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Research Article

**PEDIATRIC NOCTURNAL ENURESIS PREVALENCE IN  
ASSOCIATION WITH MULTIPLE RISK FACTORS: A CROSS-  
SECTIONAL STUDY IN JEDDAH, KSA**Soha abdul malik jameel Ashoor<sup>1</sup>, Dareen Saleh Alghalbi<sup>2</sup>, Hadeel Ahmed Alsubhi<sup>2</sup>,  
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**Abstract:**

**Background:** Nocturnal enuresis is the inability to control urination. It represents a common health problem among young children and adolescents. Nocturnal enuresis is the second most common condition affecting children aged 6 to 14 years after allergic disorders.

**Methodology:** this was a cross-sectional study conducted among young Saudi children to determine the prevalence of nocturnal enuresis and associated risk factors. An online adapted questionnaire was distributed among the children's parents to fulfill the study objects.

**Results:** Among the 432 included children, 53.2% were females and (31.5%) aged 5-7 years. There was a significant association between the child's age ( $P=0.000$ ), gender ( $P=0.040$ ), and father's education ( $P=0.096$ ) and nocturnal enuresis. The parents' and siblings' family history, hospital admission, blood grouping, suffering from diabetes, and UTI also has a significant association with the prevalence of nocturnal enuresis ( $P=0.032$ ), ( $P=0.000$ ), ( $P=0.024$ ), ( $P=0.004$ ), ( $P=0.000$ ), and ( $P=0.006$ ), respectively.

**Conclusion:** We demonstrated a high prevalence of nocturnal enuresis among young Saudi children. Family history was significantly associated with the enuresis prevalence. High prevalence of diurnal enuresis and which caused social shame to most of the participants. Children who were admitted to hospital after delivery, born with obstructed, and those suffered from diabetes and UTI were found to have the highest prevalence of enuresis.

**Keywords:** Nocturnal enuresis; Pediatric; Saudi Arabia

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## INTRODUCTION:

Nocturnal enuresis is involuntary urination during sleeping or the inability to control urination, which is prevalent among young children [1]. Enuresis is described by the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV) criteria as the urination of children over the age of five in clothes or bed twice a week for three consecutive months [2].

According to the presence of symptoms, nocturnal enuresis could be classified into a mono-symptomatic condition, which is natural voiding occurring at night in bed in the absence of any urogenital or gastrointestinal symptoms. Poly-symptomatic condition is bedwetting accompanied by daytime symptoms such as urgency, high frequency, chronic constipation, or encopresis. According to the previous periods of drying, nocturnal enuresis is categorized into primary enuresis, which is bedwetting in a child who has never been dry in his or her life, and secondary enuresis, which occurs in a child who has been dry at night for at least six months [3]. Generally, bedwetting is diagnosed when a child is 5 years old or older. However, it is usually not treated until the children are between the ages of 7 and 8 [4].

Nocturnal enuresis is a common issue in children and adolescents. After allergic disorders, nocturnal enuresis is the second most common condition affecting children aged 6 to 14 years [5]. In one study, the global incidence of enuresis in children aged 6 to 12 years was found to be 15% to 25% [6]. Moreover, an epidemiological study in Egypt found a prevalence of 18% among young children [7].

The most commonly supported etiologic variable for nocturnal enuresis is genetic predisposition. According to one study, if both parents were enuretic as children, the risk of their children having enuresis is 77% .

If one parent was enuretic as a child, the risk dropped to 43%, and it dropped to 15% when neither parent was enuretic [8]. Nocturnal enuresis was previously considered to be a psychological disorder. It now seems that psychological issues are the product of enuresis rather than the source of it. There is no evidence that children with nocturnal enuresis have an elevated risk of emotional issues [9].

Attempts to establish bladder issues as the cause of nocturnal enuresis have yielded conflicting results [10]. Extensive urodynamic research has revealed that bladder function in children with nocturnal

enuresis is within the normal range. According to one study, while actual bladder capacity is the same in children with and without nocturnal enuresis, functional bladder capacity (the volume at which the bladder empties itself) may be lower in those with enuresis [11].

Regarding the sleep disorders, in most reports, sleep electroencephalograms revealed no or only nonspecific variations between children with and without nocturnal enuresis. When polled, however, parents regularly claim that their children with nocturnal enuresis are "deep sleepers," as opposed to their non-bed-wetting children. Other studies also discovered that children with nocturnal enuresis are more likely to experience "confused awakenings," such as night terrors or sleepwalking, than children who do not wet the bed [12].

It has been proposed that regular development may involve the demonstration of a circadian rhythm in the secretion of the antidiuretic hormone arginine vasopressin [13]. This hormone's nocturnal increase would reduce the amount of urine released at night. Children with nocturnal enuresis may be delayed in reaching this circadian increase in arginine vasopressin and, as a result, may experience nocturnal polyuria—the bladder's capacity to store urine until morning is overwhelmed by this nocturnal polyuria [14].

This study aims to estimate the association between nocturnal enuresis among young children and variable sociodemographic factors, health problems, family history, and pregnancy and birth-related factors in Saudi Arabia.

## METHODOLOGY:

### Study design and objectives

This is a cross-sectional study conducted between January and February 2021 to assess the prevalence of nocturnal enuresis among young children and its association with variable sociodemographic factors, health problems, family history, and pregnancy birth-related factors.

### Study setting

The study was conducted among Saudi children in Jeddah, Saudi Arabia.

### Participants and sample size

This study included 432 young children aged 5-16 in Jeddah, Saudi Arabia. The sample size of 432 was determined utilizing the equation  $n = z^2 p (1-p) / e^2$  ( $n$  = sample size,  $z$  = degree of confidence based on the

standard normal distribution,  $p$  = approximate proportion of the population that exhibits the trait, and  $e$  = tolerated margin of error). A convenient sampling method was used.

#### Selection criteria

##### Inclusion criteria

- Both children aged at least 5 years and less than 16 years.
- Children with risk factors including mental illnesses, neurological disorders, anemia, diabetes, obesity, urinary tract infection (UTI), worm infection, and delayed development.
- The children whose parents gave consent forms for data collection and filled the questionnaire.

##### Exclusion criteria

- We only excluded participants whose parents refused to give consent and fill the questionnaire.
- Children who did not meet age limits; younger than 5 years or older than 16 years.
- Children with other chronic diseases not mentioned in this study.

#### Data collection

Data was collected using an adapted questionnaire from *Alhifthy et al.* [15], distributed online to the children's parents/ caregivers on specific social media platforms, including Facebook and Twitter, and comprised questions made to meet the study objectives.

The following main items were involved in the questionnaire:

- The participants' sociodemographic characteristics (age, gender, mother's and father's age and education, relationship between the parents, and the child's birth order).
- Enuresis-related characteristics include prevalence, family and siblings' history with enuresis, time, an improvement on decreasing intake of fluids prior to sleeping, frequency, and

social embarrassment regarding nocturnal enuresis.

- Child's health problems and pregnancy and birth-related factors such as mental illnesses, neurological disorders, anemia, diabetes, obesity, UTI, type of delivery, gestational age, and hospital admission after delivery.

#### Ethical considerations

The questionnaire started with a brief explanation of its objective and intent, as well as a reminder to participants that their participation is entirely voluntary. The surveys did not collect names, nor did they collect dates of birth or addresses. All responses were kept private and safe.

#### Statistical analysis

The Statistical Package for Social Sciences (SPSS) version 26 was used to analyze the data (IBM Corp., Armonk, NY). For the prevalence and quantitative variables, descriptive statistics were used. The  $X^2$  test was used to assess categorical risk factors. A  $p$ -value of less than 0.05 was regarded as statistically significant.

#### RESULTS:

**Table (1)** shows the sociodemographic characteristics of 432 participants. Nearly (31.5%) aged from 5-7 years, 29.2% aged from 7-10 years, and 39.4% of them were older than 10 years. More than half of the participants (53.2%) were females, 51.2% of them their mothers aged from 30-40 years, and 39.2% of them their fathers also aged from 30-40 years. Most of the participants' mothers (70.6%) had a university degree or higher, and only 48.1% of their fathers had a university degree or higher. Almost half of the parents (53.9%), did not have any kinship in between. Regarding the birth order, 31% of the children were the second or third child, 31.9% were the fourth or fifth, and 11.6% were the first.

*Table (1): Description of Sociodemographic characteristics of the participants (n=432).*

Parameter	No.	Percent
Child's age	From 5 to 7 years	136 31.5%
	From 7 to 10 years	126 29.2%
	Older than 10 years	170 39.4%
Child's gender	Female	230 53.2%
	Male	202 46.8%
Mother's age	Less than 20 years old	5 1.2%
	From 20 to 30 years old	59 13.7%
	From 30 to 40 years old	221 51.2%
	Are over 40 years old	147 34.0%
Father's age	From 20 to 30 years old	22 5.1%
	From 30 to 40 years old	172 39.8%
	Are over 40 years old	238 55.1%
Mother's education	Illiterate	20 4.6%
	Primary	38 8.8%
	Intermediate	30 6.9%
	Secondary	39 9.0%
	University or higher	305 70.6%
Father's education	Illiterate	14 3.2%
	Primary	14 3.2%
	Intermediate	37 8.6%
	Secondary	159 36.8%
	University or higher	208 48.1%
Relationship between parents	Cousin	123 28.5%
	There is no relationship	233 53.9%
	From the same family	76 17.6%
Birth order of the child	First	50 11.6%
	Second or third	134 31.0%
	Fourth or fifth	138 31.9%
	Sixth or more	110 25.5%

**Table (2)** investigates the nocturnal enuresis related-characteristics among the participants. The prevalence of nocturnal enuresis among children was found to be 92.8% among children in Jeddah, Saudi Arabia. Most of the children (77.6%) did not have a family history of nocturnal enuresis, 15.5% had a family history from the mother side, 5.2% had it from the father side, and only 1.7% had it from both sides. Nearly (34.4%) had a siblings' family history of nocturnal enuresis. 78.1% of the children had enuresis at night only, while only 1% had it at daytime and 20.9% had it at night and day times. 62.8% were found to be improved on decreasing fluids intake before sleeping, less than half of the children (42.6%) had enuresis once or twice a week, and 27.9% had it 3-4 times a week. Nearly 38.9% of the mothers keen to wake the child at night to urinate. The problem caused embarrassment and social shaming for 65.8% of the participants.

*Table (2): nocturnal enuresis related-characteristics among the participants*

Parameter		Frequency	Percent
Prevalence of nocturnal enuresis	No	31	7.2%
	Yes	401	92.8%
History of the parents with nocturnal enuresis during their childhood	Father	21	5.2%
	Mother	62	15.5%
	Both	7	1.7%
	Neither	311	77.6%
Sibling suffering from the same condition	No	263	65.6%
	Yes	138	34.4%
Time of enuresis	Only at night	313	78.1%
	Night and day	84	20.9%
	Daytime only	4	1.0%
Improvement on decreasing fluid intake before sleeping	No	149	37.2%
	Yes	252	62.8%
Frequency per week	Once or twice	171	42.6%
	3 or 4 times	112	27.9%
	5 to 7 times	89	22.2%
	More	29	7.2%
Mother keen to wake the child at night to urinate	No	245	61.1%
	Yes	156	38.9%
The problem causes embarrassment and social shame to the child	Probably	106	26.4%
	No	31	7.7%
	Yes	264	65.8%

**Table (3)** presents the distribution of a child's health problems and pregnancy and birth-related factors. Only 5.1% of the children were reported to suffer from mental illnesses, 0.5% from neurological diseases (epilepsy), 8.1% have from anemia, and 12% weighed less than 2.5 kg. The majority of the children (93.8%) were born within the ninth month or more, 62.7% of them were born with normal labor, and 33.1% of the mothers had a cesarean section. Only 13.2% of the children were hospitalized after birth, 14.6% have obesity, 0.7% have diabetes, 5.1% have worm infection, 18.3% have UTI, 6.3% suffer from delayed development, and 10.2% were grown up in a broken family or with family problems. 33.3% were "O" blood group, 23.6% were "A" blood group, and 21.8% did not know their blood groups. Nearly 53.9% were RH positive, and 36.8% did not know their rhesus factor. Regarding the mothers' blood groups, 40.3% were "O" group, 25.2% were "A" group, and only 6.5% did not know. 56.9% of the mothers were RH positive, and 35.4% did not know.

Table (3): distribution of child's health problems and pregnancy and birth-related factors (n=432).

Parameter	Frequency	Percent	
Suffering from mental illnesses	No	410	94.9%
	Yes	22	5.1%
Suffering from neurological diseases	No	430	99.5%
	Yes	2	0.5%
If yes, the neurological disease is	Epilepsy	2	0.5%
Suffering from anemia	No	397	91.9%
	Yes	35	8.1%
The weight of a child with involuntary urination at birth	2.5 kg or more	380	88.0%
	Less than 2.5 kg	52	12.0%
Gestational age (in months)	Ninth or more	405	93.8%
	Eighth	16	3.7%
	Seventh or less	11	2.5%
Type of delivery	Normal labour	271	62.7%
	Obstructed labour	18	4.2%
	Caesarean	143	33.1%
Hospital admission after delivery	No	375	86.8%
	Yes	57	13.2%
Suffering from diabetes	No	429	99.3%
	Yes	3	0.7%
Have a worm infection	No	410	94.9%
	Yes	22	5.1%
Suffering from UTI	No	353	81.7%
	Yes	79	18.3%
Suffering from delayed development	No	405	93.8%
	Yes	27	6.3%
Having a broken family or family problems	No	388	89.8%
	Yes	44	10.2%
Blood grouping of the child	A	102	23.6%
	AB	24	5.6%
	B	68	15.7%
	O	144	33.3%
	I don't know	94	21.8%
Rhesus factor of the child	Rh -ve negative	40	9.3%
	Rh + ve positive	233	53.9%
	I don't know	159	36.8%
Blood grouping of the mother	A	109	25.2%
	AB	33	7.6%
	B	88	20.4%
	O	174	40.3%
	I don't know	28	6.5%
Rhesus factor of the mother	Rh -ve negative	33	7.6%
	Rh + ve positive	246	56.9%
	I don't know	153	35.4%
Suffering from obesity	No	369	85.4%
	Yes	63	14.6%

**Table (4)** indicates the prevalence of nocturnal enuresis in association with the child and parents' sociodemographic characteristics. The child's age and gender were found to be significantly associated with the prevalence of nocturnal enuresis ( $P=0.000$ ) and ( $P=0.040$ ), respectively. Prevalence of enuresis was 97.6% among the children aging 10 years or more and 84.1% among the ones aging 7-10 years. Females were found to have a higher prevalence of enuresis (95.2%) while males (90.1%). Father's education was also significantly associated with nocturnal enuresis prevalence ( $P=0.000$ ). However, we did not find any significant association between the mother's age ( $P=0.895$ ), father's age ( $P=0.311$ ), mother education ( $P=0.923$ ), the relationship between parents ( $P=0.096$ ), and birth order ( $P=0.508$ ).

**Table (4): prevalence of nocturnal enuresis in relation to the sociodemographic characteristics of the child and parents.**

Parameter		Nocturnal enuresis		P-value
		No	Yes	
Child's age	From 5 to 7 years	7 (5.1%)	129 (94.9%)	0.000*
	From 7 to 10 years	20 (15.9%)	106 (84.1%)	
	Older than 10 years	4 (2.4%)	166 (97.6%)	
Child's gender	Female	11 (4.8%)	219 (95.2%)	0.040*
	Male	20 (9.9%)	182 (90.1%)	
Mother's age	Less than 20 years old	0 (0%)	5 (100%)	0.895
	From 20 to 30 years old	5 (8.5%)	54 (91.5%)	
	From 30 to 40 years old	15 (6.8%)	206 (93.2%)	
	Are over 40 years old	11 (7.5%)	136 (92.5%)	
Father's age	From 20 to 30 years old	2 (9.1%)	20 (90.9%)	0.311
	From 30 to 40 years old	16 (9.3%)	156 (90.7%)	
	Are over 40 years old	13 (5.5%)	225 (94.5%)	
Mother's education	Illiterate	2 (10%)	18 (90%)	0.923
	Primary	3 (7.9%)	35 (92.1%)	
	Intermediate	3 (10%)	27 (90%)	
	Secondary	2 (5.1%)	37 (94.9%)	
	University or higher	21 (6.9%)	284 (93.1%)	
Father's education	Illiterate	0 (0%)	14 (100%)	0.000*
	Primary	0 (0%)	14 (100%)	
	Intermediate	10 (27%)	27 (73%)	
	Secondary	6 (3.8%)	153 (96.2%)	
	University or higher	15 (7.2%)	193 (92.8%)	
Relationship between parents	Cousin	4 (3.3%)	119 (96.7%)	0.096
	There is no relationship	22 (9.4%)	211 (90.6%)	
	From the same family	5 (6.6%)	71 (93.4%)	
Birth order	First	1 (2%)	49 (98%)	0.508
	Second or third	10 (7.5%)	124 (92.5%)	
	Fourth or fifth	11 (8%)	127 (92%)	
	Sixth or more	9 (8.2%)	101 (91.8%)	

*Chi-square test was used.*

**Table (5)** investigates the association between nocturnal enuresis and family history and the child's medical records. The parents' and siblings' family history with nocturnal enuresis was significantly associated with nocturnal enuresis prevalence ( $P=0.032$ ) and ( $P=0.000$ ), respectively. All of the participants (100%) who had a family history of one of the parents or their siblings also had nocturnal enuresis. Hospital admission, blood grouping, suffering from diabetes, and UTI also has a significant association with the prevalence of nocturnal enuresis ( $P=0.024$ ), ( $P=0.004$ ),

( $P=0.000$ ), and ( $P=0.006$ ). All of the children (100%) admitted to the hospital after delivery, 33.3% of those with diabetes, and all of those with UTI (100%) also had nocturnal enuresis. Nevertheless, there was no significant association detected between mental illnesses ( $P=0.624$ ), neurological diseases ( $P=0.693$ ), anemia ( $P=0.739$ ), type of delivery ( $P=0.203$ ), child's weight ( $P=0.675$ ), gestational age ( $P=0.465$ ), and having a worm infection ( $P=0.181$ ).

*Table (5): the association between nocturnal enuresis prevalence and family history and the medical records of the child.*

Parameter	Nocturnal enuresis		P-value	
	No	Yes		
History of the parents with nocturnal enuresis during their childhood	Father	0 (0%)	21 (100%)	0.032*
	Mother	0 (0%)	62 (100%)	
	Both	0 (0%)	7 (100%)	
	None	31 (9.1%)	311 (90.9%)	
Sibling suffering from the same condition	No	31 (10.5%)	263 (89.5%)	0.000*
	Yes	0 (0%)	138 (100%)	
Suffering from any mental illnesses	No	30 (7.3%)	380 (92.7%)	0.624
	Yes	1 (4.5%)	21 (95.5%)	
Suffering from neurological diseases	No	31 (7.2%)	399 (92.8%)	0.693
	Yes	0 (0%)	2 (100%)	
Suffering from anemia	No	28 (7.1%)	369 (92.9%)	0.739
	Yes	3 (8.6%)	32 (91.4%)	
The weight of a child at birth	2.5 kg or more	28 (7.4%)	352 (92.6%)	0.675
	Less than 2.5 kg	3 (5.8%)	49 (94.2%)	
Gestational age (in months)	Ninth or more	29 (7.2%)	376 (92.8%)	0.465
	Eighth	2 (12.5%)	14 (87.5%)	
	Seventh or less	0 (0%)	11 (100%)	
Type of delivery	Normal labor	17 (6.3%)	254 (93.7%)	0.203
	Obstructed labor	0 (0%)	18 (100%)	
	Caesarean	14 (9.8%)	129 (90.2%)	
Hospital admission after delivery	No	31 (8.3%)	344 (91.7%)	0.024*
	Yes	0 (0%)	57 (100%)	
Suffering from diabetes	No	29 (6.8%)	400 (93.2%)	0.000*
	Yes	2 (66.7%)	1 (33.3%)	
Having a worm infection	No	31 (7.6%)	379 (92.4%)	0.181
	Yes	0 (0%)	22 (100%)	
Suffering from UTI	No	31 (8.8%)	322 (91.2%)	0.006*
	Yes	0 (0%)	79 (100%)	
Suffering from delayed development	No	31 (7.7%)	374 (92.3%)	0.136
	Yes	0 (0%)	27 (100%)	
Having a broken family, or are there family problems	No	27 (7%)	361 (93%)	0.604
	Yes	4 (9.1%)	40 (90.9%)	
Blood grouping of the child	A	9 (8.8%)	93 (91.2%)	0.004*
	AB	2 (8.3%)	22 (91.7%)	
	B	0 (0%)	68 (100%)	

	<b>O</b>	<b>18 (12.5%)</b>	<b>126 (87.5%)</b>	
	<b>I don't know</b>	<b>2 (2.1%)</b>	<b>92 (97.9%)</b>	
<b>Rhesus factor of the child</b>	<b>Rh -ve negative</b>	<b>2 (5%)</b>	<b>38 (95%)</b>	<b>0.141</b>
	<b>Rh + ve positive</b>	<b>22 (9.4%)</b>	<b>211 (90.6%)</b>	
	<b>I don't know</b>	<b>7 (4.4%)</b>	<b>152 (95.6%)</b>	
<b>Blood grouping of the mother</b>	<b>A</b>	<b>9 (8.3%)</b>	<b>100 (91.7%)</b>	<b>0.024*</b>
	<b>AB</b>	<b>0 (0%)</b>	<b>33 (100%)</b>	
	<b>B</b>	<b>1 (1.1%)</b>	<b>87 (98.9%)</b>	
	<b>O</b>	<b>19 (10.9%)</b>	<b>155 (89.1%)</b>	
	<b>I don't know</b>	<b>2 (7.1%)</b>	<b>26 (92.9%)</b>	
<b>Rhesus factor of the mother</b>	<b>Rh -ve negative</b>	<b>2 (6.1%)</b>	<b>31 (93.9%)</b>	<b>0.049</b>
	<b>Rh + ve positive</b>	<b>24 (9.8%)</b>	<b>222 (90.2%)</b>	
	<b>I don't know</b>	<b>5 (3.3%)</b>	<b>148 (96.7%)</b>	
<b>Suffering from obesity</b>	<b>No</b>	<b>25 (6.8%)</b>	<b>344 (93.2%)</b>	<b>0.435</b>
	<b>Yes</b>	<b>6 (9.5%)</b>	<b>57 (90.5%)</b>	

*Chi-square test was used.*

### DISCUSSION:

In young children, nocturnal enuresis is regarded as a worldwide health problem. There are differences in its prevalence across countries and cultures [16]. This study demonstrated a high prevalence of nocturnal enuresis among young children in Jeddah, Saudi Arabia (92.8%). This was consistent with the results of *Sherah et al.* [17], who also reported a high prevalence of nocturnal enuresis (76.4%) among school-age children in Saudi Arabia. However, an earlier cross-sectional population-based study in Saudi Arabia aimed to estimate the prevalence of nocturnal enuresis among 560 primary school students and reported a much lower prevalence than ours, with 16.3% in boys, 13.8% in girls, and a total prevalence of 15%. Another cross-sectional survey was conducted on 354 children attending primary healthcare centers in Riyadh, Saudi Arabia, and reported a prevalence of 18.5% for nocturnal enuresis [18]. *Alhifthy et al.* [15] also reported a 31.2% prevalence of enuresis among Saudi children. An Egyptian study that included 450 students with an age range from 6-12 years in Benha reported a prevalence rate of 15.7% of nocturnal enuresis [19].

Lower prevalence for nocturnal enuresis was also recorded among school children in Istanbul (12.4%), India (7.61%), systematic Iranian review (11.01%), and Isparta (11.5) [20-23]. Many epidemiological studies of nocturnal enuresis were conducted in different parts of the world, such as Europe [24], Taiwan [25], Thailand [26], and they also showed a much lower prevalence between corresponding age

groups. The observed differences may be due to differences in sample size, sampling process, age range, and nocturnal enuresis description. Medical, psychological, socioeconomic, cultural, and racial factors could also affect the prevalence.

The results of this study reported that most of the children did not have a family history with nocturnal enuresis. However, we demonstrated a significant association between the parents' and siblings' family history with nocturnal enuresis and nocturnal enuresis prevalence ( $P=0.032$ ) and ( $P=0.000$ ), respectively. All of the participants who had a family history of one of the parents or both of their siblings also had nocturnal enuresis.

Another Saudi cross-sectional study also established family or siblings history for nocturnal enuresis as a risk factor for the studied children [15]. Some other former researches found high prevalence rates of nocturnal enuresis among children with positive family history [17, 27, 28]. In contrast, *Alshahrani et al.* [18] showed that the children's family history with nocturnal enuresis was not associated with their children. In clinical population research, positive family history was reported in 63.2% of families, 22.2% of the parents, and 16.5% of the affected siblings [29]. Another cross-sectional study found that the risk of nocturnal enuresis 5-7 times higher in case that one parent had a positive history of enuresis, and the risk ratio increases to 11.3 if both parents were affected compared to healthy families [30].

This study found that 78.1% of the children had enuresis at night only, while only 1% had it at daytime and 20.9% had it at night and day times. **Sherah et al.** [17] reported a diurnal prevalence of nocturnal enuresis was 27.7%. These results were higher than results in studies conducted by **Toktamis et al.** [31] and **Safarinejad et al.** [32]. We also found that less than half of the children (45.3%) had enuresis once or twice a week, and 29.8% had it 3-4 times a week. **Alshahrani et al.** [18] revealed that all children with nocturnal enuresis wet their beds more frequently every week than every night. In addition, some of the children (11.3%) were wetting their beds during the day every week.

Improvement of the condition was observed in 62.8% of the sample on decreasing fluids intake before sleeping. A cross-sectional study reported that most parents relied mainly on fluid restriction and emptying the bladder before sleeping to manage nocturnal enuresis [17]. This problem caused embarrassment and social shaming for 59% of the participants. **Alhifthy et al.** [15] reported that the enuresis problem caused social shame and embarrassment for 97.3% of the included children. The most challenging aspect of nocturnal enuresis is the effect on a child's self-esteem, self-perception, and school performance. Bedwetting can cause children embarrassment, leading them to avoid age-appropriate activities such as sleepovers. Parents may become dissatisfied with their child's wetting because it consumes their time, energy, and resources. Some parents discipline their children for wetting the bed [33].

In this study, the child's age and gender were significantly associated with the prevalence of nocturnal enuresis ( $P=0.000$ ) and ( $P=0.040$ ), respectively. Prevalence of enuresis was 97.6% among the children aging 10 years or more and 84.4% among the ones aging 7-10 years. **Sherah et al.** [17] also presented that nocturnal enuresis frequency increased with age as it was 64% among children aged 5 years, 85.5% aged 7-9 years, and 85.6% aged 9-12 years. However, **Alhifthy et al.** [15] found that the majority of children aged from 5-7 years had nocturnal enuresis, while the prevalence significantly dropped to 9.6% among children aging 7-10 years and to 4.5% among older children than 10 years. Previous research from various regions found a dramatic decrease in the prevalence of nocturnal enuresis from 6 to 12 years [19, 34, 35]. Since nocturnal enuresis improves spontaneously [21], it was expected to decline with age. However, this did not occur in the present study participants. This may

be due to the parents' lack of concern about the illness, as well as the condition's persistence. Females were found to have a higher prevalence of enuresis (93.6%) in this study, while males (83.8%). In contrast, **Bakhtiar et al.** [34] reported that the prevalence of nocturnal enuresis in boys (10.7%) is higher than in girls (5.4%) ( $P = 0.009$ ). Also, no significant association was detected between gender and enuresis ( $P=0.104$ ) in a previous Saudi study [15].

Father's education was also significantly associated with nocturnal enuresis prevalence in the current study ( $P=0.000$ ), as children with a less-educated parent had higher enuresis prevalence. This was consistent with **UK** [36], who reported that parents with lower education levels tend to punish their children, which aggravates the disorder.

We also demonstrated that Hospital admission, blood grouping, suffering from diabetes, and UTI also has a significant association with prevalence of nocturnal enuresis ( $P=0.024$ ), ( $P=0.004$ ), ( $P=0.000$ ), and ( $P=0.006$ ). In this study, all of the children admitted to the hospital after delivery have nocturnal enuresis. This was higher than **Bilal et al.** [37], who reported that 66% of the children admitted to hospital after delivery had enuresis and much higher than **Alhifthy et al.** [15] with 12.2%. We also found that 33.3% of those who had diabetes and all of the participants with UTI had nocturnal enuresis; however, **Sherah et al.** [17] found no significant association regarding diabetic participants ( $P=0.13$ ). Enuresis was related to a history of repeated UTI and congenital defects at birth, suggesting the risk of other genitourinary and/or nervous system disorders [38].

We would like to emphasize that it is important for families who have children with nocturnal enuresis to seek medical consultation as soon as possible, as this may result in substantial improvements for their children. Counselling the child and parents on successful behavioral changes may be part of medical consultation. The treatment chosen is heavily influenced by the child's age, night-time voiding habits, and the child and family's wishes. Children with primary enuresis that are refractory to normal and combination treatments and children with certain secondary causes of enuresis, such as urinary tract malformations, chronic urinary tract infections, or neurologic disorders, should be referred to a pediatric urologist [39].

#### Limitations

One of our study's limitations is its cross-sectional study, which prevents us from studying the temporal

trends in nocturnal enuresis as children get older. The study was conducted online on Facebook and Twitter platforms which reduces the reliability of our results as the data collected could be doubtful. The study did not indicate the children's opinions about the social shame and stress and was dependent on the parents' answers only which may bias our findings, the sample size was also small. As a result, additional longitudinal studies are needed to assess the causal relationships between risk factors and nocturnal enuresis. Other drawbacks include a lack of clinical evidence of the disorder and memory bias since the questionnaire was filled out by the parents based on their knowledge of the nocturnal enuresis-related incidents. These factors may lead to discrepancies in estimating the prevalence and function of various factors.

### CONCLUSION AND RECOMMENDATIONS:

This study demonstrated a high prevalence of nocturnal enuresis (92.8%) among young children in Jeddah, KSA. We found that family history was significantly associated with enuresis prevalence. The child's age, blood grouping and father's education was significantly associated with enuresis prevalence, older children recorded higher prevalence. This study also reported a high prevalence of diurnal enuresis and that the problem caused social shame to most of the participants. The frequency of nocturnal enuresis increased with aging in this study, and the incidence was found to be higher in female participants than the males. Children admitted to hospital after delivery, born with obstructed or normal labor, and those who suffered from diabetes and UTI were found to have the highest prevalence of nocturnal enuresis. So, we recommend that health education regarding the causes and risk factors and promote immediate treatment and close follow-up to avoid the related self-shame and family stress. More research is required to look into the specifics of the treatment modalities and how they are carried out and adopted, as well as their efficacy in Saudi children. In the Saudi community, families' compliance with those modalities requires further study.

### REFERENCES:

1. Gür E, Turhan P, Can G, Akkus S, Sever L, Güzelöz S, Çifçili S, Arvas A. Enuresis: prevalence, risk factors and urinary pathology among school children in Istanbul, Turkey. *Pediatrics international*. 2004 Feb;46(1):58-63.
2. Özkan S, Durukan E, Iseri E, Gürocak S, Maral I, Bumin MA. Prevalence and risk factors of monosymptomatic nocturnal enuresis in Turkish children. *Indian journal of urology: IJU: journal*

- of the Urological Society of India. 2010 Apr;26(2):200.
3. Thiedke CC. Nocturnal enuresis. *American family physician*. 2003 Apr 1;67(7):1499-506.
4. Logan AC, Lesperance F. Primary nocturnal enuresis: omega-3 fatty acids may be of therapeutic value. *Medical hypotheses*. 2005 Jan 1;64(6):1188-91.
5. DiBianco JM, Morley C, Al-Omar O. Nocturnal enuresis: A topic review and institution experience. *Avicenna journal of medicine*. 2014 Oct;4(4):77.
6. von Gontard A, Mauer-Mucke K, Plücker J, Berner W, Lehmkuhl G. Clinical behavioral problems in day-and night-wetting children. *Pediatric Nephrology*. 1999 Sep;13(8):662-7.
7. Hamed A, Yousf F, Hussein MM. Prevalence of nocturnal enuresis and related risk factors in school-age children in Egypt: an epidemiological study. *World journal of urology*. 2017 Mar 1;35(3):459-65.
8. Nørgaard JP, Djurhuus JC, Watanabe H, Stenberg A, Lettgen B. Experience and current status of research into the pathophysiology of nocturnal enuresis. *British journal of urology*. 1997 Jun;79(6):825-35.
9. Fergusson DM, Horwood LJ, Shannon FT. Factors related to the age of attainment of nocturnal bladder control: an 8-year longitudinal study. *Pediatrics*. 1986 Nov 1;78(5):884-90.
10. Djurhuus JC. Definitions of subtypes of enuresis. *Scandinavian Journal of Urology and Nephrology*. 1999 Jan 1;33(203):5-7.
11. Yeung CK, Chiu HN, Sit FK. Bladder dysfunction in children with refractory monosymptomatic primary nocturnal enuresis. *The Journal of urology*. 1999 Sep;162(3 Part 2):1049-54.
12. Nevéus T, Hetta J, Cnattingius S, Tuvemo T, Läckgren G, Olsson U, Stenberg A. Depth of sleep and sleep habits among enuretic and incontinent children. *Acta paediatrica*. 1999 Jul;88(7):748-52.
13. Devitt H, Holland P, Butler R, Redfern E, Hiley E, Roberts G. Plasma vasopressin and response to treatment in primary nocturnal enuresis. *Archives of disease in childhood*. 1999 May 1;80(5):448-51.
14. Thiedke CC. Nocturnal enuresis. *American family physician*. 2003 Apr 1;67(7):1499-506.
15. Alhifthy EH, Habib L, Al-Makarem AA, AlGhamdi M, Alsultan D, Aldhamer F, Buhlagah R, Almubarak FM, Almufadhi E, Bukhamsin GM, Zadah MH. Prevalence of nocturnal enuresis among Saudi children population. *Cureus*. 2020 Jan;12(1).

16. Chiozza ML, Bernardinelli L, Caione P, Del Gado R, Ferrara P, Giorgi PL, Montomoli C, Rottoli A, Vertucci P. An Italian epidemiological multicentre study of nocturnal enuresis. *British journal of urology*. 1998 May;81:86-9.
17. Sherah K, Elsharief M, Barkat N, Jafery A. Prevalence of nocturnal enuresis in school-age children in Saudi Arabia. *Int J Med Develop Ctries*. 2019;3:669-75.
18. Alshahrani A, Selim M, Abbas M. Prevalence of nocturnal enuresis among children in Primary Health Care Centers of Family and Community Medicine, PSMC, Riyadh City, KSA. *Journal of family medicine and primary care*. 2018 Sep;7(5):937.
19. Mohammed AH, Saleh AG, Al Zoheiry I. Frequency of bedwetting among primary school children in Benha city, Egypt. *Egyptian Journal of Medical Human Genetics*. 2014 Aug 29;15(3):287-92.
20. Gür E, Turhan P, Can G, Akkus S, Sever L, Güzelöz S, Çifçili S, Arvas A. Enuresis: prevalence, risk factors and urinary pathology among school children in Istanbul, Turkey. *Pediatrics international*. 2004 Feb;46(1):58-63.
21. De Sousa A, Kapoor H, Jagtap J, Sen M. Prevalence and factors affecting enuresis amongst primary school children. *Indian journal of urology: IJU: journal of the Urological Society of India*. 2007 Oct;23(4):354.
22. Hadinezhad Makrani A, Moosazadeh M, Nasehi M, Abedi G, Afshari M, Farshidi F, Aghaei S. Prevalence of enuresis and its related factors among children in Iran: A systematic review and meta-analysis. *International Journal of Pediatrics*. 2015 Nov 1;3(6.1):995-1004.
23. Ozden C, Ozdal OL, Altinova S, Oguzulgen I, Urgancioglu G, Memis A. Prevalence and associated factors of enuresis in Turkish children. *International braz j urol*. 2007 Apr;33(2):216-22.
24. Butler RJ, Golding J, Heron JA, ALSPAC Study Team. Nocturnal enuresis: a survey of parental coping strategies at 7½ years. *Child: care, health and development*. 2005 Nov;31(6):659-67.
25. Tai HL, Chang YJ, Chang SC, Chen GD, Chang CP, Chou MC. The epidemiology and factors associated with nocturnal enuresis and its severity in primary school children in Taiwan. *Acta paediatrica*. 2007 Feb;96(2):242-5.
26. Hansakunachai T, Ruangdaraganon N, Udomsuppayakul U, Sombuntham T, Kotchabhakdi N. Epidemiology of enuresis among school-age children in Thailand. *Journal of Developmental & Behavioral Pediatrics*. 2005 Oct 1;26(5):356-60.
27. Chang JW, Yang LY, Chin TW, Tsai HL. Clinical characteristics, nocturnal antidiuretic hormone levels, and responsiveness to DDAVP of school children with primary nocturnal enuresis. *World journal of urology*. 2012 Aug;30(4):567-71.
28. Schaumburg H, Hollmann E, Eiberg H, Rittig S. The genetics of enuresis: a review. *J Urol*. 2001;166(6):2438.
29. Hjalmas K, Arnold T, Bower W, Caione P, Chiozza LM, Von Gontard A, Han SW, Husman DA, Kawauchi A, Läckgren G, Lottmann H. Nocturnal enuresis: an international evidence based management strategy. *The Journal of urology*. 2004 Jun;171(6 Part 2):2545-61.
30. Chiozza ML, Bernardinelli L, Caione P, Del Gado R, Ferrara P, Giorgi PL, Montomoli C, Rottoli A, Vertucci P. An Italian epidemiological multicentre study of nocturnal enuresis. *British journal of urology*. 1998 May;81:86-9.
31. Toktamis A, Demirel Y, Ozkan KU, Garipardıç M, Gözükcükük A, Nur N. Prevalence and associated factors of day wetting and combined day and night wetting. *Urologia internationalis*. 2008;81(1):54-9.
32. Safarinejad MR. Prevalence of nocturnal enuresis, risk factors, associated familial factors and urinary pathology among school children in Iran. *Journal of pediatric urology*. 2007 Dec 1;3(6):443-52.
33. Elbahnasawy HT, Elnagar MA. Psychological impact of nocturnal enuresis on self-esteem of school children. *American Journal of Nursing Research*. 2015 Mar 10;3(1):14-20.
34. 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. *International journal of pediatrics*. 2014 Jan 1;2014.
35. Alkot M, Deeb M. Nocturnal enuresis among school children in Menofia Governorate, Egypt: a hidden problem. *J Am Sci*. 2012;8(1):327-4.
36. UK NC. Nocturnal enuresis: the management of bedwetting in children and young people.
37. Bilal M, Haseeb A, Saeed A, Saeed A, Sarwar T, Ahmed S, Ishaque A, Raza M. Prevalence of Nocturnal Enuresis Among Children Dwelling in Rural Areas of Sindh. *Cureus*. 2020 Aug;12(8).
38. Kalo BB, Bella H. Enuresis: prevalence and associated factors among primary school children in Saudi Arabia. *Acta Paediatrica*. 1996 Oct;85(10):1217-22.

39. Baird D, Seehusen DA, Bode DV. Enuresis in children: a case based approach. American

family physician. 2014 Oct 15;90(8):560-8.