Prevalence, impact and risk factors associated with nocturnal enuresis among children in some rural areas of Assiut Governorate: A cross sectional study

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Abstract: Background: Nocturnal enuresis is an important developmental problem for school age children and it can cause emotional and social problems for the child as well as family. **Aim of the study:** The purpose of this study was to determine the prevalence of nocturnal enuresis in children aged 6-13 years of age in the study area, to investigate the risk factors associated with nocturnal enuresis and to identify the different treatment methods for those children. We also investigated the impact of enuresis on the parents' and the child's life. **Subjects and methods:** This was a cross-sectional survey. The survey was conducted during a three months period (1st of August 2009- 30th of October 2009) by interviewing randomly selected parents of children aged from sixth to thirteen years at their homes in three villages of Abnoub district of Assiut Governorate. A total of 1050 questionnaires were filled. To describe enuresis the ICD-10 definition of at least one wet night per month for three consecutive months was used. Chi-square test and a logistic regression model were used to identify significant predictive factors for enuresis. **Results:** A total of 1050 children aged between 6 and 13 years were investigated. 154 (14.7%) children with nocturnal enuresis were identified. Several parental factors that are related to enuresis were low educational level of the parents and mothers' working status were insignificantly higher among parents' of enuretic children. Also gender of child as being male and high birth order were insignificantly higher among enuretic children. On the other hand younger age, positive family history of enuresis, increased family size, divorced parents were significantly higher in children with enuresis when compared to non-enuretics. Recurrent UTI, chronic constipation and deeper sleep children were also significantly higher in enuretics when compared to non-enuretics. After multivariate analysis Enuresis was significantly associated with age (OR= 5.489), positive family history of enuresis (OR = 3.291), family size (OR= 1.784) and history of recurrent urinary tract infection (OR = 2.065). Nocturnal enuresis was primary in 76.0% and secondary in 24.0% of the cases. In most children (40.2%), episodes of enuresis occurred less than 2 nights per week in Less than half of children (40.2%). Of the enuretic children, 53.9% (83 children) had visited a physician. The majority of the respondents who visited the physician, 53 (63.9%) stated that the recommended plan was not helpful. As regards parents' attitude, Seventy parents (45.5%) were reacted with understanding and support. On the other hand, 87 (56.5%) felt that their child was embarrassed, shy and hesitant to spend the night away from home. **Conclusion:** Our findings suggest that nocturnal enuresis is a common problem among school children, especially younger age, increased family size, positive family history and recurrent attacks of UTIs. Enuresis is a pediatric public health problem and efforts at all levels should be made such as preventive, etiological and curative.

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Introduction:

Nocturnal enuresis (NE) can be defined as the involuntary passage of urine during sleep beyond the age of anticipated nighttime bladder control, which is generally accepted as 5 years of age. Nocturnal enuresis is a very common clinical problem in children, especially in boys[1]. Primary nocturnal enuresis (PNE) consists of never having established urinary continence at night, while secondary nocturnal enuresis (SNE) refers to the development of enuresis after a period of established urinary continence.[2] Although PNE is generally a benign symptom, it causes considerable distress to both parents and child [3].

Enuresis is also defined in the DSM-IV- TR (Diagnostic and Statistical Manual of Mental Disorders-4) as the repeated voiding of urine into 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. Nocturnal enuresis (NE) refers to voiding during sleep; diurnal enuresis defines wetting while awake [4]. NE is one of the most common developmental problems among the children[5]. According to the DSM-IV-TR, secondary reasons such as medicine use (e.g. diuretics), diabetes mellitus, spina bifida and epilepsy must be excluded[4].

In recent terminology, NE is categorized into two different groups. The first, monosymptomatic NE

(MNE), is bedwetting occurring without any day-time incontinence or urological symptoms[6][7]. It might be an explanation of a normal void occurring at an inappropriate and socially unacceptable time and place [6]. In contrast, bedwetting associated with day-time indicators of bladder dysfunction, such as urgency or toileting frequency, is considered polysymptomatic or non-monosymptomatic NE [8,9,10]. However, the characteristics of different forms of NE have not yet been clarified.

Primary nocturnal enuresis (PNE) is a very common clinical problem in children. Although PNE is generally a benign symptom, it causes considerable distress to both parents and child [11]. Chronic anxiety, impaired self-esteem, and delayed developmental steps such as attending camps or sleeping at a friend's house may occur as secondary problems. Frequently, the psychological and developmental damage may actually be more significant and devastating to the child than the symptom of enuresis itself. With this regard, nocturnal enuresis is evaluated as an important public health problem [12].

The purpose of this study was to determine the prevalence of nocturnal enuresis in children aged 6-13 years of age in the study area, to investigate the risk factors associated with nocturnal enuresis and to identify the different treatment methods for those children. We also investigated the impact of enuresis on the parents' and the child's life.

Subjects and methods:

Definition of Terms :

For clarity, the following terms need to be defined.

Continence – the ability to control one's bladder and bowel.

Enuresis – refers to the inability to control urination, especially involuntary bed-wetting.

Nocturnal enuresis – the emission of urine during one's sleep.

Primary enuresis – never having established urinary continence.

Secondary enuresis - the development of enuresis after a period of established urinary continence, typically six months or longer.

Study design:

A cross- sectional population - based study design was adopted**.**

Selection and description of Sample

The survey was conducted during a three months period (1st of August 2009- 30th of October 2009) by interviewing randomly selected parents of children aged from sixth to thirteen years at their homes in three villages of Abnoub district of Assiut Governorate. Houses were the primary unit of selection. Systematic random sample of houses were taken. The initial sample included 1200 households whom had a child between the ages of six and thirteen old. Of those initial 1200, 1050 approved to the participate (response rate was 87.5%). One- thousand and fifty parents and their children were interviewed.

Instrumentation, data collection and data analysis:

Data were collected via a questionnaire completed by interviewing parents. The questionnaire consisted of two parts. The first part was designed to investigate prevalence and associated factors of enuresis, and the second part was planned to identify common methods of its management and attitude of parents and children's self- esteem. The questions in the first part asked about sex, age, education level of parents, family history, family size, parents' divorce, birth order, history of urinary tract infection (UTI), constipation and deeper sleep children.

The questionnaire in the second part asked about the frequency of bed-wetting at night, wetting after a continuous dry period of 6 > months and any history of medical treatment of enuresis. Enuresis was defined as an episode of bedwetting occurring at least once a month. Primary enuresis was defined as bed-wetting in subjects who have never been dry for an extended period. Furthermore secondary enuresis was defined as the onset of wetting after a continuous dry period of 6 > months.

Frequency tables and descriptive statistics were analyzed using the SPSS for Windows version 16 software program. The relationship between the prevalence of enuresis and the patients' age, gender, the parental educational level and employment status, and number of family members were tested by means of chi- square test, t- test and logistic regression analysis. P-values of < 0.05 were considered to be statistically significant. A logistic regression model was applied to estimate significant predictive factors for enuresis. Variables with p values < 0.05 on univariate analysis were included in the regression model by backward elimination.

Ethical issue:

Each client informed about the aim of the study and the client consented either orally or by written consent.

Results:

A total of 1050 children aged between 6 and 13 years were investigated. 154 (14.7%) children with nocturnal enuresis were identified. There was no significant difference in prevalence of nocturnal enuresis between boys and girls (15.6% versus 14.0%) ($p>0.05$). The ratio of male to female was about 1.1.

The prevalence of nocturnal enuresis declined with increasing age. Of the 6-7 years- old children 33.1% still wetted their beds, while it was 4.7% for 12-13 years-olds. Mean age of enuretics was significantly higher than non-enuretics (9.28± 2.005 versus 7.42± 1.79) ($p < 0.05$) (Table 1).

Univariate analysis analysis showed that there was no significant association between enuresis and parents' educational level or mother's working status [$p>0.05$]. Prevalence of enuresis was significantly more in children with positive family history (31.6% versus 13.7%), and among children of divorced parents (23.1% versus 14.0%). The Mean family size was significantly higher among enuretic children (5.214± 1.37 versus 4.96± 1. 62) ($p < 0.05$) (Table 2).

Enuresis was significantly more in children with history of urinary tract infection (24.3% and 13.9% respectively), with constipation (31.6% versus 13.7%) and with deeper sleep children (25.2% as compared to 13.4%). ($p < 0.05$). There was also no significant association between enuresis and birth order of the child ($p > 05$) (Table 3).

After multivariate analysis, age (OR= 5.489), family history of enuresis (OR = 3.291), family size (OR= 1.784) and history of recurrent urinary tract infection (OR = 2.065) were factors associated with enuresis (Table 4).

Nocturnal enuresis was primary in 76.0% and secondary in 24.0% of the cases (Fig.1). In less than half of children (40.2%), episodes of enuresis occurred less than 2 nights per week (Fig. 2). Of the enuretic children, 53.9% (83 children) had visited a physician. Of all cases, 45 (29.2%) treated by a medication, 15 (9.7%) followed a behavioral plan, 23 (14.9%) followed a combination of treatment, 46 (30%) let it run its course and 25 (16.2%) used herbal remedies (Table 5). The majority of the respondents who visited the physician, 53 (63.9%) stated that the recommended plan was not helpful, 21 (25.3%) stated that the recommended plan was helpful, and 9(10.8%) did not use the recommended plan.

Parents were asked about the impact of enuresis on their life and the child's life. Seventy parents (45.5%) were reacted with understanding and support. However in 32 (20.7%) of cases. the reactions of parents tended to be more negative and 52 (33.8%) of parents did not concern (Table 6).

Of the respondent's, 87 (56.5%) felt that their child was embarrassed, shy and hesitant to spend the night away from home. On the other hand 38 (24.7%) suffered some emotional effect at sometimes and 29 (18.8%) did not feel that their child's self-esteem was affected by their bedwetting (Table 6).

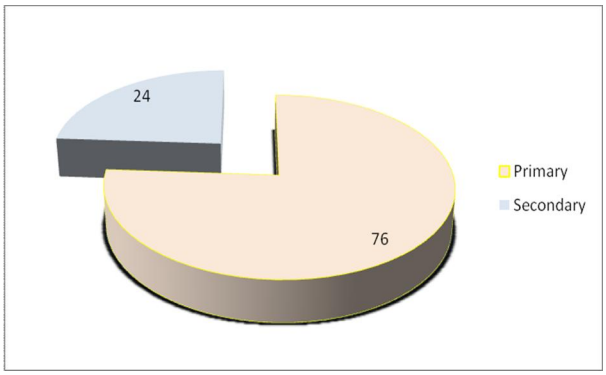

Fig. (1): Type of nocturnal enuresis

Table (1): Prevalence of nocturnal enuresis according to age and sex, among study participants at some rural areas of Assiut governorate, 2009.

	Enuretics		non-enuretics		**Total**		**P- value**
	N(154)	%(14.7)	N(896)	%(85.3)	N(1050)	%(100.0)	
Age/ years							
6-7	99	33.1	200	66.9	299	28.5	
8-9	31	10.4	267	89.6	298	28.4	
10-11	17	5.6	288	94.4	305	29.0	
12+	7	4.7	141	95.3	148	14.1	
Mean ± SD	9.28 ± 2.005		7.42 ± 1.796		8.99 ± 2.079		
	T= 10.677;	P= 0.000					
Gender							
Boys	70	15.6	380	84.4	450	42.9	X^2 0.497
Girls	84	14.0	516	86.0	600	67.1	P= 0.482

Table (2): Social background of study participants at some rural areas of Assiut governorate, 2009.

	Enuretics		non-enuretics		Sig	
	N(154)	%(14.7)	N(896)	%(85.3)	**Sig. test**	**P**
Family history of enuresis						
Yes	18	31.6	39	68.4	13.77	0.001
No	136	13.7	857	68.3		
Father's education						
Illiterate or read and write	39	18.7	170	81.3		
Primary or preparatory	50	13.9	309	86.1	4.926	0.177
Secondary	44	15.1	247	84.9		
University	21	11.0	170	89.0		
Mother's education						
Illiterate or read and write	53	19.1	225	80.9		
Primary or preparatory	48	14.5	283	85.5	7.429	0.059
Secondary	40	12.9	270	87.1		
University	13	9.9	118	90.1		
Mother's working status						
Yes	30	19.5	124	80.5	3.341	0.083
No	124	13.8	759	86.**2**		
Divorced parents:						
Yes	18	23.1	60	76.9	4.762	0.044
No	136	14.0	836	86.0		
Family size						
Mean ± SD	5.214 ± 1.37		4.96± 1.26		2.290	0.022
< 5	97	17.2	468	82.8		
≥ 5	57	11.8	428	88.24.4		

Table (3): Some Characteristics of enuretics and Nonuretics children among study participants at some rural areas of Assiut governorate, 2009.

	Enuretics		non-enuretics		Sig	
	N154	**%**	**N896**	**%**	**Sig. test**	**P**
Birth order						
1-2th	27	11.6	205	88.4		
other	127	15.5	691	84..5	2.183	0.171
History of urinary tract infection						
Yes	18	24.0	57	76.0	5.622	0.026
No	136	13.9	839	86.1		
History of constipation						
Yes	18	31.6	39	68.4	13.77	0.001
No	136	13.7	857	68.3		
Deeper sleep						
Yes	29	25.2	86	74.8	11.487	0.002
No	125	13.4	810	86.6		

Table (4): Logistic regression of the determinants of nocturnal enuresis among study participants at some rural areas of Assiut governorate, 2009.

	B	S.E.	Wald	df	Sig.	Odds Ratio
Age<10≥10 (r)	1.703	.236	52.019	1	.000	5.489
Family size<5 (r)≥5	.579	.188	9.520	1	.002	1.784
Family history YesNo (r)	1.191	.326	13.355	1	.000	3.291
Urinary tract infection YesNo (r)	.725	.304	5.703	1	.017	2.065
Constant	-3.436-	.255	181.493	1	.000	.032

Table (5): Case management among study participants at some rural areas of Assiut governorate, 2009.

	N	%
Had the child been seen by a physician for bedwetting?		
Yes	83	53.9
No	71	46.1
Case management (N 154)		
Those who visit the physician (N= 83)		
Medication	45	29.2
* Behavior Plan	15	9.7
Combination	23	14.9
Those who did not visit the physician (N 71)		
Let it run its course	46	30.0
Herbal remedies	25	16.2
Was the recommended plan by physicians successful in helping the child? (N 83)		
Yes	21	25.3
No	53	63.9
Did not follow the recommended plan	9	10.8

* (Not to drink liquids after dinner, go to toilet before sleeping or an alarm system)

Table (6): Parental and enuretic children response to bed-wetting behavior among study participants at some rural areas of Assiut governorate, 2009.

	N(154)	%
Parental attitude		
Understanding and supportive	70	45.5
Disappointment and upset	32	20.7
Did not Concern	52	33.8
Bed-wetting effects on child's self-esteem.		
Shy, embarrassed and Hesitant to spend the night away from home	87	56.5
Some emotional effect (at sometimes)	38	24.7
No effect	29	18.8

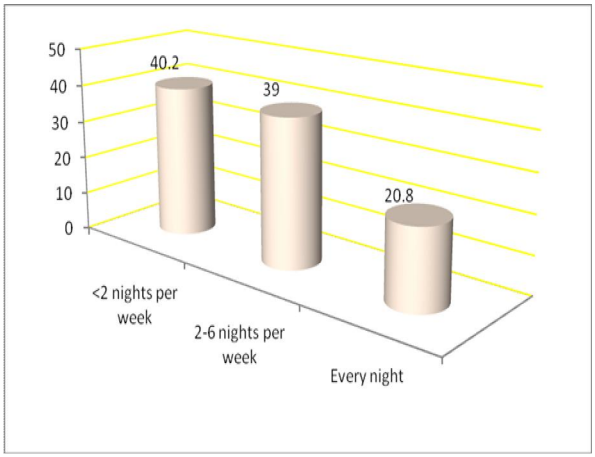

Fig. (2): Severity of nocturnal enuresis

Discussion

Nocturnal enuresis that has a view of an iceberg is a public health problem that may cause emotional and social problems for both the child and family. The results from the present study participants indicated that 14.7% of the respondents presently dealt with bed-wetting behavior. The prevalence rates of enuresis differ across countries, ranging from 4.3% in Chinese children [13] and 52% in Jamaican primary school children [14].

Approximately 15% of children wet their bed at night when they are 5 years old. There is a spontaneous resolution rate of about 15% per year; therefore, by the age 15, only about 1% of adolescents have a problem with NE [15].

After multivariate analysis Enuresis was significantly associated with younger age (OR= 5.489), positive family history of enuresis (OR = 3.291), increased family size (OR= 1.784) and history of recurrent urinary tract infection (OR = 2.065).

In the present study, as shown in table (1), There was no significant difference in prevalence of nocturnal enuresis between boys and girls (15.6% versus 14.0%) (p>0.05) and this is a concordant result with the literature [13,16,17]. The general principle about gender and enuresis is more common in boys in the early years but equals out in the latter years[18]. In disagreement, other studies revealed that nocturnal enuresis frequency was significantly higher in boys than girls (P<0.05) [18, 19)].

Our results showed that the prevalence of nocturnal enuresis declined with increasing age in Univariate and multivariate analysis. Of the 6-7 years-old children 33.1% still wetted their beds, while it was 4.7% for 12-13 years-olds. Mean age of enuretics was significantly higher than nonuretics (9.28± 2.005 versus 7.42± 1.79) (p< 0.05) (Table1). This trend is also similar to most reports in the literature. Spee-Van der Wekke stated that the prevalence of nocturnal enuresis was 15% in the 5-6-year-old group and 1% in the 13-15-year-old group [20]. Lee *et al*. showed that prevalence of enuresis declined with age from 20.4% in 7-year-olds to 5.6% in 12-year-olds [21].

In our study, there was no relationship between the enuresis prevalence and the educational level of the parents (Table 2). Spee-Van der Wekke, also, found that the educational level of parents was not significantly related to the prevalence of nocturnal enuresis [20]. In Turkey, Gumus *et al*. however, showed that the low educational level of parents was associated with nocturnal enuresis[5] Ozden *et al*. also showed that low education level were significantly associated with enuresis [22].

In our study, there was no association between mothers' working status and enuresis (Table2). In contrast, monosymptomatic enuresis nocturna was found to be more common in the children of the unemployed mothers, while diurnal enuresis was more common in the children of unemployed fathers in Turkey but in agreement with our results, nocturnal enuresis was found to be associated with large families [23].

Prevalence of enuresis in this study as revealed by Univariate analysis and multivariate analysis was significantly more in children with positive family history (p < 0.05) (Table 2). Enuresis history of the child's mother, father, brothers or sisters has frequently been reported as an accompanying finding in the literature. Furthermore, In a study performed in Malaysia, positive family history was determined in 53% of the enuretic children. [24]. Another study from Turkey declared that this ratio was 63 and 6% in the enuretic and control group, respectively [25]. previous studies also reported the prevalence of family history in enuretic children as 22-48%. Twin studies also support a genetic basis for enuresis [22,5,25].

Prevalence of nocturnal enuresis in this study was significantly higher among children of divorced parents (23.1% versus 14.0%) (P<0.05) (Table 2). Dimitriou *et al.,* reported that the organic factor is accepted as an important one in a percentage not exceeding that of five percent. As a psychological psychosomatic phenomenon, nocturnal enuresis is considered to be the result of many interacting factors. One of the psychological factors is known to be the child-parent relationship and the influence of the family environment as a whole. Increased stress may lead to nocturnal enuresis. The child may have stayed dry for a period of time before the stress occurred. The child may feel stress if he is afraid of the dark and being alone at night while he sleeps. Divorcing parents, fighting parents, or a hospital stay may cause stress and lead to nocturnal enuresis [26].

In this study birth order was insignificantly higher among higher birth order children. Rona *et al*., in their study of the population of England and Scotland, found that primary nocturnal enuresis was more likely in a child who was not the first born in the family [27]. Kanaheswari, as in agreement with the results of the present study, showed that birth order was not associated with enuresis [24].

Enuresis was significantly more in children with history of urinary tract infection (24.3% and 13.9% respectively), with constipation (31.6% versus 13.7%). It has been proposed that rectal distention due to fecal retention in chronic functional constipation (CFC) leads to a distortion in the bladder wall and base, and elongation of the urethra causing mural irregularities. These factors may lead to the stimulation of the detrusor and dyssynergia. Additionally, distortion of the trigonal area of the bladder may cause ureteral valve incompetence [28, 29].

Kajiwara *et al*. also found that children with a history of cystitis had a significantly higher rate of nocturnal enuresis than children without such a history [30]. Ozden *et al*., found that recurrent UTI were significantly higher in enuretics when compared to non-enuretics [22]. The reason for this is not clear. However, it has been suggested that the strong contraction of the proximal urethra and pelvic floor muscles might cause UTI by leading to urethrovesical reflux of bacteria in the proximal urethra[31]. Pelvic floor overactivity and bladder dysfunction are thought to simultaneously cause overconstriction of the anal sphincter resulting in constipation[30]. Inan *et al*., also found that constipation was more frequent in enuretics [32].

Nocturnal enuresis was primary in 76.0% and secondary in 24.0% of the cases (Fig.1). According to literature from Robson, "secondary nocturnal enuresis accounts for about one quarter of patients with bed wetting [33]."

There have been few investigations of the severity of bedwetting in the literature. In the present study, 20.8 % of children wet every night (Fig. 2). Sureshkumar *et al*., found that Overall prevalence of nocturnal enuresis was 18.2%, with 12.3% of patients having mild, 2.5% moderate and 3.6% severe enuresis among school children in Sydney, Australia [(19)]. Ozden *et al.,* defined 33.3% severe enuresis as bed wetting every night in Turkish children [(22)]. In Karachi, 30% of the children with bed wetting wet every night [(32)]. Wang *et al*., found that the prevalence of bed-wetting every night was 24.6% [(34)].

Affiliations

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In the present study, 53.9% of the diseased children were seen by a physician. Herbal remedies were use by 16.2% of parents. Oge *et al.* from Turkey reported that the families mostly choose the traditional methods in attempt to treat enuresis [(35).] The use of medical treatment in this research is considered high as in agreement with other studies [(35,21,24)] Stephen *et al*.[(36)], reported that the urine alarm procedure, would be useful for children with both enuresis and diabetes. We found that 30.0% of families let the disease to run its course. It may be that among parents few know of the availability of medical treatment.

In our study, 29.2% of the children treated with medication and 9.7% of families followed a behavioural plan (as Not to drink liquids after dinner, go to toilet before sleeping or an alarm system) and 14.9% used a combination methods (drugs and behavioural plan). Zaffanello et al., reported that, enuresis alarm has been widely advocated as being effective for treating nocturnal enuresis and the positive effect of achieving dry nights with pharmacotherapy can encourage the child to sustain behavioral therapy [(37)].

In the present study, 10.8% of those who visit the physician did not follow the recommended plan. Van Herzeele et al., showed in their study that, some patients were poorly compliant with medication even at study initiation and only 71% were fully compliant with long-term treatment. Decreased compliance was associated with a lower response rate as in our research as 63.9% of parents reported that the treatment was not successful in helping their children. They recommended that Patients should be encouraged to comply fully with treatment to achieve an optimal outcome [(38)].

Nocturnal enuresis is a benign condition, yet needs treatment to relieve the child and parents of the accompanying anxiety and the stigma attached to it. Nocturnal enuresis is still perceived as a shameful condition and kept as a secret. But there is nothing shameful about bedwetting. It is caused by a delay in maturation of the somatic mechanisms responsible for sleeping dry all night. The approach of family to the child is an effective factor. In a study performed in Taiwan, nocturnal enuresis was found 1.74 times more in the children who have families with oppressive and authoritarian attitude, 1.6 times more in the children whose families have protective attitude [(39)].

Parental attitude toward bedwetting was found to be supportive. Seventy parents (45.5%) were reacted with understanding and support. However in 32 (20.7%) of cases. the reactions of parents tended to be more negative and 52 (33.8%) of parents did not concern (Table 6). Of the respondent's, 87 (56.5%) felt that their child was embarrassed, shy and hesitant to spend the night away from home. On the other hand 38 (24.7%) suffered some emotional effect at sometimes and 29 (18.8%) did not feel that their child's self-esteem was affected by their bedwetting (Table 6).

The parent is typically the one responsible for the clean up after an accident and is also typically charged with finding a cure for the problem [(40)]. This problem can be stressful for the parents and other family members. Feelings of the parents may range from worried to frustrated, sad to angry, and even tired. Children may be able to sense these feelings in parents. Children may feel responsible for their parents' reactions and for upsetting the household[(40)]. Kanaheswari reported that 73% of parents of nocturnal enuresis consider it a problem and 76% of children with nocturnal enuresis embarrassed by their problem [(24)]. Foxman *et al.* [(11)] also found that two-thirds of American parents worried about the symptom, and over half the children were disturbed by the problem. Lee *et al*. reported similar findings in Korean children [(21)]. Nocturnal enuresis can take a toll on a child's self-esteem and is a frustrating problem to parents. The parent is typically the one responsible for the clean up after an accident.

Conclusion

Our findings suggest that nocturnal enuresis is a common problem among school children, especially younger age, increased family size, positive family history and recurrent attacks of UTIs. Enuresis is a pediatric public health problem and efforts at all levels should be made such as preventive, etiological and curative.

In conclusion, as can be seen by the literature review and study findings, nocturnal enuresis is prevalent among school children. Parents should not become overwhelmed with feelings of frustration or failure due to their child's bed-wetting. Although it is

prevalent, bed-wetting is seldom a topic of conversation among parents due to the private nature of the topic and perhaps to spare the feelings of the child.

Recommendations:

A thorough examination of the child by the family physician should be done to rule out any medical issues and if necessary professional counseling should be sought to help the child overcome their bed-wetting behavior.

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