



CODEN [USA]: IAJPB

ISSN : 2349-7750

INDO AMERICAN JOURNAL OF PHARMACEUTICAL SCIENCES

SJIF Impact Factor: 7.187

Available online at: <http://www.iajps.com>

Research Article

PREVALENCE AND RISK FACTORS OF NOCTURNAL ENURESIS AMONG CHILDREN OF PARENTS ATTENDING PRIMARY HEALTHCARE CENTERS, MINISTRY OF HEALTH, TAIF 2021

Dr. Sultan Salem Algethami¹, Dr. Abdullah Ahmed Albarq².¹MBBS, Saudi Board Of Family Medicine Program, Ministry of Health, Taif City, Kingdom of Saudi Arabia.²SBFM, ABFM, Family Medicine Consultant.

Article Received: February 2022

Accepted: February 2022

Published: March 2022

Abstract:

Introduction: Nocturnal enuresis is a common genetically complex disorder around the world and have complex underlying etiologies. Its prevalence differs according to age. This study aimed to estimate the prevalence and associated risk factors for nocturnal enuresis

Methodology: This cross-sectional study was conducted in five primary health centers in Taif city. Parents of children between 5 and 15 years were included in the study. The sample size was estimated to be 213 parents, assuming that approximately 1000 patients will visit the PHCCs throughout the study period, with confidence level of 95%, prevalence of 22.7% and margin error of 5%. The study tool included: Personal information, Information for nocturnal enuresis and Information for possible associated factors. Chi-square test, fisher exact test and T test were used when appropriate.

Results: 211 parents completed the questionnaire. the majority of the children were in the age group of 5 to 7 years (49.3%) followed by the age group of 8 to 10 years (28%). The prevalence of nocturnal enuresis was 39.9%, and it was primary in 54.2% and secondary in 45.8%. The most commonly reported urinary symptom was frequency (44.6%) and urgency (28.9%). The average number of dry nights per week for those children was 5.9 ± 2.2 days.

Conclusion: In summary, the prevalence of nocturnal enuresis in Taif City is 39.9%, which is in the range of what was reported in different regions across Saudi Arabia. The majority of the cases were primary and 27% had daytime symptoms. Nocturnal enuresis was associated with the following factors: type of house, number of bedrooms and bathrooms, family history and consanguinity, recurrent UTIs, diabetes mellitus, mental illness, changing home or school, and drinking soft drinks and tea during or after dinner. Enuresis is a pediatric health problem that needs efforts at all levels such as preventive, etiological and curative measures. Some misconceptions among parents and families of those children require health education intervention.

Corresponding author:**Dr. Sultan Salem Algethami,**

MBBS, Saudi Board Of Family Medicine Program,

Ministry of Health,

Taif City, Kingdom of Saudi Arabia.

QR code



Please cite this article in press Sultan Salem Algethami et al, *Prevalence And Risk Factors Of Nocturnal Enuresis Among Children Of Parents Attending Primary Healthcare Centers, Ministry Of Health, Taif 2021.*, Indo Am. J. P. Sci, 2022; 09(3)

INTRODUCTION:

Nocturnal enuresis (NE) or bed-wetting is defined as a frequent involuntary loss of urine on bed or clothes during sleep at least two times per week for three consecutive months in the absence of congenital or acquired defects of the urinary tract or central nervous system (1,2).

Nocturnal enuresis is a common genetically complex disorder around the world. Its prevalence differs according to age; at five years old, the prevalence range from 15-20%, at 10 - year - old, it is 5% and it is 1-2% at people aged 15 years and above (1,3). In Saudi Arabia (2013), a prevalence of 8.6% has been reported among primary school children in Makkah Al-Mukarramah (4).

Nocturnal enuresis is generally considered benign while it causes significant impact on affected children and their families such as low self-esteem, social irritation, and sleep disturbance (1,5).

Nocturnal enuresis can be divided into two main parts; monosymptomatic nocturnal enuresis (MNE) when the child has enuresis without any urinary symptom and constitute approximately 85% of case and non-monosymptomatic nocturnal enuresis (NMNE) when the patient has enuresis with urinary tract symptoms such as urgency, frequency, weak stream, dribbling and incomplete emptying and constitute the remaining 15% of cases (3,6).

The monosymptomatic may subdivide into primary and secondary enuresis. The primary enuresis refers to children had never been dry for prolong period while secondary enuresis refers to children who dry for period of time then become enuretic later, it is usually associated with medical, behavioral or psychosocial problem (5,6).

Nocturnal enuresis may result from one or a combination of the increased urine production during night due to inadequate secretion of antidiuretic hormone or increase drinking of fluid during the day or before the sleep, small bladder capacity, sleep disturbance, maturational delay, overactivity, genetic factors and upper airway obstruction such as tonsillar hypertrophy(3,5). Furthermore, cold weather can lead to increase the rate of enuresis due to increase bladder contractility during winter months (7).

Most studies have consistently found that the risk factors for enuresis are male gender, low age and family history of enuresis, divorced parents and deep sleep (8-10).

Rationale

Although the nocturnal enuresis is one of the common, usually hidden psychosocial problem in pediatric age group, up to our knowledge, it is not investigated in Taif city.

From the researcher's point of view, this problem affects the most important individuals in the family (the child and the mother) hence the whole family will be affected.

Aim of the study

This study aimed to estimate the prevalence of nocturnal enuresis among children between 5 years to 15 years attending the primary health care centers, Ministry of Health, Taif city, 2021.

Also To estimate factors associated with nocturnal enuresis among children whose parents attending the primary health care centers, Ministry of Health, Taif city, 2021.

Specific objectives:

- 1- To estimate the prevalence of nocturnal enuresis among children whose parents attending the primary health care centers, Ministry of Health, Taif city, 2021.
- 2- To estimate factors associated with nocturnal enuresis among children whose parents attending the primary health care centers, Ministry of Health, Taif city, 2021.

REVIEW OF LITERATURE

With reviewing the literatures, numerous studies were cited. The following is summary of the most related studies carried on at local, regional and international levels.

Saudi studies

Shahin et al (2017) carried out a cross-sectional study aimed to determine the prevalence and associated factors of nocturnal enuresis in Saudi school and preschool children (5-12 years) in Hail, and to define common methods used for its management. The overall prevalence of nocturnal enuresis was 22%. Female gender, younger age, parental/siblings` history of enuresis, deep sleep and history of urinary tract infections and other socio-psychological problems were significantly associated with enuresis. Slightly more than a quarter (27%) of children with enuresis was seen by physician for treatment whereas 40% were treated by traditional means (11).

Alnajjar (2013) carried out a cross-sectional study to estimate the prevalence of nocturnal enuresis and determine its associated factors among primary school

children (6-12 years) in Makkah Al-Mokarramah. The prevalence of nocturnal enuresis was 8.6%. Among enuretic primary schoolchildren, enuresis was considered primary in 84.6% while it was considered secondary in 15.4% of them. Enuresis was more frequent among children who are 8 years of age, those who live with either father or mother only but not both, with history of consanguinity among their parents, low monthly income, low educational level of fathers, living in smaller number of rooms, those having recurrent urinary tract infection (UTI), stool incontinence, habit of eating chocolate or fast foods at dinner, psychological trouble (changing school or home, losing of admirable person, parental separation and acute family problem) and those having history of enuresis among siblings. Among children with a history of bedwetting, only parents of two children (4.1%) tried herbal and traditional medicine and another 2 parents (4.1%) reported medical consultation. No treatment was prescribed for any cases (4).

Taha et al (2011) conducted in Al Khobar a case-series study to evaluate the social and personal characteristics, symptomatology, associated factors and management of nocturnal enuresis. They reviewed medical records of 117 confirmed nocturnal enuresis children. Males were 65%, 82.1% were of school age. More than half (58%) of patients had positive family history of enuresis in one of the parents while 59% showed positive family history in one of the siblings. Almost two-thirds (62%) of children were punished for bedwetting. Patients who improved with instructions and medications were 66%. Most of patients (81%) were enuretic for most of the nights. A significantly higher proportion of patients aged 7-18 years improved by instructions plus medication (12).

Regional studies:

Hamed et al (2017) carried out a cross-sectional study to estimate the prevalence of mono-symptomatic nocturnal enuresis (MNE) and its risk factors among 4652 school-age children (9 ± 2 years) in Sohag, Upper Egypt. The prevalence of NE was 18 %, with no significant difference between rural and urban areas. Younger students showed higher prevalence of MNE than in older children. MNE caused moderate-to-severe bother for 44.5 and 87.8 % of students and parents, respectively. The significant risk factors were UTI, pinworm infestation, constipation, and caffeine over-consumption. Family history of mono-symptomatic nocturnal enuresis was positive in 84%. Daytime incontinence was observed in 16 % of cases. Children with 4 or more siblings and birth order 3 or more had more prevalent MNE associated with it.

Deep sleep and exposure to social problems or violence correlated positively with occurrence of mono-symptomatic nocturnal enuresis. Father's education and work status, mother education, number of children per room, and socioeconomic status significantly associated with occurrence of MNE. No treatment was utilized by 53.2 % of cases (13).

Yousef et al (2011) conducted a cross-sectional study to determine the prevalence of nocturnal incontinence in Yemeni primary school children, describe its severity and identify the relation between nocturnal enuresis with personal and family characteristics. The prevalence of NE was 17.2%. Nocturnal enuresis decreased by age from 31.5% at 6-8 years to 8.7% at 15+ years ($P < 0.05$). Primary nocturnal enuresis affected 76.1%, of which the majority of children were bedwetting every night. Positive family history of nocturnal enuresis, deeper sleep, daytime enuresis, tea drinking, being non working father or with less education showed significant association with the occurrence of enuresis in the students. Stressful events in the previous 6 months of the study were twice more frequently noted (14).

Bakhtiar et al (2014) determined the prevalence and associated factors of nocturnal enuresis in 710 school children in Khorramabad city, Iran. Nocturnal enuresis was diagnosed, based on the diagnostic criteria of DSM-IV. The prevalence of NE was 8%, including 5.2% of primary nocturnal enuresis and 2.8% of secondary nocturnal enuresis. The prevalence of nocturnal enuresis in the boys (10.7%) was higher compared with that in the girls (5.4%). There were significant relationships between nocturnal enuresis and history of nocturnal enuresis in siblings, respiratory infections, deep sleep, corporal punishment at school, itching and history of seizures (15).

International studies

Doganer and his colleagues investigated the prevalence and severity of NE among elementary schoolchildren (6-14 years) and sociodemographic risk factors related to it in Ankara, Turkey. The overall prevalence of NE was 9.9%; 10.7% for males and 9.2% for females. Factors associated significantly with NE were age groups ($P < 0.001$), education level of parents ($P < 0.001$), the number of sibling ($P = 0.002$), income level ($P < 0.001$), and positive family history ($P < 0.001$). In multivariate logistic regression analysis, only 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, $P < 0.001$) were significant predictors for NE (16).

Gunes et al (2009) conducted a cross-sectional study in Turkey to determine the possible differences in the prevalence of enuresis between children in boarding school and daytime school (n=562) and the association of enuresis with socio-demographic factors. This was a cross-sectional survey. The overall prevalence of nocturnal enuresis was 14.9%; 18.5% among children attending day time school and 11.5% among those 11.5% attending boarding school ($p < 0.05$). The prevalence of nocturnal enuresis decreased with age (33.3% at age of 6 years and only 2.6% at age of 15 years). The prevalence of NE was slightly higher in girls than boys with no statistically significant difference (16.8% versus 14.3%). Prevalence of NE increased among children living in villages, with low income and with positive family history. Multivariate analysis revealed that history of urinary tract infection (OR =2.02), age (OR =1.28), low monthly income (OR =2.86) and family history of enuresis (OR =3.64) were significant predictors of NE after controlling for confounding. Almost half of children and parents were significantly concerned about the impact of enuresis (57.1% and 46.4%, respectively) (17).

Carman et al (2008) carried out another study in Turkey to study the prevalence of nocturnal enuresis and define the associated familial factors in children (6-12 years) with a different socioeconomic status. Two groups of children were compared; children from a suburban region of Istanbul (group 1), and children from a well-developed part of Istanbul (group 2). The prevalence of enuresis were 25.5% and 16% in group 1 and group 2 of children, respectively, $p < 0.01$. Only 7.8% of group one and 10.8% of group 2 children received treatment for enuresis, $p > 0.05$. The parents of the enuretic children from group 1 considered the condition as a normal developmental entity. They believed that enuresis will resolve spontaneously and that no treatment is necessary. On the contrary, the parents of the enuretic children in second group believed that enuresis is a psychological problem and that intensive psychological assistance is essential for the management (18).

Etuk et al (2011) conducted a cross-sectional study to estimate the frequency of enuresis among 3,230 primary school children in Calabar, Nigeria and to explore the treatment modalities. The frequency of nocturnal enuresis was 6.7%. Enuresis frequency was higher among boys than though this was not statistically significant (7.3% versus 6%). Treatment methods were water restriction (42.8%), awaking for voiding (27.3%), use of alarm bell (0.5%), medication (1.6%), herbal medication (8.0%), while 19.8% received no form of treatment. Only 2.1% of this study

population ever sought medical consultation for this condition (19).

METHODOLOGY:

Study design:

A cross-sectional design was used.

Study area:

The study was conducted at primary health care centers (PHCCs) affiliated by Ministry of health (MOH) in Taif city (n=19).

Study population and inclusion criteria:

Children between 5 and 15 years (male or female) attending the PHCCs, MOH in Taif throughout the study period (April 2021) constituted the target population for the study.

Inclusion criteria:

-Parents who have at least one child aged between 5 and 15 years (male or female).

Exclusion criteria:

-Parents who haven't children aged between 5 and 15 years.
-Severely ill parents and children who cannot cooperate properly with the researcher
-parents or child who refuse to participant to research

Sampling:

The sample size was estimated to be 213 parents using online sample size calculator from www.raosoft.com, assuming that approximately 1000 patients will visit the PHCCs throughout the study period, with confidence level of 95%, prevalence of 22.7% and margin error of 5%. In order to compensate for drop out, 235 questionnaires were distributed.

Five PHCCs will be randomly selected through a simple random technique using ideal bowl method and a consecutive sample of 50 parents and children with the inclusion criteria were chosen from each of these centers.

Study instrument:

A self-administered questionnaire was used for literate participants and interviewing questionnaire was used with illiterate participants. The questionnaire included three main parts: Personal information, Information for nocturnal enuresis and Information for possible associated factors. The study tool has been used previously in a study carried out in Makkah among primary school students (4). Permission to use the tool was obtained from the author through personal

communication. Some modifications were be done and validation was done.

Data collection method:

Fifty self-administrated questionnaires were distributed to each of the chosen PHCC by the researcher, thereafter the physician/nurse of the PHCC delivered the questionnaire to eligible parents and children or who were included in criteria to be filled, then, they were collected in the same day. Interviews were done with illiterates.

Study definitions:

Primary enuresis was defined as continuous wetting since early childhood till the time of the study i.e. urinary continence for a period of at least 6 months has never been accomplished (20). Secondary enuresis was considered when the child has been toilet trained for at least 6 months after the age of bladder control, and bladder control is subsequently lost (20).

Pilot study:

A pilot study was conducted among 20 participants to test wording of the questionnaire and estimate the time needed to complete the questionnaire. The data of the pilot study was included in the final draft of the research, if no significant difference was be observed.

Administrative and ethical considerations:

All the necessary permissions were obtained before the process of data collection. Prior to data collection, the researcher informed all potential participants regarding the objectives of the study and assured that no harm is ever expected to occur if they decide to not

participate in the study. They were also assured about the confidentiality and anonymity of their answers. Consents to participate were present at the beginning of the questionnaire.

Data management:

For the purpose of data entry and analysis, Statistical Package for Social Sciences (SPSS) software version 25.0 was used Descriptive statistics (numbers, frequencies, percentage for categorical variables and mean, standard deviation for continuous variables). Chi-squre test, fisher exact test and T tests were used when appropriate. A p-value equal or less than 0.05 was considered statistically significant.

RESULTS:**Sociodemographic characteristic of children and their care giver:**

A total of 211 children were included in the study and 2 children were excluded due to insufficient data in their questionnaires. As shown in **Table 1**, the majority of the children were in the age group of 5 to 7 years (49.3%) followed by the age group of 8 to 10 years (28%). More than half of their mothers had an educational level of university or above (53.5%), and similarly, more than half of their fathers had an educational level of university or above (52.6%). Regarding the monthly income of the caregivers, 35.1% had an income of > 15,000 Saudi Riyal, 27% had 10,001 to 15,000 Saudi Riyal, 19.9 had 5,001 to 10,000 Saudi Riyal and 18% had < 5,000 Saudi Riyal per months.

Table 1: Sociodemographic characteristic of children and their caregivers. N = 211

Sociodemographic factor	Frequency	Percentage
Age group		
5 – 7 years	104	49.3%
8 – 10 years	59	28.0%
11 – 13 years	32	15.2%
14 – 15 years	16	7.6%
Father's education		
Primary or below	7	3.3%
Intermediate	14	6.7%
Secondary	79	37.4%
University or above	111	52.6%
Mother's education		
Primary or below	31	14.7%
Intermediate	13	6.2%
Secondary	54	25.6%
University or above	113	53.5%
Living with		
Both father and mother	14	6.6%
Father	119	56.4%
Mother	72	34.1%
Monthly income of caregiver		
<5,000 SR	38	18.0%
5,001 – 10,000 SR	42	19.9%
10,001 – 15,000 SR	57	27.0%
> 15,000 SR	74	35.1%

Prevalence and characteristic of nocturnal enuresis (NE):

83 cases of nocturnal enuresis were reported in this study, making an overall prevalence of 39.3%. Across different age groups, the prevalence was as follows: 44.2% in children 5 to 7 years (N = 104), 35.6% in children 8 to 10 years (N = 59), 31.3% in children 11 to 13 years (N = 32) and 37.5% in children 14 to 15 years old (N = 18). **Figure 1, 2.**

Among the 83 nocturnally enuretic children, primary enuresis was reported in 54.2% of cases, and secondary enuresis was reported in 45.8% of cases.

The average number of dry nights per week for those children was 5.9 ± 2.2 days. The longest time period of reported dry nights was less than one week in 56.6% of cases, and less than one months in 22.9% of cases. Daytime enuresis was also present in 23 children (27.7%), while stool incontinence was present in 7 children (8.4%). The most common urinary symptoms in nocturnally enuretic children was frequency (44.6%) and urgency (28.9%) **Table 2** summarizes those results.

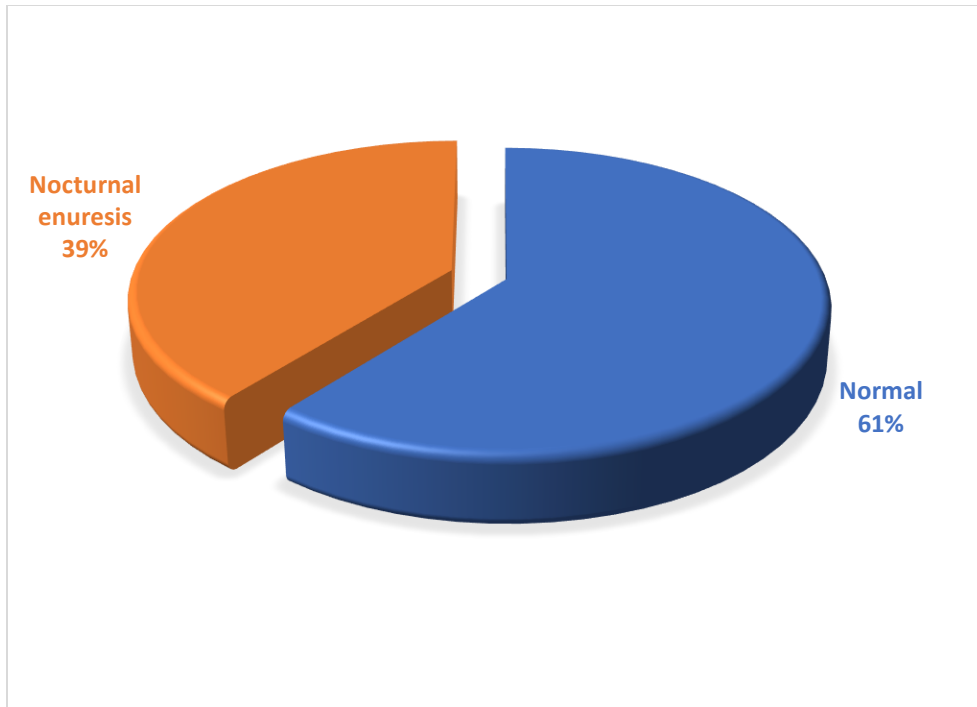


Figure 1: Prevalence of nocturnal enuresis. N = 211

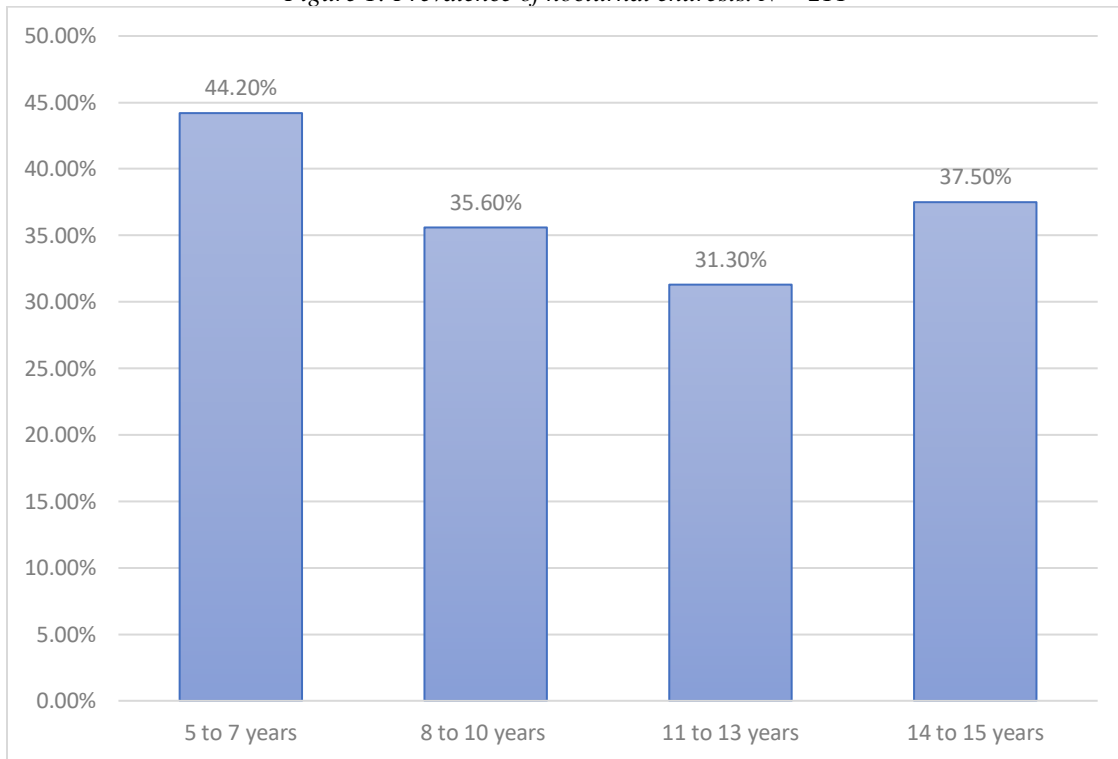


Figure 2: Prevalence of nocturnal enuresis across different age groups

Table 2: Characteristic of children with nocturnal enuresis. N = 83

Characteristic of nocturnal enuresis	Frequency (Mean)	Percentage (SD)
Type of enuresis		
Primary	45	54.2%
Secondary	38	45.8%
Average number of dry nights per week	(5.9)	(2.2)
Longest period of dry nights		
< 1 week	47	(56.6%)
< 1 month	19	(22.9%)
2 – 6 months	10	(7.8%)
> 6 months	56	(43.8%)
Association with daytime enuresis		
Yes	23	27.7%
Association with stool incontinence		
Yes	7	8.4%
Urinary symptoms		
Dysuria	2	2.4%
Weak stream	2	2.4%
Divided stream	5	6.0%
Haematuria	0	0.0%
Frequency	37	44.6%
Urgency	24	28.9%

Personal risk factors for nocturnal enuresis (NE):

As shown in **Table 3**, family history of nocturnal enuresis (NE), consanguinity, type of housing and number of both bedrooms and bathrooms had a significant relationship with NE (p -value < 0.05). Children with a family history of NE had higher incidence of NE compared to children who did not have a family history (81.4% vs 28.6% respectively). Parents' consanguinity was associated with more NE compared to non-consanguinity (49.4% vs 32% respectively). The average number of both bedrooms and bathrooms were significantly higher in houses of children who were reported to have NE, and the highest reported rate of NE was for children who lived in Villas (57.1%). More information is provided in **Table 3**.

Table 3: Personal risk factors for nocturnal enuresis. $N = 211$. Chi-square test or T-tests were used when appropriate

Personal risk factors	Categories	Nocturnal enuresis		P-value
		No	Yes	
Age group	5 – 7 years	58 (55.8%)	46 (44.2%)	0.514
	8 – 10 years	38 (64.4%)	21 (35.6%)	
	11 – 13 years	22 (68.8%)	10 (31.3%)	
	14 – 15 years	10 (62.5%)	06 (37.5%)	
Type of house	Villa	33 (42.9%)	44 (57.1%)	0.000
	Flat	80 (70.8%)	33 (29.2%)	
	Traditional house	15 (71.4%)	06 (28.6%)	
Average number of rooms	-	4.2 ± 1.3	4.2 ± 1.4	0.833
Number of bedrooms	-	2.4 ± 0.8	3.1 ± 1.1	0.000
Number of bathrooms	-	2.4 ± 1.1	3.1 ± 1.2	0.000
Family history	Yes	08 (18.6%)	35 (81.4%)	0.000
	No	120 (71.4%)	48 (28.6%)	
Parents consanguinity	Yes	45 (50.6%)	44 (49.4%)	0.010
	No	83 (68.0%)	39 (32.0%)	
Onset of bathroom training	< 2 years of age	22 (56.4%)	17 (49.6%)	0.408
	2 – 3 years of age	95 (63.3%)	55 (36.7%)	
	4 – 5 years of age	11 (50.0%)	11 (50.0%)	

Medical conditions associated with nocturnal enuresis (NE):

As shown in **Table 4**, all of the following medical conditions had a statistically significant relationship with nocturnal enuresis (NE): recurrent Urinary Tract Infections (UTIs), history of mental illness, and history of diabetes mellitus. Recurrent UTIs were present in 89.5% of enuretic children compared to 34.4% of non-enuretic children (p -value < 0.05). All the children with a history of diabetes mellitus had nocturnal enuresis (100%) compared to 37.3% of non-diabetic children (p -value < 0.05). Similarly, all the children with a history of mental illness had nocturnal enuresis (100%) compared to only 37.3% of children who did not have nocturnal enuresis (p -value < 0.05). The remaining medical conditions did not have a significant relationship with enuresis. **Table 4.**

Table 4: Medical conditions associated with nocturnal enuresis (NE). (N = 211) (chi-square test/ fisher exact test were used when appropriate) (NA = not applicable).

Medical	Nocturnal enuresis		P-value
	No	Yes	
Recurrent UTI			0.000
Yes	2 (10.5%)	17 (89.5%)	
No	126 (65.6%)	66 (34.4%)	
Congenital defects			0.281
Yes	3 (100%)	0 (0.0%)	
No	125 (60.1%)	83 (39.9%)	
Sickle cell disease			0.520
Yes	2 (100%)	0 (0.0%)	
No	126 (60.3%)	83 (39.7%)	
Mental handicap			NA
Yes	0 (0.0%)	0 (0.0%)	
No	128 (60.7%)	83 (39.9%)	
Mental illness			0.001
Yes	0 (0.0%)	7 (100%)	
No	128 (62.7%)	76 (37.3%)	
Diabetes mellitus			0.001
Yes	0 (0.0%)	7 (100%)	
No	128 (62.7%)	76 (37.3%)	
Head trauma			0.159
Yes	3 (33.3%)	6 (66.7%)	
No	125 (61.9%)	77 (38.1%)	
Seizures			NA
Yes	0 (0.0%)	0 (0.0%)	
No	128 (60.7%)	83 (39.9%)	
Recurrent constipations			0.250
Yes	7 (46.7%)	8 (53.3%)	
No	121 (61.7%)	75 (38.3%)	
Allergic rhinitis			0.063
Yes	17 (45.9%)	20 (54.1%)	
No	111 (63.8%)	63 (36.2%)	

Stressful social and psychological conditions associated with nocturnal enuresis (in the past 6 years):

Among the various stressful psychological and social conditions outlined in Table 5, changing home or school, and history of surgical operation in the past 6 years appeared to have a statistically significant relationship with nocturnal enuresis (NE) (P-value <0.05). 65.6% of children who changed their house/ school during the past 6 years have NE compared to 34.6% of those who did not change their house/school (p-value < 0.05). More details are provided in Table 5.

Table 5: Stressful social and psychological conditions associated with nocturnal enuresis (in the past 6 years) (N = 211) (chi-square test/ fisher exact test were used when appropriate)

In the past 6 years	Nocturnal enuresis		P-value
	No	Yes	
Had new sibling			0.216
Yes	66 (56.9%)	50 (43.1%)	
No	62 (65.3%)	33 (34.7%)	
Parents separated			0.080
Yes	1 (20%)	4 (80.0%)	
No	127 (61.7%)	79 (38.3%)	
Separated from mother for more than a month			0.320
Yes	4 (44.4%)	5 (55.6%)	
No	124 (61.4%)	78 (38.6%)	
Changed home or school			0.001
Yes	11 (34.4%)	21 (65.6%)	
No	117 (65.4%)	62 (34.6%)	
Hospitalized			1.000
Yes	1 (100%)	0 (0.0%)	
No	127 (60.5%)	83 (39.5%)	
Underwent surgery			0.004
Yes	11 (100%)	0 (0.0%)	
No	117 (58.5%)	83 (41.5%)	
Lost a loved one			0.159
Yes	5 (100%)	0 (0.0%)	
No	123 (59.7%)	83 (40.3%)	
Acute psychological or social stress among family			1.000
Yes	7 (58.3%)	5 (41.7%)	
No	121 (60.8%)	78 (39.2%)	

Eating habits associated with nocturnal enuresis (NE):

As shown in **Table 6**, those who drinks soft drinks and or tea during or after dinner have higher incidence of nocturnal enuresis (76.9% and 59.1% respectively) when compared with those who do not drinks soft drinks and or tea (22.6% and 34.1% respectively) (p-value <0.05). Other eating habits did not show significant relationship with nocturnal enuresis. More details about the eating habits are provided in **Table 6**.

Table 6: Eating habits associated with nocturnal enuresis (NE). N = 211) (chi-square test/ fisher exact test were used when appropriate)

Eating habits	Nocturnal enuresis		P-value
	No	Yes	
Eating chocolate during or after dinner			0.110
Yes	55 (55.0%)	45 (45.0%)	
No	73 (65.8%)	38 (34.2%)	
Soft drinks during or after dinner			0.000
Yes	15 (23.1%)	50 (76.9%)	
No	113 (77.4%)	33 (22.6%)	
Drinking coffee during or after dinner			0.364
Yes	8 (50.0%)	8 (50.0%)	
No	120 (61.5%)	75 (38.5%)	
Drinking tea during or after dinner			0.003
Yes	18 (40.9%)	26 (59.1%)	
No	110 (65.9%)	57 (34.1%)	
Eating fast food			0.062
Yes	65 (55.1%)	53 (44.9%)	
No	63 (67.7%)	30 (32.3%)	

Impact of nocturnal diuresis and attitude of family members:

As shown in Table 7, about two thirds (67.5%) of parents of the 83 nocturnally enuretic children showed reported that they want this condition to be treated by a specialized doctor, However, only 26.5% of them actually did visit a doctor. Additionally, only 12% and 14.5% of parents tried using medications or traditional therapies to treat nocturnal enuresis respectively. When asked about the impact of nocturnal enuresis on their children. 49.4% of parents said it affects their self confidence and 18.1% said it affected their school performance. 25.3% of the enuretic children are being punished for their enuresis.

Table 7: Impact and attitude of family regarding nocturnal enuresis. N = 83

Impact of Nocturnal enuresis	No (%)	Yes (%)
Does family need this to be treated by specialized doctor?	27 (31.5%)	56 (67.5%)
Visited a doctor for nocturnal enuresis?	61 (73.5%)	22 (26.5%)
Used medication for nocturnal enuresis?	73 (88.0%)	10 (12.0%)
Used traditional medications for nocturnal enuresis?	71 (85.5%)	12 (14.5%)
Does enuresis affect the child confidence?	42 (50.6%)	41 (49.4%)
Does enuresis affect his school performance	68 (81.9%)	15 (18.1%)
Is child being punished for enuresis?	62 (74.7%)	21 (25.3%)

DISCUSSION:

Nocturnal enuresis is one of the common childhood conditions that have complex underlying etiologies and risk factors (21). In this study, we explored the burden of this health problem among children of parents attending primary healthcare centers in Taif City, Saudi Arabia. We targeted children in the age group of 5 to 15 years. In Saudi Arabia, numerous studies reported a prevalence rate ranging from 7.8% to 31.2%, and fewer studies reported a prevalence that exceeded 50% (22–27). In Al-Taif City, the prevalence of nocturnal enuresis was reported to be 7.8% by Al-Zahrani *et al.*, However, our study revealed that the prevalence is 39.3% in the same city. This can be explained by the difference in the study settings, where Al-Zahrani *et al.* conducted his study in primary school setting, and our study included children of parents attending primary healthcare centers (22). Compared to the finding of a 2019 study in Jazan region which reported a prevalence rate of 67.4% for nocturnal enuresis, our sample's prevalence is significantly lower (25). The inconsistencies in the prevalence across regions of Saudi Arabia could be due to the different definitions used in each study and

differences in participants. In addition, these differences can also be due to the trend of under-reporting behaviours in various study settings.

We also found that, more than half of the nocturnally enuretic children had primary nocturnal enuresis (54.2%, N=83), while 45.8% had secondary enuresis, where they have gained control of their urine continence at some point and then they developed enuresis later in life. In a 2017 study in Makkah City, primary enuresis was more common and constituted

84.6% of the reported cases (4). Our result also showed that the association with daytime enuresis was reported in 27.7% of the nocturnally enuretic children. This is in line with the result of two studies in Saudi Arabia which reported 11% and 55% of nocturnally enuretic children with daytime symptoms (23,27). Other studies also reported daytime enuresis in 18% of nocturnally the enuretic children (28).

In this study, we also explored some risk factors that could be associated with nocturnal enuresis. The etiologies of nocturnal enuresis are generally multifactorial and are the result of the interaction of physical and psychosocial factors. Regarding the physical factors, we associated nocturnal enuresis with recurrent urinary tract infections and diabetes mellitus, which is similar to many previous studies (8,17,29). The relationship between recurrent urinary tract infections and enuresis had been suggested to be due to the weak contractions of urethric sphincters that are caused by the damage caused by these recurrent infections (17). Although uncommon presentation, diabetes mellitus can lead to polyurea and polydipsia which could subsequently lead to nocturnal enuresis. Thus, one of the common workup of enuretic children is to screen their urine for evidence of urinary tract infections and glucose (30).

Our results also showed that there is a strong relationship between enuresis and family history and consanguinity. Previous studies shows that whenever one parent has a history of prolonged nocturnal enuresis, approximately 50% of his/her offspring are affected too; and when both parents have a history, approximately 75% of offspring are affected, which shows trend similar to autosomal dominant

inheritance. In contrast, whenever no parent has a history of nocturnal enuresis, only 15% of offspring are affected (31).

It is worth mentioning that our study did not show significant association between nocturnal enuresis and the age of the child and the age of onset of his/ her toilet training, which might be due to the sample size used in this study. In a 2020 study in Saudi Arabia, a significant reduction in the prevalence of enuresis was associated with the increasing age of children (23). Similar results were reported in different regions of Saudi Arabia (4,26,32). Additionally, some authors found that children with early or late onset of toilet training had more complaints of daytime enuresis than in children with normal training (33). This highlights the strong genetic predisposition of this health problem.

Regarding the psychosocial factors and its association with nocturnal enuresis, we associated nocturnal enuresis with mental illness, changing house and school in the previous 6 years, type of house, and number of bathrooms and bedrooms in a house. Alnajjar *et al.* reported similar results about the effect of psychosocial stressors and also associated parental separation, loss of an admirable one and acute psychosocial and family problem with nocturnal enuresis (4). Additionally, the relationship between childhood anxiety and nocturnal enuresis has been well emphasized as a contributor to the onset of nocturnal enuresis and not as a main cause of it (34). Furthermore, nocturnal enuresis may be associated with neurodevelopmental disorders and other mental illnesses, including mental handicap, autism, and attention deficit hyperactivity disorder (ADHD). Disturbed sleep pattern may contribute to or exacerbate this problem (35).

Several studies showed that some foods and beverages can induce nocturnal enuresis or bladder irritability, which in some children can exacerbate their bladder symptoms and aggravate enuresis (4,36). In our study we highlighted the effect of drinking soft drinks and or tea during or after dinner as a contributor to nocturnal enuresis. Children need to avoid these eating habits during dinner time to reduce the incidence of nocturnal enuresis.

This study also explored some of the impact of nocturnal enuresis on the children and their care givers. When we asked the parents about the impact of nocturnal enuresis on their children, 49.4% of parents said it affects their self- esteem and confidence, and 18.1% said it affected their school performance.

Furthermore, 25.3% of the enuretic children are being punished for their enuresis. Although psychological stresses have been hypothesized to have a role in the causation of nocturnal enuresis, this relationship remains vague. The resulting low self-esteem tend to improve after resolution of enuresis, indicating that the behavioural problems are a result of the enuresis rather than a cause of it (37). Furthermore, Children whose enuresis has resolved completely do not develop other behavioural or mental symptoms (38).

CONCLUSION:

In summary, the prevalence of nocturnal enuresis in Taif City is 39.9%, which is in the range of what was reported in different regions across Saudi Arabia. The majority of the cases were primary and 27% had daytime symptoms. Nocturnal enuresis was associated with the following factors: type of house, number of bedrooms and bathrooms, family history and consanguinity, recurrent UTIs, diabetes mellitus, mental illness, changing home or school, and drinking soft drinks and tea during or after dinner. Enuresis is a pediatric health problem that needs efforts at all levels such as preventive, etiological and curative measures. furthermore, some misconceptions among parents and families require health education intervention.

REFERENCES:

1. Ma Y, Liu X, Shen Y. Behavioral factors for predicting severity of enuresis and treatment responses in different compliance groups receiving behavioral therapy. *Pakistan J Med Sci* [Internet]. 2017 Aug 4;33(4). Available from: <http://pjms.com.pk/index.php/pjms/article/view/12922>
2. Glazener CM, Evans JH, Peto RE. Complex behavioural and educational interventions for nocturnal enuresis in children. *Cochrane Database Syst Rev* [Internet]. 2004 Jan 26; Available from: <https://doi.wiley.com/10.1002/14651858.CD004668>
3. Kiddoo DA. Toilet training children: when to start and how to train. *Can Med Assoc J* [Internet]. 2012 Mar 20;184(5):511–511. Available from: <http://www.cmaj.ca/lookup/doi/10.1503/cmaj.110830>
4. Alnajjar M. Prevalence and risk factors associated with nocturnal enuresis among primary school children in Al-Eskan region, Makkah Al-Mokarramah [Internet]. 2013 [cited 2022 Mar 2]. Available from: <https://www.semanticscholar.org/paper/Prevalence-and-Risk-Factors-Associated-with-Among-AlNajjar/d4f5d43ca2155a00f668215fb3906773e015d90d>
5. DiBianco JM, Morley C, Al-Omar O. Nocturnal enuresis: A topic review and institution experience.

- Avicenna J Med [Internet]. 2014 Oct 9;04(04):77–86. Available from: <http://www.thieme-connect.de/DOI/DOI?10.4103/2231-0770.140641>
6. Baird DC, Seehusen DA, Bode D V. Enuresis in children: a case based approach. *Am Fam Physician* [Internet]. 2014 Oct 15;90(8):560–8. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25369644>
 7. Tas T, Cakiroglu B, Hazar AI, Balci MBC, Sinanoglu O, Nas Y, et al. Monosymptomatic nocturnal enuresis caused by seasonal temperature changes. *Int J Clin Exp Med* [Internet]. 2014;7(4):1035–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24955178>
 8. Ozden C, Ozdal OL, Altinova S, Oguzulgen I, Urgancioglu G, Memis A. Prevalence and associated factors of enuresis in turkish children. *Int braz j urol* [Internet]. 2007 Apr;33(2):216–22. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1677-55382007000200013&lng=en&tlng=en
 9. Hazza I, Tarawneh H. Primary nocturnal enuresis among school children in jordan. *Saudi J Kidney Dis Transpl* [Internet]. 13(4):478–80. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17660671>
 10. De Sousa A, Kapoor H, Jagtap J, Sen M. Prevalence and factors affecting enuresis amongst primary school children. *Indian J Urol* [Internet]. 2007;23(4):354. Available from: <http://www.indianjurol.com/text.asp?2007/23/4/354/36703>
 11. Shahin M. THE EPIDEMIOLOGY AND FACTORS ASSOCIATED WITHNOCTURNAL ENURESIS AMONG SCHOOL & PRESCHOOL CHILDREN IN HAIL CITY, SAUDI ARABIA: A CROSS-SECTIONAL STUDY. *Int J Adv Res* [Internet]. 2017 Apr 30;5(4):2048–58. Available from: <http://www.journalijar.com/article/17212/the-epidemiology-and-factors-associated-withnocturnal-enuresis-among-school-&-preschool-children-in-hail-city,-saudi-arabia:-a-cross-sectional-study/>
 12. Taha AZAA, Sabra AA. Nocturnal enuresis at a primary health care setting: Analysis of 117 cases. *Bahrain Med Bull*. 2011;33(2).
 13. Hamed A, Yousf F, Hussein MM. Prevalence of nocturnal enuresis and related risk factors in school-age children in Egypt: an epidemiological study. *World J Urol* [Internet]. 2017 Mar 15;35(3):459–65. Available from: <http://link.springer.com/10.1007/s00345-016-1879-2>
 14. Yousef KA, Basaleem HO, bin Yahiya MT. Epidemiology of nocturnal enuresis in basic schoolchildren in Aden Governorate, Yemen. *Saudi J Kidney Dis Transpl* [Internet]. 2011 Jan;22(1):167–73. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21196640>
 15. Bakhtiar K, Pournia Y, Ebrahimzadeh F, Farhadi A, Shafizadeh F, Hosseinabadi R. Prevalence of Nocturnal Enuresis and Its Associated Factors in Primary School and Preschool Children of Khorramabad in 2013. *Int J Pediatr* [Internet]. 2014;2014:1–7. Available from: <http://www.hindawi.com/journals/ijpedi/2014/120686/>
 16. Doganer Y, 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 Prim Care* [Internet]. 2015;4(1):39. Available from: <https://journals.lww.com/10.4103/2249-4863.152250>
 17. Gunes A, Gunes G, Acik Y, Akilli A. The epidemiology and factors associated with nocturnal enuresis among boarding and daytime school children in southeast of Turkey: a cross sectional study. *BMC Public Health* [Internet]. 2009 Dec 22;9(1):357. Available from: <https://bmcpublihealth.biomedcentral.com/articles/10.1186/1471-2458-9-357>
 18. Carman KB, Ceran O, Kaya C, Nuhoglu C, Karaman MI. Nocturnal Enuresis in Turkey: Prevalence and Accompanying Factors in Different Socioeconomic Environments. *Urol Int* [Internet]. 2008;80(4):362–6. Available from: <https://www.karger.com/Article/FullText/132692>
 19. Etuk I, Ikpeme O, Essiet G. Nocturnal Enuresis And Its Treatment Among Primary School Children In Calabar Nigeria. *Niger J Paediatr* [Internet]. 2011 Nov 16;38(2). Available from: <http://www.ajol.info/index.php/njp/article/view/72248>
 20. Robson WLM, Leung AKC, Van Howe R. Primary and Secondary Nocturnal Enuresis: Similarities in Presentation. *Pediatrics* [Internet]. 2005 Apr 1;115(4):956–9. Available from: <https://publications.aap.org/pediatrics/article/115/4/956/67556/Primary-and-Secondary-Nocturnal-Enuresis>
 21. Gomez Rincon M, Leslie SW, Lotfollahzadeh S. Nocturnal Enuresis [Internet]. *StatPearls*. StatPearls Publishing; 2022 [cited 2022 Mar 2]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK545181/>
 22. AlZahrani S. Nocturnal enuresis and its treatment among primary-school children in Taif, KSA. *Int J Res Med Sci* [Internet]. 2014;2(1):91. Available from: <http://www.msjonline.org/index.php/ijrms/article/view/2067>
 23. Alhifthy EH, Habib L, Abu Al-Makarem A, AlGhamdi M, Alsultan D, Aldhamer F, et al. Prevalence of Nocturnal Enuresis among Saudi Children Population. *Cureus* [Internet]. 2020 Jan 15; Available from:

- <https://www.cureus.com/articles/25765-prevalence-of-nocturnal-enuresis-among-saudi-children-population>
24. Alshahrani A, Selim M, Abbas M. Prevalence of nocturnal enuresis among children in Primary Health Care Centers of Family and Community Medicine, PSMCC, Riyadh City, KSA. *J Fam Med Prim Care* [Internet]. 2018;7(5):937. Available from: https://journals.lww.com/10.4103/jfmpc.jfmpc_32_18
 25. Sherah K, Elsharief M, Barkat N, Jafery A. Prevalence of Nocturnal Enuresis in school-age children in Saudi Arabia. *Int J Med Dev Ctries* [Internet]. 2019;669–75. Available from: <https://www.ejmanager.com/fulltextpdf.php?mno=25434>
 26. Soha Abdul Malik Jameel Ashoor, Dureen Saleh Alghalbi, Hadeel Ahmed Alsubhi F Abdullah Al Herz. PEDIATRIC NOCTURNAL ENURESIS PREVALENCE IN ASSOCIATION WITH MULTIPLE RISK FACTORS: A CROSS-SECTIONAL STUDY IN JEDDAH, KSA. 2021 Apr 24 [cited 2022 Mar 2]; Available from: <https://zenodo.org/record/4716912>
 27. Alanazi ANH, Alanazi RSM, Alanazi EN, Alanazi RM, Rabbani U. Prevalence of Nocturnal Enuresis Among Children and Its Association With the Mental Health of Mothers in Northern Saudi Arabia. *Cureus* [Internet]. 2022 Feb 15; Available from: <https://www.cureus.com/articles/86083-prevalence-of-nocturnal-enuresis-among-children-and-its-association-with-the-mental-health-of-mothers-in-northern-saudi-arabia>
 28. Sarici H, Telli O, Ozgur BC, Demirbas A, Ozgur S, Karagoz MA. Prevalence of nocturnal enuresis and its influence on quality of life in school-aged children. *J Pediatr Urol* [Internet]. 2016 Jun;12(3):159.e1-159.e6. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1477513115004507>
 29. Geffken GR, Williams LB, Silverstein JH, Monaco L, Rayfield A, Bell SK. Metabolic Control and Nocturnal Enuresis in Children With Type 1 Diabetes. *J Pediatr Nurs* [Internet]. 2007 Feb;22(1):4–8. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0882596306002600>
 30. Robson WLM. Evaluation and Management of Enuresis. *N Engl J Med* [Internet]. 2009 Apr 2;360(14):1429–36. Available from: <http://www.nejm.org/doi/abs/10.1056/NEJMcp0808009>
 31. Eiberg H, Berendt I, Mohr J. Assignment of dominant inherited nocturnal enuresis (ENUR1) to chromosome 13q. *Nat Genet* [Internet]. 1995 Jul;10(3):354–6. Available from: <http://www.nature.com/articles/ng0795-354>
 32. Spee-van der Wekke J, Hirasing R., Meulmeester J., Radder J. Childhood Nocturnal Enuresis in the Netherlands. *Urology* [Internet]. 1998 Jun;51(6):1022–6. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S009042959800106X>
 33. Krane S, Gorbachinsky I, Richards K, Hodges S. The association of age of toilet training and dysfunctional voiding. *Res Reports Urol* [Internet]. 2014 Oct;127. Available from: <http://www.dovepress.com/the-association-of-age-of-toilet-training-and-dysfunctional-voiding-peer-reviewed-article-RRU>
 34. Salehi B, Yossefi Chiegan P, Rafeei M, Mostajeran M. The Relationship Between Child Anxiety Related Disorders and Primary Nocturnal Enuresis. *Iran J Psychiatry Behav Sci* [Internet]. 2016 May 17;10(2). Available from: <https://brief.land/ijpbs/articles/4462.html>
 35. Nevéus T. Diagnosis and management of nocturnal enuresis. *Curr Opin Pediatr* [Internet]. 2009 Apr;21(2):199–202. Available from: <https://journals.lww.com/00008480-200904000-00006>
 36. Ferrara P, Del Volgo V, Romano V, Scarpelli V, De Gara L, Miggiano GAD. Combined Dietary Recommendations, Desmopressin, and Behavioral Interventions May Be Effective First-Line Treatment in Resolution of Enuresis. *Urol J* [Internet]. 2015 Sep 4;12(4):2228–32. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26341763>
 37. Longstaffe S, Moffatt ME, Whalen JC. Behavioral and self-concept changes after six months of enuresis treatment: a randomized, controlled trial. *Pediatrics* [Internet]. 2000 Apr;105(4 Pt 2):935–40. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/10742350>
 38. Wille S, Anveden I. Social and behavioural perspectives in enuretics, former enuretics and non-enuretic controls. *Acta Paediatr* [Internet]. 1995 Jan;84(1):37–40. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/7734896>