED together was found out as 2.8% (n = 64). When it is evaluated regarding genders, EN prevalence was determined as 10.7% (n = 120) for males and 9.2% (n = 110) for females. The condition of students when they had EN, was evaluated, it was found that 58.7% (n = 135) of them had this problem once a week, 10.4% (n = 24) twice a week, 11.7% (n = 27) 3–4 times a week, and 19.1% (n = 44) had it every day. Students having both EN and ED were evaluated; it was detected that 71.9% (n = 46) had this problem once a week, 10.9% (n = 7) twice a week, 4.7% (n = 3) 3–4 times a week, and 12.5% (n = 8) had it every day.

From the students in EN (+) group, 52.2% (n = 120) were male, while 48.1% (n = 1003) of EN (−) group were (P = 0.244). Students were divided into three groups; as Group I, of 6–8 years old (n = 958), Group II, of 9–11 years old (n = 1014), and Group III, of 12–14 years old (n = 342). The percentage of students from Group I of EN (+) group was 58.7% (n = 135) while the rate of Group I of EN (−) group was 39.5% (n = 823) ($P < 0.001$). When the educational status of parents was evaluated, the percentage of mothers received training ≥ 8 years was 40.9% (n = 94) in EN (+) group, while it was 57% (n = 1187) in EN (−) group. However, the rate of fathers received training ≥ 8 years was 63.5% (n = 146) in EN (+) group, while it was 74.8% (n = 1558) in EN (−) group ($P < 0.001$, $P < 0.001$, respectively) [Table 1].

While the rate of families with higher monthly income was 18.7% in EN (+) group (n = 43), and it was 28% (n = 584) in EN (−) group ($P < 0.001$). The association between the number

of siblings and EN was evaluated, it was observed that the rate for having more than two siblings was 23.5% ($n = 54$) in EN (+) group, while it was 15.5% ($n = 322$) in EN (−) group ($P = 0.002$). 50.9% ($n = 117$) of the participants in EN (+) group had a positive family history among first-degree relatives [Figure 1], while this ratio was 11% ($n = 229$) in EN (−) group ($P < 0.001$). No significant relationship based on family history of EN in first-degree relatives was found out between EN (+) and EN (−) groups. In addition, there was not any significant relationship regarding the parental working status [Table 1].

The mean age of students with EN and positive family history was 8.46 ± 3.03. The distribution of family members with EN history is shown in Figure 1. When the behavior of taking liquid before sleep (water, milk, etc.) was analyzed, it was detected that 22.2% ($n = 51$) of the students with EN were abstaining from it. It was stated that the parents of 31.7% ($n = 73$) of students in EN (+) group had a problem in awakening their children in the morning, while this ratio was 17.3% ($n = 360$) in EN (−) group ($P < 0.001$).

When the EN and the combination of EN and ED were evaluated, it was observed that there was statistically significant difference between age groups [Table 2]. Only 12 (0.51%) students had just daytime wetting (ED) history. 52.2% ($n = 120$) of EN (+) group were male and 47.8% ($n = 110$) were female. The age groups were analyzed. It was found that 43% ($n = 58$) of students with EN were female; 57% ($n = 77$) were male in Group I. When age groups with EN were evaluated regarding genders, there was statistically significant difference ($P = 0.048$) [Table 3].

Multiple logistic regression analysis revealed that lower age group of students ([6–8 years old], [9–11 years old]), low education level of mother, and positive family history were effective in the development of EN [Table 4].

Discussion

Enuresis nocturna which is described as "bedwetting, wetting while asleep" is the urinary incontinence problem during the night while asleep, not resulted from any urological or neurological disorder. The aim of this study was to research the prevalence and severity of primary EN and related sociodemographic risk factors related to it. As a result of this study, it was detected that the 6–8 years and 9–11 years of participants, low education level

Table 1: Comparison of EN (+) and EN (−) groups regarding sociodemographic characteristics (n=2314)

Parameters	% (n)		P
	EN (+)	EN (−)	
Gender			
Male	52.2 (120)	48.1 (1003)	0.244
Female	47.8 (110)	1081 (51.9)	
Age group			
6-8 years (group I)	58.7 (1358)	39.5 (823)	**<0.001**
9-11 years (group II)	35.7 (82)	44.7 (932)	
12-14 years (group III)	5.7 (13)	15.8 (329)	
Education level of mother			
≤8 years	59.1 (136)	43 (897)	**<0.001**
>8 years	40.9 (94)	57 (1187)	
Education level of father			
≤8 years	36.5 (84)	25.2 (526)	**<0.001**
>8 years	63.5 (146)	74.8 (1558)	
Working status of mother			
Yes	17.8 (41)	21.3 (444)	0.219
No	82.2 (189)	78.7 (1640)	
Working status of father			
Yes	93.5 (215)	96.1 (2002)	0.063
No	6.5 (15)	3.9 (82)	
Number of siblings			
≤2	76.5 (176)	84.5 (1762)	**0.002**
>2	23.5 (54)	15.5 (322)	
Income level			
Low (<$549)	33.9 (78)	22.5 (468)	**<0.001**
Medium ($549-1098)	47.4 (109)	49.5 (1032)	
High (>$1098)	18.7 (43)	28 (584)	
Family history			
Positive	50.9 (117)	11 (229)	**<0.001**
Negative	49.1 (113)	89 (1855)	

EN: Enuresis nocturna $P<0.05$

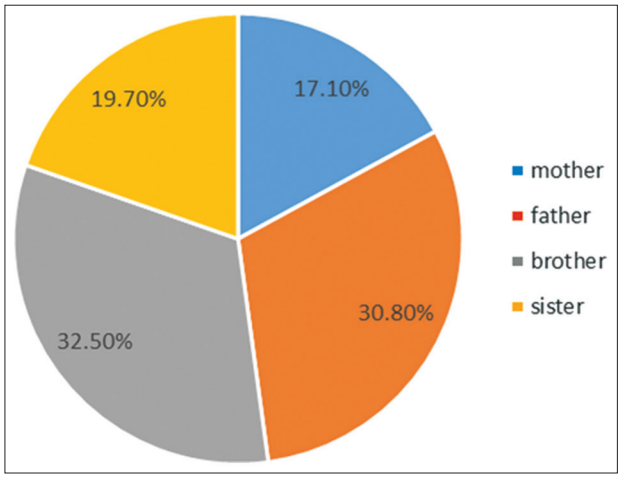

Figure 1: The distribution of family members with enuresis nocturna (EN) histories in EN (+) group ($n = 2314$)

Table 2: The comparison of EN (+) with combination of EN and ED regarding age groups (n=2314)

	Group I (6-8 years)	Group II (9-11 years)	Group III (12-14 years)	P
EN (+)	58.7 (135)	35.7 (82)	5.7 (13)	**<0.001**
EN and ED (+)	64.1 (41)	31.3 (20)	4.7 (3)	**0.001**

ED: Enuresis diurna $P<0.05$

Table 3: Evaluation of age groups with EN (+) regarding genders (n=2314)

Groups	Male % (n)	Female % (n)	P
I (6-8 years)	57 (77)	43 (58)	**0.048**
II (9-11 years)	48.8 (40)	51.2 (42)	
III (12-14 years)	23.1 (3)	76.9 (10)	

EN: Enuresis nocturna

Table 4: Evaluation of factors affecting EN problem (*n*=2314)

	β	OR	*P*
Age groups			
Group I 6-8 years (vs. 12-14 years)	1.488	4.426 (2.406-8.144)	**<0.001**
Group II 9-11 years (vs. 12-14 years)	0.757	2.131 (1.142-3.975)	**0.017**
Number of sibling			
≤2 (vs. >2)	−0.244	0.783 (0.539-1.139)	0.201
Education level of mother			
≤8 years (vs. >8 years)	0.367	1.443 (1.018-2.045)	**0.039**
Education level of father			
≤8 years (vs. >8 years)	0.142	1.153 (0.796-1.668)	0.451
Income level			
Low (vs. high)	0.247	1.281 (0.778-2.107)	0.330
Medium (vs. high)	0.098	1.103 (0.728-1.670)	0.644
Family history			
Negative (vs. positive)	−2.106	0.122 (0.090-0.165)	**<0.001**

OR: Odd ratio; EN: Enuresis nocturna $P<0.05$

of mothers could be effective factors in EN development. It was detected that the most important determinant factor is to be 6–8-year-old students.

In a study conducted in USA, the prevalence of EN among male under 9 years old was detected as 18%, it was 12% among females.[7] In the studies performed in Europe, the prevalence of EN was between 9% and 19% for 5-year-old children, 7–22% for 7-year-old children, 5–13% for 9-year-old children, and 1–2% for 16-year-old children.[8] In general, it could be stated that as the age increases, the prevalence rate decreased. When the ratios of EN prevalence were evaluated regarding different geographical regions, it was determined as 12.6%[9] in India; 3.8%[10] in Italy; 1.8%[11] in Korea; 8%[12] in Malaysia; 5.5%[13] in Taiwan; 4.2%[14] in Thailand; 12.4%[2] in Turkey; 18.2%[15] in Australia; 28.6%[16] in Yemen; 3.5%[5] in Hong Kong; 6%[17] in The Netherland; and 1.2%[18] in Croatia. Moreover, the ratios of different studies on the prevalence of enuresis held in Turkey were as follows; it was detected as 13%[19] in the study of Gümüs *et al.*, it was 12.4% in the study of Gür *et al.*[2] In this study, EN prevalence was determined as 9.9%. This ratio supports the results of the other studies held in Turkey. These different ratios reveal the diversity in improvement of bladder control in different ethnical group and cultures.[10,20] In addition, the selection criteria of study sample and bias occurred while informing process also cause different ratios of prevalence. It is considered that the most important determinant factor is the differently recognized definitions of enuresis.[21]

In various studies on 6–14 age-group, it was emphasized that males were affected by EN more than females; the difference was statistically significant.[22,23] It was stated that the prevalence and the period of nocturnal incontinence among males were much more than females.[24] The researchers had different thoughts concerning reasons of those findings. It was considered that girls probably had fewer problems in this issue because it was clear that the general continence had a relation with maturation, thus girls completed maturation process earlier than boys.[25] In their study, Gümüs *et al.*, detected that the ratio of prevalence of EN was higher among boys than girls.[19] In the study of Gür *et al.*, the similar result was obtained.[2] However, even if it was not significantly significant, in this study the number of boys with EN was higher than girls (52.2%/47.8%) ($P = 0.244$).

It was considered that positive family history was a risk factor in EN development. The study of Gümüs *et al.*, determined that 76.5% of families of enuretic children had enuresis history.[19] Gür *et al.*, found the ratio of positive family history in children with EN as 64.5%.[2] Similar results were gained in the study of Tai *et al.* and Safarinejad.[21,26] In the study of Hjalmas *et al.,* the rate of positive family history was determined as 63.2%, while the proportion of EN history for fathers was 22.2%, it was 23.9% for mothers and 16.5% for siblings.[27] In this study, the ratio of positive family history in children with EN was determined as 50.9%. When compared with previous studies, it was observed that this ratio was lower. This could depend on incorrect information given by parents, who filled in the questionnaires, especially about enuresis history of themselves.

Many studies were held on the relation between EN and the education level of parents. Spee-Van der Wekke and Safarinejad defined a significant relation between EN prevalence and education level of parents.[17,26] Gümüs *et al.*, also emphasized the relation between parents with low education level and EN.[19] Similarly, in the study of Gür *et al.*, it was stated that EN was more prevalent in families with parents having low education level. A negative correlation was determined between the prevalence of EN and the education level of father.[2] Tai *et al.*, reached that the education level of father was inversely related with the severity of enuresis.[21] However, in this study, the education level of parents of EN (−) group was higher than EN (+) group, the difference was significant. The findings of this study were in consistent with results of previous literature. The education level of parents affects EN prevalence, and this suggests that EN problem is related to the level of education and awareness. In addition, it is clear that the education level and awareness of parents, who faced by this problem, are effective on early diagnosis and treatment of EN and on how to approach this problem.

When EN problem was addressed regarding monthly income of families, in the study of Chiozza *et al.*, it was detected that the number of children with enuresis was higher in families from lower socio-economic class. A negative correlation was found between monthly income level and the prevalence of EN.[10] In the study of Gür *et al.*, it was detected that the prevalence of EN increased in families with lower monthly income.[2] In this present study, a similar result in consistent with the literature was obtained, These findings emphasize the fact that the factors as the level of education and awareness cannot be evaluated apart from the economic level concerning EN problem.

There have been many studies, which obtained different results suggesting that the working status of parents contribute to the economic level and affected on a sociocultural level, therefore,

affected EN prevalence.[5,17,19] In this study, a statistically significant relation between working status of parents and EN prevalence could not be presented. This result would depend on the fact that the ratios of working status of parents in both groups were close to each other.

There have been some studies addressing the families of many children and accompanying EN. Gür *et al.*, detected a positive correlation between the number of children in the family and EN in their study.[2] Hanafin and Safarinejad also emphasized the prevalence of enuresis in families of many children.[22,26] In this study, it was detected that the prevalence of EN was higher in families with more than two children. These results, in consistence with the literature, suggest that having an extended family could be a risk factor in the development of EN.

In an epidemiologic study, Tai *et al.*, determined a serious relation between the difficulty in awakening children in the morning and EN.[21] In a study held in Turkey, Ozkan *et al.* detected similar relation.[28] Recently, in the study of Sahin *et al.*, it was stated that 60.24% of parents in EN (+) group had difficulty in awakening their children while this ratio was 40.92% in EN (−) group.[29] In this study, the ratio of families having awakening problems was 31.7% in EN (+) group, while this ratio was 17.3% in EN (−) group. This statistically significant difference was similar with the results of the previous studies. It was suggested in the studies that difficulty in waking up could have a relation with disorder in the reticular activator system, which operated with the help of noradrenergic neurons in the brain.[30]

Limitations of the study

There were some restrictions in this study. Parents of students were asked to fill in and sign the questionnaires. We think that some students, especially the last grade students could have filled in and signed the questionnaires themselves; because they would be shy about their enuresis problem. In the assessment family history, parents could have given misleading information. Therefore, it would be probable to obtain misleading results in the evaluation of information based on this questionnaire.

Conclusion

Consequently, such factors as an age group of the students, low education levels of parents, families of many children, low monthly income, and family history should be taken into consideration concerning EN development. It is important to carry out detailed researches on student population containing above-mentioned factors. It is evaluated that EN problem would affect many issues such as self-respect and self-confidence, success in lessons, and social relations. It has great importance that family physicians working at the primary care centers should establish efficient relationship with children and their family. Moreover, they should take a detailed history and make a comprehensive physical examination. Because EN has a variable etiologic spectrum from a simple developmental problem to a serious urinary obstruction.

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How to cite this article: Doganer YC, Aydogan U, Ongel K, Sari O, Koc B, Saglam K. The prevalence and sociodemographic risk factors of enuresis nocturna among elementary school-age children. J Fam Med Primary Care 2015;4:39-44.

Source of Support: Nil. **Conflict of Interest:** None declared.