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Nocturnal Enuresis in Primary Schools Children (6-12 Years) of Tabuk City, Saudi Arabia

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Regardless of the significance and the disturbing magnitudes of NE, this problem remains under-reported in Tabuk, Saudi Arabia and comprehensive studies in this regard are considerably lacking in that region. This study aimed to discuss the prevalence and associated risk factors of NE among children in Saudi Arabia.
Methodology: A cross sectional study design was adopted in Tabuk, KSA using a self-administered questionnaire for data collection distributed online on social media sites to be filled out personally. All data were collected, tabulated, and statistically analyzed using SPSS 23.0 for windows (SPSS Inc., Chicago, IL, USA).
Results: The study included 431 participants. (37.4%) of children aged between six and seven years old, (32.7%) between eight and nine years old, and (17.2%) between ten and twelve years old. (58.9%) of children were males and (41.1%) females. Average frequency various from (53.8%) one time to two times per week, (31.3%) three times to four times per week, (14.8% five times to seven times per week. Enuresis was at night only in (77.5%) while (22.5%) at day or night. (64.5%) don't seek to medical advice, while (35.5%) getting medical advice. (48.5%) of children getting behavioral therapy to treat this condition, (15.8%) exercise to strengthen bladder muscles, (14.6%) getting medical treatment, (10%) getting urination alarm, (0.5%) doing surgical intervention. There

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was a significant relationship between frequency per week of enuresis with mother educational level, number of family member, age of child (6-7) years old, sex of child (female), family history of nocturnal enuresis and delayed growth. Also, there was a significant relation between timing of enuresis during night or day and night with parents suffering from nocturnal enuresis, father's education level, mother's education level, and caring of parents to awaken the child.

Conclusion: Nocturnal enuresis associated factors and parenteral knowledge of definition and causes of it were among universal reported figures. Referral to a pediatric urologist can be indicated for children with primary enuresis refractory to standard and combination therapies, and for children with some secondary causes of enuresis, including urinary tract malformations, recurrent urinary tract infections, or neurologic disorders.

Keywords: Nocturnal enuresis; urinary tract malformations; urination alarm; neurologic disorders.

1. INTRODUCTION

Nighttime incontinence or nocturnal enuresis is known as nighttime bedwetting in children aged 5 years or older [1]. It is the urological complaint that is most common in pediatric patients. If it happens in a child who is not dry for at least 6 months, the case may be described as nocturnal enuresis, while secondary enuresis develops after a duration of nocturnal dryness of at least 6 months [2,3].

NE is an international problem across all cultures. The incidence of enuresis (≥2 nights per week) in one large British study was 8% at 9.5 years [2]. In a few studies, the overall prevalence rate was reported to be 5%–20% [4].

It is possible to distinguish Enuresis into primary and secondary classes. Primary enuresis occurs when for six or more months in a row a child > 5 years of age has never achieved a period of full dryness. Although secondary enuresis is a condition that develops at least six months or several years after a child has reached a full dryness period [5].

Enuresis etiology is not fully known. Several main pathophysiological, such bladder dysfunction, low functional bladder capacity, abnormal vasopressin levels, nocturnal polyuria, and abnormal sleep patterns, were suggested [6].

For the child and the parents, nocturnal enuresis has serious consequences. A range of cognitive, social and psychological issues can be triggered by nocturnal enuresis, including embarrassment, blushing, loss of self-esteem and aggression [7]. Behavioral changes such as low self-esteem, isolation, reduced ambition, and increased anxiety in many children who suffer from NI. Within the school system, these children are often low-achievers and become a concern for their family and school. It is therefore important to classify children at risk and to perform therapeutic steps [8].

Prevalence of NE in KSA was variable as a study in Taif region by Al-Zahrani (2014) who carried out a cross sectional study on 2701 child. He reported the frequency of nocturnal enuresis was 7.81 %. There were no significant between boys (7.33%) and girls (8.42%) [9].

Alhifthy et al.(2020) in Saudi Arabia conducted A cross-sectional descriptive study on 2148 Child, it was stated that, 31.2% of children have nocturnal enuresis. There were no significant correlations between nocturnal enuresis and child gender while it significantly correlated with child's age and having a family history of NE [10].

Alshahrani, et al. (2018) in Riyadh, Saudi Arabia carried out another cross-sectional survey included 352 families that had children with NE, it was found that, the prevalence of NE was 18.5% among families with a higher prevalence in boys. Prevalence of NE decreased with increasing age with many children found of having stressful events in their life other than parents' divorce [11].

Also, Sherah et al. (2019) in Jazan, Saudi Arabia conducted a cross-sectional study on 505 child, reported that, 76.4% of the children had NE. The prevalence of NE in the boys (79.5%) was non-significantly higher than girls (73.3%).There were statistically significant relationships between NE and history of pinworms infestation, no breastfeeding, low school performance, and lower father education [12].

In Hail, Saudi Arabia, Shahin et al. (2017) conducted a cross sectional study that included

652. The overall prevalence of nocturnal enuresis was 22.7%. Female gender, young age, history of enuresis among parents or siblings, deep sleep and history of urinary tract infections and other social and psychological problems were associated factors with enuresis [13].

Regardless of the significance and the disturbing magnitudes of NE, this problem remains under-reported in Tabuk, Saudi Arabia and omprehensive studies in this regard are considerably lacking in that region.

2. METHODOLOGY

To discuss the prevalence and associated risk factors of NE among children in Saudi Arabia

Study Design: A cross sectional study design was adopted.

Study Area and Setting: The study was carried out in Tabuk, KSA. It is located in northern Saudi Arabia.

Study Period: The data was collected during a period of four months from February 1st 2021 to June 31th, 2021.

Study Population: Mothers of children of primary school age (6-12 years).

Inclusion Criteria:

· Age between 18 and 65 years
· Saudi
· Able to read and write

Exclusion Criteria:

· Older than 65 or younger than 18 years
· Illiterate
· Non-Saudi

Sample Size:

The sample size of this study is calculated by using the formula: n= P (1-P) * Z_{α}^{2} / d^{2}, [14] assuming
n: Calculated sample size
Z: The z-value for the selected level of confidence (1- a) = 1.96.
P: An estimated prevalence of having child with nocturnal enuresis as 50% since t.ere is no specific figure for that
Q: (1 – 0.50) = 50%, i.e., 0.50
D: The maximum acceptable error = 0.05.

So, the calculated minimum sample size was:

n = (1.96)2 X 0.50 X 0.50/ (0.05) 2 = 384. By adding 10% dropped out cases, the total sample becomes 420 mothers.

Data Collection Tool:

A self-administered online disseminated questionnaire was used for data collection. It composed of two main sections. Section 1 includes socio-demographic characteristics of the child. The second sections was ask history of NE in the family, knowledge of the mothers about NE, risk factors, management and caring about the affected child.

Data Collection Technique:

The researchers distributed the questionnaire online as the questionnaire on social media sites (WhatsApp- Facebook- Twitter) to be filled out personally. The questionnaire had a brief introduction explaining the nature of the research and confidentiality of the information that given to participants.

A Pilot study was conducted on 20 mothers of school students to test the questionnaire's clarity and relevance, the time needed to answer all questions, and test reliability. We carried out all modifications, and they were not included in the analysis.

Data Management and Statistical Analysis:

All data were collected, tabulated, and statistically analyzed using SPSS 23.0 for windows (SPSS Inc., Chicago, IL, USA). Quantitative data were expressed as the mean ± SD & (range), and qualitative data were expressed as absolute frequencies (number) & relative frequencies (percentage). Percent of categorical variables were compared using the Chi-square test or Fisher exact test when appropriate. Mann-Whitney U was used to the compared median of the variable of two groups not normally distributed. All tests were two-sided. P-value < 0.05 was considered statistically significant (S), and p-value ≥ 0.05 was considered statistically insignificant (NS).

3. RESULTS

In Table (1), illustrated the sociodemographic characters of 431 participants, the mother's

education level was (10.9%) of primary school, (18.3%) of high school level, while (70.8%) of fathers have university education or more, (35.3%) of fathers was high school education. monthly family income was (64.3%) enough (20%) is more than enough while (15.8) % isn't enough. Number of family members was (55.9%) five to ten member, (36%) less than five member, (8.1) more than ten member. The marital status of parents was; (82.8%) living together, (10%) divorced, (7.2) one of them deceased. Age of children was n=161 (37.4) % was between six and seven years old, n=141 (32.7%) was between eight and nine years old, n=72 (17.2%) was between ten and twelve years old, n=55 (12.8%) more than twelve years old. Sex of children was (58.9%) male, (41.1%) female. The birth order of children was (63.6%) from first to the third, (18.1%) was from forth to the fifth, (18.3%) upper than fifth.

As illustrated in Table (2); (82.1%) of participants know that nocturnal enuresis is a health problem, while (17.9%) did not know. But (60.1) %of participants did not know the reasons of nocturnal enuresis, while (39.9%) know the reason of nocturnal enuresis. The causes of nocturnal enuresis various (34%) psychological problems, (16.5%) hereditary, (25.3%) weakness of bottoms urinary tract muscles, (15%) urinary tract infection, (2.6%) freedom and patience, (5.8%) problems or nerves that control urinary tracts, (0.7%) reasons of pregnancy and child birth.

As Table (3) showed characters of nocturnal enuresis; average frequency various from (53.8%) one time to two times per week, (31.3%) three times to four times per week, (14.8% five times to seven times per week. Enuresis was at night only in (77.5%) while (22.5%) at day or night. The fluid reduction intake before night improving the enuresis by (91%). (60.3%) of parents cares to awaken their children at night , while (39.7%) don't care . (69.4) % of children feel embracing of this condition. (64.5%) don't seek to medical advice, while (35.5%) getting medical advice. (48.5%) of children getting behavioral therapy to treat this condition , (15.8%) exercise to strengthen bladder muscles , (14.6%) getting medical treatment , (10%) getting urination alarm, (0.5%) doing surgical intervention. (71.5%) improved by these methods of treatment, (17.9) % did not improve, and (10.7%) did not use treatment.

Table 1. Sociodemographic characters

		No. (%)
Mother's educational level	Primary education / preparatory	47 (10.9%)
	high school education	79 (18.3%)
	University education and more	305 (70.8%)
Father's educational level	Primary education / preparatory	47 (10.9%)
	high school education	152 (35.3%)
	University education and more	232 (53.8%)
Monthly family income is …	Enough	277 (64.3%)
	More than enough	86 (20%)
	Not enough	68 (15.8%)
Number of family members	Less than 5	155 (36%)
	five to 10	241 (55.9%)
	More than 10	35 (8.1%)
Parents are …	Divorced	43 (10%)
	Living together	357 (82.8%)
	One of them deceased	31 (7.2%)
Age of the child	6-7 years	161 (37.4%)
	8-9 years	141 (32.7%)
	10-12 years	74 (17.2%)
	More than 12 years	55 (12.8%)
Sex of the child	Female	177 (41.1%)
	Male	254 (58.9%)
Birth order	1 to 3	274 (63.6%)
	4 to 5	78 (18.1%)
	>5	79 (18.3%)

Table 2. Knowledge of the guardian on nocturnal enuresis

		No. (%)
Knowing that nocturnal enuresis is a health problem	No	77 (17.9%)
	Yes	354 (82.1%)
Knowing the causes of nocturnal enuresis	No	259 (60.1%)
	Yes	172 (39.9%)
Causes of nocturnal enuresis	Freedom / patience	11 (2.6%)
	Hereditary	71 (16.5%)
	Problems or urinary tract or nerves that control the urinary system	25 (5.8%)
	Psychological problems	147 (34.1%)
	Reasons for pregnancy and childbirth	3 (0.7%)
	Urinary tract infections	65 (15.1%)
	Weakness of bottom urinary tract muscles	109 (25.3%)

Table 3. Characters of nocturnal enuresis

		No. (%)
Average frequency of enuresis per week	1 to 2	232 (53.8%)
	3 to 4	135 (31.3%)
	5 to 7	64 (14.8%)
Timing of enuresis	During the night just	334 (77.5%)
	During the night or day	97 (22.5%)
Improvement on fluid intake reduction before sleep	No	39 (9%)
	Yes	392 (91%)
Parents care to awaken a child at night to urinate	No	171 (39.7%)
	Yes	260 (60.3%)
The condition causes embarrassment to the child	No	132 (30.6%)
	Yes	299 (69.4%)
Seeking medical advice	No	278 (64.5%)
	Yes	153 (35.5%)
Type of treatment offered for the child	Urination alarm	43 (10%)
	Exercises to strengthen bladder muscles	68 (15.8%)
	Medical treatment	63 (14.6%)
	No treatment used	46 (10.7%)
	Surgical intervention	2 (0.5%)
	Behavioral therapy	209 (48.5%)
Improvement with treatment	No	77 (17.9%)
	No treatment used	46 (10.7%)
	Yes	308 (71.5%)

In Table (4); (68%) having normal delivery, while (32%) having caesarean delivery. (88.6%) did not get hospitalization on delivery, while (11.4%) getting hospitalization. Gestational age (95.6) % at nine months. (72.2%) sibling did not suffer from nocturnal enuresis. (6.3%) of children had positive family history for enuresis in both children, (13.7%) had family history in fathers and (10.7%) had family history in mothers.

In Table (5) (7.4%) of children suffer from anemia, (5.3%) suffer from parasitic infection, (2.6%) have diabetes mellitus, (3.5%) suffer from delayed growth, (8%) suffer from recurrent or chronic urinary tract infection, and (9.5%) have psychological illness.

In Tables (5, 6); there was a significant relationship between frequency per week of enuresis and mother educational level ,number

of family member, divorcing of parents' , age of child (6-7) years old, sex of child (female), birth order from first to third ,timing of enuresis during just night , improvement of fluid taking reduction, awaken children at night to urinate, embarrassment of condition to the child, urination alarm to the child, improvement to the treatment , parents' which suffering from nocturnal enuresis , delayed growth. Also there was a significant relation between timing of enuresis during night or day and night with parents suffering from nocturnal enuresis, type of delivery, embarrassment from condition to the child, average frequency of enuresis, not knowing that nocturnal enuresis is a health problem, parents are divorced, monthly family income, fathers education level, mothers education level, caring of parents to awaken the child.

Table 4. Neonatal and family history

		No. (%)
Gestational age	Less than 7 months	6 (1.4%)
	7 months	6 (1.4%)
	8 months	7 (1.6%)
	9 months	412 (95.6%)
Type of delivery	Caesarean	138 (32%)
	Normal delivery	293 (68%)
Hospitalization after delivery	No	382 (88.6%)
	Yes	49 (11.4%)
Sibling(s) suffer(ed) from nocturnal enuresis	No	311 (72.2%)
	Yes	120 (27.8%)
Parent(s) suffer(ed) from nocturnal enuresis	Both of them	27 (6.3%)
	Father	59 (13.7%)
	Mother	46 (10.7%)
	No	299 (69.4%)

Table 5. Medical history of the child

		No. (%)
Anemia	No	399 (92.6%)
	Yes	32 (7.4%)
Parasitic infestation	No	408 (94.7%)
	Yes	23 (5.3%)
Diabetes mellitus	No	420 (97.4%)
	Yes	11 (2.6%)
Delayed growth	No	416 (96.5%)
	Yes	15 (3.5%)
Recurrent or chronic urinary tract infection	No	399 (92.6%)
	Yes	32 (7.4%)
Psychological illness	No	390 (90.5%)
	Yes	41 (9.5%)

Table 6. Frequency per week

Parameter		**Frequency of NE/Week**			**Chi-square**	**P-value**
		1 to 2	**3 to 4**	**5 to 7**		
Mother's educational level	Primary education / preparatory	18 (38.3%)	26 (55.3%)	3 (6.4%)	15.231	.004*
	high school education	47 (59.5%)	21 (26.6%)	11 (13.9%)		
	University education and more	167 (54.8%)	88 (28.9%)	50 (16.4%)		

Parameter		Frequency of NE/Week			Chi-square	P-value
		1 to 2	3 to 4	5 to 7		
Father's educational level	Primary education / preparatory	25 (53.2%)	19 (40.4%)	3 (6.4%)	5.239	0.264
	high school education	80 (52.6%)	44 (28.9%)	28 (18.4%)		
	University education and more	127 (54.7%)	72 (31%)	33 (14.2%)		
Monthly family income is …	Enough	145 (52.3%)	84 (30.3%)	48 (17.3%)	4.741	0.315
	More than enough	51 (59.3%)	28 (32.6%)	7 (8.1%)		
	Not enough	36 (52.9%)	23 (33.8%)	9 (13.2%)		
Number of family members	Less than 5	103 (66.5%)	40 (25.8%)	12 (7.7%)	19.270	.001*
	five to 10	116 (48.1%)	81 (33.6%)	44 (18.3%)		
	More than 10	13 (37.1%)	14 (40%)	8 (22.9%)		
Parents are …	Divorced	34 (79.1%)	6 (14%)	3 (7%)	24.565	.000*
	Living together	189 (52.9%)	110 (30.8%)	58 (16.2%)		
	One of them deceased	9 (29%)	19 (61.3%)	3 (9.7%)		
Age of the child	6-7 years	108 (67.1%)	37 (23%)	16 (9.9%)	29.827	.000*
	8-9 years	76 (53.9%)	44 (31.2%)	21 (14.9%)		
	10-12 years	33 (44.6%)	28 (37.8%)	13 (17.6%)		
	More than 12 years	15 (27.3%)	26 (47.3%)	14 (25.5%)		
Sex of the child	Female	118 (66.7%)	49 (27.7%)	10 (5.6%)	27.584	.000*
	Male	114 (44.9%)	86 (33.9%)	54 (21.3%)		
Birth order	1 to 3	165 (60.2%)	66 (24.1%)	43 (15.7%)	19.919	.001*
	4 to 5	34 (43.6%)	36 (46.2%)	8 (10.3%)		
	>5	33 (41.8%)	33 (41.8%)	13 (16.5%)		
Knowing that nocturnal enuresis is a health problem	No	36 (46.8%)	30 (39%)	11 (14.3%)	2.638	0.267
	Yes	196 (55.4%)	105 (29.7%)	53 (15%)		
Knowing the causes of nocturnal enuresis	No	124 (47.9%)	90 (34.7%)	45 (17.4%)	9.491	.009*
	Yes	108 (62.8%)	45 (26.2%)	19 (11%)		
Causes of nocturnal enuresis	Freedom / patience	5 (45.5%)	6 (54.5%)	0 (0%)	20.793	.053[b,c]
	Hereditary	33 (46.5%)	27 (38%)	11 (15.5%)		
	Problems or urinary tract or nerves that control the urinary system	14 (56%)	8 (32%)	3 (12%)		
	Psychological problems	94 (63.9%)	39 (26.5%)	14 (9.5%)		
	Reasons for pregnancy and childbirth	3 (100%)	0 (0%)	0 (0%)		
	Urinary tract infections	33 (50.8%)	18 (27.7%)	14 (21.5%)		
	Weakness of	50 (45.9%)	37 (33.9%)	22 (20.2%)		

Parameter		Frequency of NE/Week			Chi-square	P-value
		1 to 2	3 to 4	5 to 7		
	bottom urinary tract muscles					
Timing of enuresis	During the night just	194 (58.1%)	99 (29.6%)	41 (12.3%)	12.953	.002*
	During the night or day	38 (39.2%)	36 (37.1%)	23 (23.7%)		
Improvement on fluid intake reduction before sleep	No	10 (25.6%)	17 (43.6%)	12 (30.8%)	15.708	.000*
	Yes	222 (56.6%)	118 (30.1%)	52 (13.3%)		
Parents care to awaken a child at night to urinate	No	70 (40.9%)	73 (42.7%)	28 (16.4%)	20.892	.000*
	Yes	162 (62.3%)	62 (23.8%)	36 (13.8%)		
The condition causes embarrassment to the child	No	99 (75%)	31 (23.5%)	2 (1.5%)	42.359	.000*
	Yes	133 (44.5%)	104 (34.8%)	62 (20.7%)		
Seeking medical advice	No	136 (48.9%)	100 (36%)	42 (15.1%)	8.942	.011*
	Yes	96 (62.7%)	35 (22.9%)	22 (14.4%)		
Type of treatment offered for the child	Urination alarm	13 (30.2%)	27 (62.8%)	3 (7%)	51.513	.000*,c
	Exercises to strengthen bladder muscles	37 (54.4%)	23 (33.8%)	8 (11.8%)		
	Medical treatment	41 (65.1%)	20 (31.7%)	2 (3.2%)		
	No treatment used	20 (43.5%)	12 (26.1%)	14 (30.4%)		
	Surgical intervention	0 (0%)	0 (0%)	2 (100%)		
	Behavioral therapy	121 (57.9%)	53 (25.4%)	35 (16.7%)		
Improvement with treatment	No	25 (32.5%)	36 (46.8%)	16 (20.8%)	29.701	.000*
	No treatment used	20 (43.5%)	12 (26.1%)	14 (30.4%)		
	Yes	187 (60.7%)	87 (28.2%)	34 (11%)		
Gestational age	Less than 7 months	2 (33.3%)	0 (0%)	4 (66.7%)	20.338	.002*,b,c
	7 months	3 (50%)	3 (50%)	0 (0%)		
	8 months	2 (28.6%)	5 (71.4%)	0 (0%)		
	9 months	225 (54.6%)	127 (30.8%)	60 (14.6%)		
Type of delivery	Caesarean	73 (52.9%)	47 (34.1%)	18 (13%)	0.963	0.618
	Normal delivery	159 (54.3%)	88 (30%)	46 (15.7%)		
Hospitalization after delivery	No	210 (55%)	113 (29.6%)	59 (15.4%)	4.875	0.087
	Yes	22 (44.9%)	22 (44.9%)	5 (10.2%)		
Sibling(s) suffer(ed) from nocturnal enuresis	No	181 (58.2%)	88 (28.3%)	42 (13.5%)	8.591	.014*
	Yes	51 (42.5%)	47 (39.2%)	22 (18.3%)		

Parameter		Frequency of NE/Week			Chi-square	P-value
		1 to 2	3 to 4	5 to 7		
Parent(s) suffer(ed) from nocturnal enuresis	Both of them	9 (33.3%)	12 (44.4%)	6 (22.2%)	23.735	.001*
	Father	27 (45.8%)	24 (40.7%)	8 (13.6%)		
	Mother	14 (30.4%)	20 (43.5%)	12 (26.1%)		
	No	182 (60.9%)	79 (26.4%)	38 (12.7%)		
Anemia	No	211 (52.9%)	129 (32.3%)	59 (14.8%)	2.652	0.266
	Yes	21 (65.6%)	6 (18.8%)	5 (15.6%)		
Parasitic infestation	No	220 (53.9%)	130 (31.9%)	58 (14.2%)	2.791	0.248
	Yes	12 (52.2%)	5 (21.7%)	6 (26.1%)		
Diabetes mellitus	No	226 (53.8%)	132 (31.4%)	62 (14.8%)	0.145	.930b
	Yes	6 (54.5%)	3 (27.3%)	2 (18.2%)		
Delayed growth	No	229 (55%)	123 (29.6%)	64 (15.4%)	17.368	.000*,b
	Yes	3 (20%)	12 (80%)	0 (0%)		
Recurrent or chronic urinary tract infection	No	214 (53.6%)	123 (30.8%)	62 (15.5%)	2.180	0.336
	Yes	18 (56.3%)	12 (37.5%)	2 (6.3%)		
Psychological illness	No	215 (55.1%)	119 (30.5%)	56 (14.4%)	2.809	0.246
	Yes	17 (41.5%)	16 (39%)	8 (19.5%)		

Table 7. Timing of enuresis

Parameter		Timing of enuresis		Chi-square	P-value
		During the night	During the day and night		
Mother's educational level	Primary education / preparatory	26 (55.3%)	21 (44.7%)	19.829	.000*
	high school education	56 (70.9%)	23 (29.1%)		
	University education and more	252 (82.6%)	53 (17.4%)		
Father's educational level	Primary education / preparatory	39 (83%)	8 (17%)	14.532	.001*
	high school education	102 (67.1%)	50 (32.9%)		
	University education and more	193 (83.2%)	39 (16.8%)		
Monthly family income is …	Enough	219 (79.1%)	58 (20.9%)	12.729	.002*
	More than enough	73 (84.9%)	13 (15.1%)		
	Not enough	42 (61.8%)	26 (38.2%)		
Number of family members	Less than 5	125 (80.6%)	30 (19.4%)	2.554	0.279
	five to 10	185 (76.8%)	56 (23.2%)		
	More than 10	24 (68.6%)	11 (31.4%)		
Parents are …	Divorced	28 (65.1%)	15 (34.9%)	4.680	0.096
	Living together	280 (78.4%)	77 (21.6%)		

Parameter		Timing of enuresis		Chi-square	P-value
		During the night	During the day and night		
	One of them deceased	26 (83.9%)	5 (16.1%)		
Age of the child	6-7 years	127 (78.9%)	34 (21.1%)	4.357	0.225
	8-9 years	102 (72.3%)	39 (27.7%)		
	10-12 years	58 (78.4%)	16 (21.6%)		
	More than 12 years	47 (85.5%)	8 (14.5%)		
Sex of the child	Female	138 (78%)	39 (22%)	0.038	0.845
	Male	196 (77.2%)	58 (22.8%)		
Birth order	1 to 3	216 (78.8%)	58 (21.2%)	9.264	.010*
	4 to 5	51 (65.4%)	27 (34.6%)		
	>5	67 (84.8%)	12 (15.2%)		
Knowing that nocturnal enuresis is a health problem	No	48 (62.3%)	29 (37.7%)	12.348	.000*
	Yes	286 (80.8%)	68 (19.2%)		
Knowing the causes of nocturnal enuresis	No	196 (75.7%)	63 (24.3%)	1.231	0.267
	Yes	138 (80.2%)	34 (19.8%)		
Causes of nocturnal enuresis	Freedom / patience	9 (81.8%)	2 (18.2%)	5.196	.519[b,c]
	Hereditary	60 (84.5%)	11 (15.5%)		
	Problems of urinary tract or nerves that control the urinary system	20 (80%)	5 (20%)		
	Psychological problems	115 (78.2%)	32 (21.8%)		
	Reasons for pregnancy and childbirth	3 (100%)	0 (0%)		
	Urinary tract infections	48 (73.8%)	17 (26.2%)		
	Weakness of bottom urinary tract muscles	79 (72.5%)	30 (27.5%)		
Average frequency of enuresis per week	1 to 2	194 (83.6%)	38 (16.4%)	12.953	.002*
	3 to 4	99 (73.3%)	36 (26.7%)		
	5 to 7	41 (64.1%)	23 (35.9%)		
Improvement on fluid intake reduction before sleep	No	24 (61.5%)	15 (38.5%)	6.259	.012*
	Yes	310 (79.1%)	82 (20.9%)		
Parents care to awaken a child at night to urinate	No	117 (68.4%)	54 (31.6%)	13.380	.000*
	Yes	217 (83.5%)	43 (16.5%)		
The condition causes embarrassment	No	116 (87.9%)	16 (12.1%)	11.765	.001*
	Yes	218 (72.9%)	81 (27.1%)		

Parameter		Timing of enuresis		Chi-square	P-value
		During the night	During the day and night		
to the child					
Seeking medical advice	No	218 (78.4%)	60 (21.6%)	0.383	0.536
	Yes	116 (75.8%)	37 (24.2%)		
Type of treatment offered for the child	Urination alarm	30 (69.8%)	13 (30.2%)	9.062	.107[c]
	Exercises to strengthen bladder muscles	46 (67.6%)	22 (32.4%)		
	Medical treatment	50 (79.4%)	13 (20.6%)		
	No treatment used	34 (73.9%)	12 (26.1%)		
	Surgical intervention	2 (100%)	0 (0%)		
	Behavioral therapy	172 (82.3%)	37 (17.7%)		
Improvement with treatment	No	65 (84.4%)	12 (15.6%)	2.706	0.259
	No treatment used	34 (73.9%)	12 (26.1%)		
	Yes	235 (76.3%)	73 (23.7%)		
Gestational age	Less than 7 months	6 (100%)	0 (0%)	6.399	.094[b]
	7 months	3 (50%)	3 (50%)		
	8 months	7 (100%)	0 (0%)		
	9 months	318 (77.2%)	94 (22.8%)		
Type of delivery	Caesarean	122 (88.4%)	16 (11.6%)	13.858	.000[*]
	Normal delivery	212 (72.4%)	81 (27.6%)		
Hospitalization after delivery	No	300 (78.5%)	82 (21.5%)	2.083	0.149
	Yes	34 (69.4%)	15 (30.6%)		
Sibling(s) suffer(ed) from nocturnal enuresis	No	249 (80.1%)	62 (19.9%)	4.231	.040[*]
	Yes	85 (70.8%)	35 (29.2%)		
Parent(s) suffer(ed) from nocturnal enuresis	Both of them	21 (77.8%)	6 (22.2%)	25.797	.000[*]
	Father	32 (54.2%)	27 (45.8%)		
	Mother	43 (93.5%)	3 (6.5%)		
	No	238 (79.6%)	61 (20.4%)		
Anemia	No	311 (77.9%)	88 (22.1%)	0.626	0.429
	Yes	23 (71.9%)	9 (28.1%)		
Parasitic infestation	No	320 (78.4%)	88 (21.6%)	3.850	.050[*]
	Yes	14 (60.9%)	9 (39.1%)		
Diabetes mellitus	No	326 (77.6%)	94 (22.4%)	0.147	.701[b]
	Yes	8 (72.7%)	3 (27.3%)		
Delayed growth	No	319 (76.7%)	97 (23.3%)	4.513	.034[*,b]
	Yes	15 (100%)	0 (0%)		
Recurrent or chronic urinary tract infection	No	311 (77.9%)	88 (22.1%)	0.626	0.429
	Yes	23 (71.9%)	9 (28.1%)		
Psychological illness	No	308 (79%)	82 (21%)	5.150	.023[*]
	Yes	26 (63.4%)	15 (36.6%)		

4. DISCUSSION

Nocturnal enuresis is a very common problem in children, leading to embarrassment, social isolation, and loss of self-esteem. Because many people do not admit to the problem for fear of embarrassment, the exact incidence remains unknown [15]. Various studies so far have used different criteria resulting in different prevalence being reported. A larger proportion of enuresis is usually the primary type. It has a global incidence of 1.4%-28% among 6-12 years old children [16].

In our study, (82.1%) of participants know that nocturnal enuresis is a health problem, (39.9%) know the reason of nocturnal enuresis. The causes of nocturnal enuresis were identified as (34%) psychological problems, (16.5%) hereditary, (25.3%) weakness of bottoms urinary tract muscles, (15%) urinary tract infection, (2.6%) freedom and patience, (5.8%) problems or nerves that control urinary tracts, (0.7%) reasons of pregnancy and child birth. A study conducted in Saudi Arabia reported that (61.3%) of respondents knew about nocturnal enuresis, and 34.2% of them believed they know its causes while 19% identified causes of nocturnal enuresis as weakness in the muscles of the lower urinary tract, 9.1% as problems or damage of the urinary tract or nerves that control the urinary system, 8.0% as psychological problems, and 2.8% as urinary tract infection [17].

In our study (77.5%) reported enuresis only at night, while (22.5%) at day or night. This was lower than reported in another Saudi study as 40% of the children had enuresis at night only, while 55.1% had it during day and night although [17]. Sherah et al. and Sarici et al. reported that daytime enuresis was seen in only 14.29% and 18% of cases, respectively, of children of school-age [18,19] Another study reported that all of the children that had NE were wetting their bed during night time with 38.7% frequency every night 11.3% of children were wetting their bed during daytime as well [20]. Lower figures was reported in Iran 0.5% for diurnal enuresis and 0.8% for combined day and night wetting [21]. Higher figures were reported in Iran one year later as (7.5%) had diurnal enuresis and one child (1.6%) had nocturnal and diurnal enuresis [22].

The fluid reduction intake before night improving the enuresis as reported by (91%) of our participants. Another study reported lower numbers as only 78.8% of children improved on decreasing fluid intake before sleeping within 5-7 weeks [17].

Regarding frequency of enuresis, average frequency found to be (53.8%) one time to two times per week, (31.3%) three times to four times per week, and (14.8%) five times to seven times per week. This was inconsistence with a study reported highest frequency of bedwetting was three or more times weekly [20]. In Iran, (50.7%) of the children with nocturnal enuresis had > or =3 wet nights per week [21].

Enuresis has been found to negatively impact the child's and family's quality of life, [8,5] lead to low self-esteem, mood problems, and high levels of stress. The condition also impairs the patient's ability to socialize with peers normally. Additionally, evidence that effective treatment of enuresis leads to improvement in the quality of life of patients [23]. In our sample, (69.4) % of children feeling of embracing of this condition. Another Saudi study reported that the problem caused embarrassment and social shame for 94.3% of children, and 76.4% sought medical advice [17]. A study in Egypt reported that most of studied children with nocturnal enuresis had law self-esteem [23].

According to our results, (7.4%) of children suffer from anemia, (5.3%) suffer from parasitic infection, (2.6%) have diabetes mellitus, (3.5%) suffer from delayed growth, (8%) suffer from recurrent or chronic urinary tract infection, and (9.5%) have psychological illness. Regarding family history, (6.3%) of children had positive family history for enuresis in both children, (13.7%) had family history in fathers and (10.7%) had family history in mothers. Another study reported that 6.5% of studied children had diabetes, 58.1% of the families of those children did not get NE when they were children and 62.9% of these children with NE were circumcised [20]. In Iran, a positive family history in father and mother was seen in 51% and 39% of children with primary nocturnal enuresis respectively [21]. Another study in Iran reported that Urinary infection is detected in one child (1.5%). The incidence of urinary system abnormalities was 10.6% in all enuretic children [22]. Another study reported numbers of the subjects with a history of urinary tract infection and seizures were (7.5%) and (3.5%) children, respectively, out of whom (9.4%) and (20%) children, respectively, had nocturnal enuresis as well (1.8%) had congenital problems (back

problems, kidney problems, nervous problems, etc.), out of whom (15.4%) had nocturnal enuresis, while (7.9%) with no congenital problems suffered from nocturnal enuresis [24].

In our study, (64.5%) don't seek to medical advice, while (35.5%) getting medical advice. (48.5%) of children getting behavioral therapy to treat this condition, (15.8%) exercise to strengthen bladder muscles, (14.6%) getting medical treatment, (10%) getting urination alarm, (0.5%) doing surgical intervention. (71.5%) improved by these methods of treatment, (17.9) % did not improve, and (10.7%) did not use treatment. A study in Saudi Arabia also reported different practices in terms of modalities of treatment provided where behavioral modification was the most commonly used modality by 31.6%, followed by pharmacological treatment (29.6%), bedwetting alarm (6.8%), exercises to strengthen the bladder muscles (6.2%) and surgery reported by 1.5% only. Improvement of nocturnal enuresis on different types of treatment occurred in 43.6% of cases studied [17]. In contrast to these results, Sherah et al. reported using medical treatment in 76% of case and Al-Zahrani et al. reported the treatment methods used to be: enuresis alarm, water restriction, medication, and awaking for voiding in 56.9%, 14.7%, 5.7% and 5.7% of cases, respectively [18,25]. Schlomer et al. reported that parents used some behavioral modifications like voiding prior to sleep (77%), limiting fluid intake at night (71%), and using bedwetting alarm (6%) [26]. Another study reported that (29%) of families tried to treat their children for bedwetting, (6%) families justified their answer of not treating their children that they found their children were improving with time, (12%) families who tried to treat their children used fluid restriction and frequently waked up their children at night to urinate, (6.1%) families who tried to treat their children used medical consultation in addition to fluid restriction as their mode of treatment and (29%) families reported that their children responded to treatment [20]. This was comparable to findings of another study as 17.45% of the children consumed medicinal plants, 31.57% used chemical treatments, 24.65% used behavioral treatments including limiting fluid intake, and 26.3% expected age increase and spontaneous resolution of nocturnal enuresis [24]. In Ramírez-Backhaus's et al.'s study, 17% of the parents did not have any treatments for nocturnal enuresis in their children, and 20% used drug treatments [27]. In the study conducted in Tehran by Safarinejad, 78.6% of the parents applied drug treatments, and this difference can be attributed to cultural differences and more parental sensitivity to the treatment of nocturnal enuresis [28]. The rates of applying treatments in Australia and New Zealand were 4.7% and 28%, respectively [29]. In Turkey, 19.8% of children were seen by a physician similar to that of 17.2% in Turkey. In our study, the most commonly used methods for treatment were medication (64.5%) [30]. Also in Turkey [31] the most preferred treatment was medication (59.5%). In contrast, these results were not supported by studies from northwest Turkey [32].

In our study, there was a significant relationship between frequency per week of enuresis with mother educational level, number of family member, age of child (6-7) years old, sex of child (female), family history of nocturnal enuresis and delayed growth. Also, there was a significant relation between timing of enuresis during night or day and night with parents suffering from nocturnal enuresis, father's education level, mother's education level, and caring of parents to awaken the child. A study in Saudi Arabia has shown significant relationship between enuresis and child's age ($P = 0.05$) and gestational age (in months) at birth ($P = 0.013$), type of delivery, hospital admission after delivery, sibling suffering from the same condition, birth order of the child, parents' history of NE, diabetes, urinary tract infection, psychological problems and delayed milestones ($P < 0.05$) [17]. This was also reported in Iran as younger age ($p < 0.002$), gender ($p < 0.0001$) and low level of education of mother ($p < 0.028$) were significant predictors of enuresis. Positive history of enuresis in father was a significant predictor of primary nocturnal enuresis ($p < 0.012$) [21]. Another study concerning the relationship between the frequency (intensity) of nocturnal enuresis and the variables reported significant relationships were found for gender, shared bedroom, deep sleep, punishment at school, history of respiratory infections, seizures, anal itching, and dominant right-handedness ($P < 0.05$). Also, diurnal enuresis was significantly associated with deep sleep, overnight nightmare, seizures, and right-handedness in the children ($P < 0.05$) [24].

5. CONCLUSION

Nocturnal enuresis associated factors and parenteral knowledge of definition and causes of it were among universal reported figures. Referral to a pediatric urologist can be indicated

for children with primary enuresis refractory to standard and combination therapies, and for children with some secondary causes of enuresis, including urinary tract malformations, recurrent urinary tract infections, or neurologic disorders. We recommend health education about the causes and risk factors in addition to encouraging prompt treatment and close follow-up to prevent associated self-shame and family stress. Further studies are needed to look in-depth into details of the modalities of treatment and how they are conducted and followed in addition to their effectiveness in Saudi children.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT

Data was anonymous for patient confidentiality and all filled questionnaires data was kept safely. Participants was assured them that the Confidentiality of their data would be maintained during the study.

ETHICAL APPROVAL

Approval to carry out the study was obtained from the Research Ethics Committee of the King Salman Armed Forces Hospital in Tabuk, KSA.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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