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Nocturnal Enuresis in Children Aged 6-9 Years in National Guard Housing in Al-Hassa, Saudi Arabia: A Cross-Sectional Study

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Abstract: ***Nocturnal enuresis (NE) is common among children worldwide, but prevalence estimates vary. This study examined NE prevalence and risks factors among primary school children and evaluated common treatments in a cross-sectional design involving students at six primary schools (age 6-9 years). NE prevalence was 14.4%.NE was associated with late child's order, history of NE, and having a sibling with history of NE and recurrent urinary tract infection. The attitude of parent toward NE are within average. Approximately 10% of parents sought treatment for NE; commonly reported treatments included waking the child (69.4%), fluids restriction (44.9%), and waiting for maturity (36.7%).Longitudinal studies are required to evaluate causal associations between risk factors and NE and assess efficacy of NE treatments.***

Keywords: Nocturnal enuresis, prevalence, risk factors, Saudi Arabia

1. Introduction

Nocturnal enuresis (NE) refers to involuntary and undesirable bedwetting beyond the age of anticipated bladder control. The Diagnostic and Statistical Manual of Mental Disorders defines NE as involuntary urination in children above the age of 5 years at least 2 times per week for 3 consecutive months in bed or clothes either at night, during the day, or both [4]. NE is common among school children worldwide, but prevalence estimates vary from 12-25%, 8-10%, and 2-3% among children aged 4, 8, and 12 years, respectively [1], [2].

NE is divided to primary and secondary. Primary NE affects children who "have never been dry" while secondary enuresis affects children who "have been dry" for at least6 months [3]. Primary enuresis constitutes 90% of all enuresis cases. It is often associated with a familial history of enuresis and can develop due to developmental disorders affecting the bladder sphincter. Secondary enuresis might develop due to urologic or neurological problems, such as recurrent urinary tract infection (UTI) and disorders of the spinal cord. Other causes of enuresis include diabetes mellitus, emotional stresses, and family conflicts. NE is aproblem for school-aged children. It can cause behavioral, emotional, and social problems for the child and for his/her family.

The etiology and pathophysiology of NE are likely multifactorial and remain unclear. Previous studies have shown that being male, family history of NE, younger age, family instability, and deep sleep were associated with NE [5]. Children with NE tend to have accompanying psychological problems; however, it is unclear whether these problems result from NE or associated etiological factors [6]. Genetic predisposition might also play a role in NE development [7].

NE can affect the quality of life of children and their families, including its social and psychological aspects. Wetting causes embarrassment to children and parents, leading them to refrain from certain age-appropriate activities and social events. Some parents punish their children in response to bedwetting. Early treatment of NE might relieve the emotional burden on the child and improve the child's functioning, including social and school performance. It could also prolong the duration of undisturbed sleep [8].

2. Literature Survey

A cross-sectional study in Makkah, Saudi Arabia, in 1996, reported NE prevalence among children aged 6-16 years as 15%. Being a first-born child, breastfeeding, and family stability were found to be factors protective against NE. Concurrently, stressful life events before the age of 6 years, deep sleep, recurrent UTI, family history of NE, family psycho-social problems, constipation, and congenital defects were found to be risk factors for NE [1].

Furthermore, a study with Indian primary school children aged 6-10 years reported in 2007 the prevalence of NE as 7.61%, with the majority of cases presenting in boys. A positive family history of NE was 28.57% and 14.29% had daytime wetting as well. Meanwhile, 24.1% of parents sought medical treatment for their children. Family stressors, significant birth history and lower socioeconomic status were presented to a larger extent in children with NE [2]. Moreover, a cross-sectional study conducted in Khorramabad with 710 children reported NE prevalence as 8% (5.2% and 2.8% of primary and secondary NE cases, respectively). NE was more common in boys than in girls, among children with family history of NE than among children without, and among children with respiratory infection, deep sleep, school corporal punishment, itching, and seizures [3] than among children without these risk factors.

In Saudi Arabia, a cross-sectional study in Jazan involved children aged 5 to 12 years and reported prevalence of NE as

76.4%; the associated risk factors included child's low school performance, father's low educational attainment, and pinworms infestation [4].

In Turkey, a 2007 cross-sectional study of primary school children reported NE prevalence as 17.5%, with associated factors including being male, parents' low educational attainment, being part of a large family, deep sleep, family history of NE, and low school performance [5]. A separate study estimated NE prevalence as 14.9%, without gender differences [6]. Another study has reported NE prevalence among children aged 5-13 years as 16.2%, with associated factors including genetic predisposition, parents' low educational attainment, and negative attitude during toilet training [7].

In 2019, a cross-sectional community-based study among primary school children aged 6-12 years in Egypt reported that NE was associated with younger age, low socioeconomic level, parents' low educational attainment, non-working mothers, and family history of NE. On the other side, NE markedly decreases by age and awaking the child to restrict fluid intake [8].

In 2017, a cross-sectional survey in Riyadh, Saudi Arabia, reported NE prevalence as 18%, with a higher rate among boys and older children than among girls or younger children. Among the study participants, 29% of the families did not seek treatment for their children with NE [9].

In 2002, a cross-sectional study in Jordan that included 950 children aged 6-8 years showed that NE prevalence was 23.8%, a rate that was lower among girls and older children than among boys or younger children [10].

In 2012, a prospective cohort study estimated the prevalence of NE in South Africa as 16%, with associated factors including constipation and family history of NE. The study authors concluded that there was low awareness of NE among parents, resulting in many children being left untreated [11].

In 2017, a cross sectional study was performed among children aged 5-12 years in Hail, Saudi Arabia, and estimated the prevalence of NE as 22.7%, concluding that NE was associated with young age, low socioeconomic status, parents' low level of educational attainment, deep sleep, family history of NE, history of UTI, and psychological problems [12].

A cross-sectional study in Iran examined children aged 7-11 years, reporting NE prevalence as 18.7%, with associated factors including crowded families, parents' low educational attainment, family history of NE, having an unemployed father or a working mother, single parent households, child's poor school performance, and history of UTI [13]. In 2011, a prospective study performed in Slovenia showed NE prevalence as 12.4%, with the rate higher among boys and children with a particular genetic predisposition than among girls and children without this predisposition. In addition, NW was reported to effect children's relationships with friends, their self-esteem, future strains, and school performance [14].

3. Significance of the Study

Despite the importance and potentially devastating consequences of NE, it remains under-reported in Saudi Arabia, and parents rarely consider NE a cause for concern. Previous studies used a cross-sectional design to estimate the prevalence of NE and determine associated factors among school children in different regions. However, no study to-date was performed in the eastern region of Saudi Arabia. In addition, examination of psychological and lifestyle factors associated with NE has been cursory. This study assessed treatments methods commonly used by parents whose children are affected by NE, including clinical management in health care centers. Furthermore, this study measured the prevalence of NE and associated factors among primary school children in Al-Hassa National Guard housing.

4. Methods

This cross-sectional study was conducted at six governmental primary schools of the National Guard Housing Al-Hassa during 2019. It included students of both genders enrolled in the first two educational levels (age 6-9 years). Children with chronic diseases or other health conditions were included. Children were excluded if they had participated in the pilot study or their parents refused their consent.

A qualitative sample size equation was used for sample size calculation, assuming the average prevalence of NE in Saudi Arabia of 33% [1], [4], [9], [21], with a 95-% confidence interval, and a 5-% margin of error. Students were selected using a multistage sampling technique. First, six schools (three boys and three girls) were selected out of 10 primary schools in the region. Second, a stratified sample was selected based on educational level from every selected school. Third, students were selected based on the enrollment list using systematic random sampling. Study investigator visited the participating schools to explain study objectives, confirm the feasibility of data collection, print enrollment lists, and train one teacher to assist in data collection.

Data were collected using a self-administered questionnaire distributed to students and completed by parents or guardians. Study investigators supervised the process of data collection. A coded questionnaire was distributed during weekdays, except for Wednesday and Thursday, to enhance response rate. Questionnaire was adapted from that by Ozden [5]. It was first translated to Arabic through Google translate and then retranslated to English and reviewed by study investigators who compared both versions. The questionnaire consisted of three parts: Demographic characteristics and factors associated with NE, parental attitude toward NE, and detailed history of NE, assessing NE frequency, type, and commonly used treatments (for children with NE only) (Appendix 1-2). Apilot study was conducted with incoming primary students who were excluded from the main study. Data entry was performed using a personal computer equipped with SPSS Software. Data cleaning and handling with missing data with deceptive statistics were addressed. In inferential statistical analysis, significant result will be represented by P value of less than

5% and 95% confidence interval "inferential statistics". Chi-square test for categorical variables and Student T test for continuous variables will be used as bivariate analysis followed by multivariable analysis. Multivariable analysis will be used to adjust the effect of related factors. The study protocol was approved by the Saudi Council of Health Specialties (SCHS) and King Abdullah International Medical Research Center (KAIMRC) in addition to Management of Education in Al-Hassa. Questionnaire and consent form were distributed in a sealed envelope with a request for the parents/guardians to return them in the same envelope once completed (Appendix 3). Respondents could decline study participation. Privacy and confidentiality were assured, as no identifiers were collected and all data (hard and soft copies) were kept in a secure place within the MNGHA premises and were used by the research team only.

5. Results/Discussion

Of 370 distributed questionnaires, there were 341 (92.2%) responses; a total of 98.2% of them were completed by parents. The study included 53.9% student's age 6-7 years; 54.8% were girls. The majority of the included families could be described as "stable" with an average economic status. Low educational attainment applied to 19.2% and 33.7% of fathers and mothers, respectively. Regarding sleep pattern, 42% of children slept <8 hours per night, and 51.9% slept in a crowded bedroom (shared with ≥ 2 siblings). NE was associated with late child's order (p= 0.037, OR= 0.47), history of NE (p <0.001, OR= 22.5), having a sibling with history of NE (p <0.001, OR= 9.4), and a recurrent UTI (p= 0.005, OR= 4.7). The prevalence of NE among study participants was 14.4% (Figure 1).

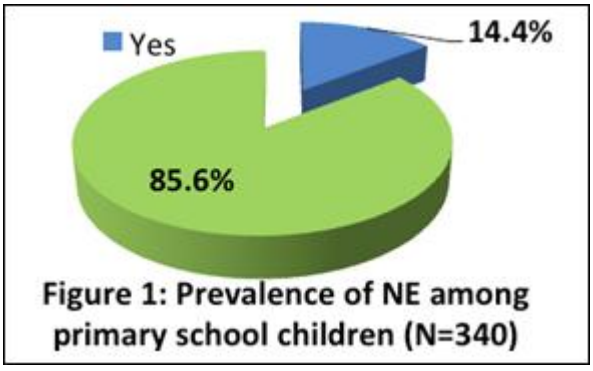


Figure 1: Prevalence of NE among primary school children (N=340)

Parental attitudes toward NE in children are presented in Figure 2. Overall, 72.6% of the parents agreed that psychological and social factors were related to NE, while 70.6% thought that psychological violence contributed toward the risk of NE, and 65% agreed to treat children with NE in health care setting.

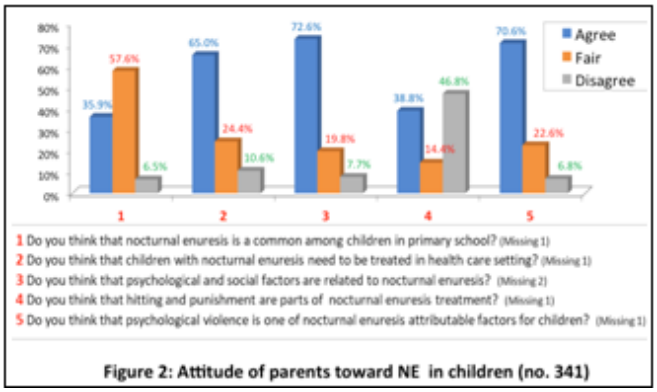


Figure 2: Attitude of parents toward NE in children (no. 341)

Table 2 and Figure 3 capture common treatments for NE. Of 49 students who had experienced NE, 43.8% reported bedwetting >4 times per week, and 22.4% experienced bedwetting at bedtime. Concurrently, there were 73.5% who had continuous dry period more than six months. Finally, 10.2% of parents sought treatment for their child with NE at a healthcare center; commonly reported treatments included waking the child (69.4%), fluids restriction (44.9%), and wait for maturity (36.7%).

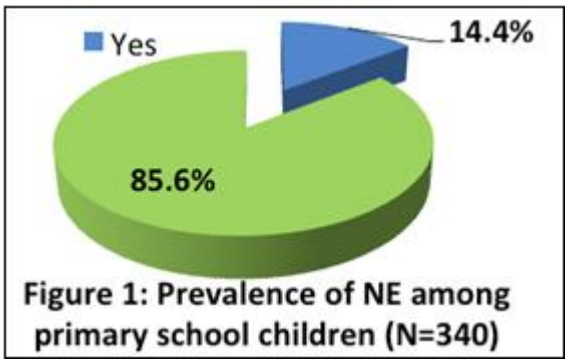
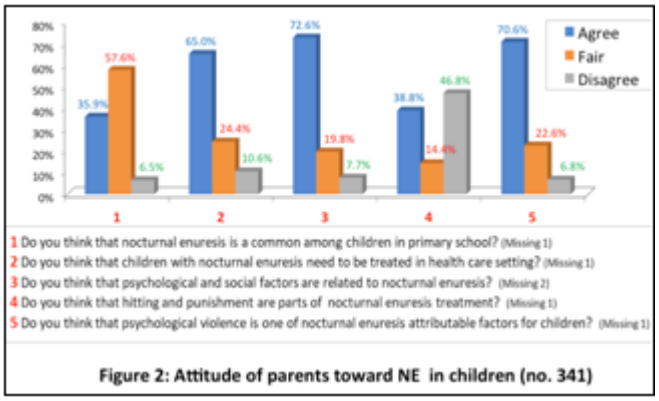


Figure 1: Prevalence of NE among primary school children (N=340)



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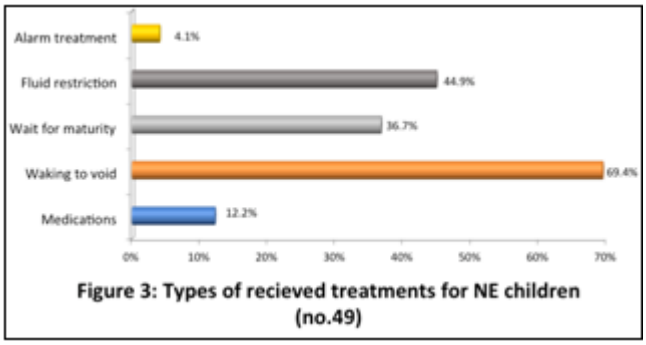

Figure 3: Types of recieved treatments for NE children (no.49)

5.1 Discussion

This study aimed to assess the prevalence of NE among children aged 6-9 years enrolled in the National Guard primary schools in Al-Hass. Different results of the prevalence of NE have been reported due to the variety of criteria used to define NE. Enuresis refers to involuntary and undesirable bedwetting beyond the age of anticipated bladder control. It occurs worldwide and is a common among school children although the prevalence varies across studies [1].

Most children achieve bladder control at the age of 5 years; thus, NE can be also defined as discrete episodes of urinary incontinence during sleep in children ≥5 years of age; it is a common developmental condition in children, which negatively affects child's self-esteem, causing embarrassment to children or their families [8], [13], [14].

In the current study, the prevalence of NE was 14.4%, without gender differences. This finding is consistent with that reported by previous studies conducted in the region; specifically, NE prevalence of 15% was reported in Makkah [1], of 18.5% in Riyadh [9], and of 22.7% in Hail [12].

Furthermore, several epidemiological surveys of NE conducted worldwide, including in India [2], Turkey [5], [6], Egypt [8], Jordan [10], and Slovenia [14], revealed much lower NE prevalence among comparable age groups. In contrast, an earlier study in Jazan, Saudi Arabia, reported NE prevalence of 76.4% [4].

In the present study, there was no difference between boys and girls regarding NE experience despite previous studies reporting higher prevalence among boys than among girls [3], [9].In contrast, studies in Turkey and Hail reported a higher prevalence of NE among girls than boys [5], [12].

Family history of NE is more likely in children with NE. In cases of a parent with a history of NE, the ni EN fo ksir dlihca is estimated at 44% [7].In the present study, family history was a highly significant risk factor for NE (OR=22.5, p <0.001). Similarly, having a sibling with history of NE was associated with NE in children (OR= 9.4, p <0.001). This result is consistent with studies from Makkah [1] and Jazan [4]. Meanwhile, a study from Riyadh [9] did not find any relationship between family history of NE and children's NE experience. However, evidence from studies in other parts of the world [2], [8], [14] indicates the role of family history in the risk of NE among children

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Controversy remains regarding the relationship between UTI and NE. UTI occurs in 18-60% in patients with NE [5].In the present study, recurrent UTI was a significant risk factor for NE (OR= 4.7, p= 0.005), which is a finding consistent with previous studies [5], [7], [8].

Previous studies have reported a significant relationship between family status and the prevalence of NE. Parental separation or loss of either of the parents and the presence of other guardians are considered major stressors associated with psychosocial consequences for the child. In the present study, 95% of the participating families could be described as "stable."
Among children with NE, we examined the frequency of wetting per week. Overall, 43.8% of children with NE urinated more than four nights per week; this result is consistent with a Turkish study that reported 33.3% of children with NE wet the bed every night [1]. Additionally, 73.5% of the children participating in this study developed secondary NE, which requires specific interventions.

Regarding treatment of NE, only 10.2% of the children had been seen by a physician, which is consistent with previous studies that reported a rate of 11-17.2% [5]. Such low rates suggest that the majority of children with NE do not present at healthcare facilities and, likely, are not treated properly. eht gnoma taht delaever osla sah yduts sihT saw ereht sdohtem tnemtaert desu ylnommocwaking (69.4%) and fluid restriction (44.9%), while less common methods included alarm treatment (4.1%) and use of medication (12.2%).

This study has several limitations, including lack of clinical confirmation of NE diagnosis among the participants. Moreover, data on school performance of the participating students were obtained from the parent rather than the school. Third, this was a cross-sectional study vulnerable to recall bias and precluding any causal inference. In data analysis, study used bivariate analysis and didn't calculate the adjusted Odds ratio (OR). As this was a descriptive study, advanced analytical methods were not required.

6. Conclusion

The prevalence of NE among primary school children and parental attitudes toward NE were consistent with expectations. In the present study, family and sibling history of NE, recurrent UTI, and late child's order were associated with NE. Further longitudinal studies are required to evaluate any causal associations between these factors and NE. Similarly, further studies are required to assess the effectiveness and efficacy of NE treatments.

Table 1: Demographic Characteristics of primary school children, satisfied by history of NE

Item (Missing)	Categories	Total (341)		NE Experience*				P
				Yes (49)		No (291)		
Age (11)	6 to 7 Y	178	53.9%	23	13%	154	87%	0.57
	8 to 9 Y	152	46.1%	23	15.1%	129	84.9%	
Gender	Male	154	45.2%	23	14.9%	131	85.1%	0.8
	Female	187	54.8%	26	14%	160	86%	
Siblings (31)	<4	140	45.2%	18	12.9%	122	87.1%	0.6
	>4	170	54.8%	25	14.8%	144	85.2%	
Child Order (19)	<3rd	131	40.7%	12	9.2%	119	90.8%	0.037

	<3rd	191	59.3%	33	17.4%	157	82.6%	
Family Status (3)	Stable	321	95%	46	14.4%	274	85.6%	0.72
	Not	17	5%	3	17.6%	14	82.4%	
Economic Status (1)	Average	282	82.9%	38	13.5%	243	86.5%	0.28
	Not	58	17.1%	11	19%	47	81%	
Education Level	1st	172	50.4%	22	12.9%	149	87.1%	0.4
	2nd	169	49.6%	27	16%	142	84%	
Educational Performance (1)	Excellent	239	70.3%	31	13%	208	78%	0.23
	Other	101	29.6%	18	18%	82	82%	
Father Education (2)	Low	65	19.2%	9	13.8%	56	86.2%	0.64
	Secondary	196	57.88%	31	15.9%	164	84%	
	University	78	23%	9	12%	69	88.5%	
Mother Education (3)	Low	114	33.7%	17	14.9%	97	85.1%	0.84
	Secondary	123	36.4%	19	15.6%	103	84.4%	
	University	101	29.9%	13	12.9%	88	87.1%	
Sleep Hours (3)	<8H	142	42%	18	12.8%	123	87.2%	0.74
	8-9H	138	40.8%	22	15.9%	116	84.1%	
	>9	58	17.2%	8	14%	50	86.2%	
Siblings in Same room (2)	<2	163	48.1%	20	123%	143	87.7%	0.26
	≥2	176	51.9%	29	16.6%	146	83.4%	
Past History of NE (2)	Yes	50	14.7%	30	60%	20	40%	<0.001
	No	289	85.3%	18	6.3%	270	93.8%	

Table 2: Features of nocturnal enuresis among primary school children (n=49)

Items (Missing)	Categories	#	%
Frequency of bedwetting per week. (1)	≥4/w	21	43.8%
	<4/w	27	56.3%
Continuous dry period > 6 m.	Yes	36	73.5%
	No	13	26.5%
Child experienced bedwetting during daytime.	Yes	11	22.4%
	No	38	77.6%
Child is already treated for bedwetting.	Yes	14	28.6%
	No	35	71.4%
Visit any health care center to treat the student from NE.	Yes	5	10.2%
	No	44	89.8%

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