Assiut Scientific Nursing Journal
http://asnj.journals.ekb.eg http://www.arabimpactfactor.com
DOI: 10.21608/asnj.2023.216891.1608 http://olddrji.lbp.world/indexedJournals.aspx
https://vlibrary.emro.who.int/journals/assiut-scientific-nursing-journal

Effectiveness of Bidirectional Multimodal Intervention Program on Nocturnal Enuresis Reduction among School Age Childrenin Mansoura City, Egypt

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Abstract
Background: Nocturnal Enuresis (NE) is a common, genetic, complex, heterogeneous and one of the most frustrating and disturbing problems for both children and their parents. **Aim of the study:** To evaluate the effectiveness of the bidirectional multimodal intervention program on nocturnal enuresis reduction among school age children in Mansoura City, Egypt. **Settings:** The study was carried out in the Involuntary Urination Outpatient Clinic at Mansoura University Children Hospital (MUCH) and the Enuresis Clinic at Shams Center of Pediatrics and Newborns. A purposive sample of 126 parents and their children suffering from NE. **Tools of data collection:** A Structured Interview Questionnaire form for the Studied Parents and a Structured Interview Questionnaire form for the Studied Children were used. **Results:** 4.8% versus 100% and 94.4% of the studied parents had good total knowledge scores as well as none versus 100% and 95.2% of them had satisfactory total reported practices scores about NE pre, immediate post and post 3 months of program implementation respectively. Moreover, 93.7% of the studied children had bedwetting more than once a week pre-program; while, post 3 months after program implementation, 55.6% of them had bedwetting once a week. **Conclusion:** Parents' level of knowledge and their reported practices about NE was significantly improved post program. Bedwetting frequency among the studied children was decreased post 3 months after program implementation. **Recommendations:** Continuous educational program for parents of children with NE is essential to update their knowledge and skills about advanced treatment strategies.

Keywords: Bidirectional multimodal - Nocturnal enuresis - Program & School age children.

Introduction
Nocturnal Enuresis (NE) is known as, bedwetting. It is a complex, common, genetic heterogeneous pediatric disorder that existing alone or in combination with other disorders **(Bulut, 2019)**. Nocturnal Enuresis is defined according to International Classification of Diseases, Tenth Revision (ICD-10) and the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V) as an involuntary or unintentional repeated urine voiding in bed during sleep beyond the age of anticipated nighttime bladder control (in more than five years old children) at least twice weekly for three consecutive months at least in the absence of central nervous system defects (either congenital or acquired) and urinary tract structural abnormality **(Osman et al., 2016)**.

According to an Egyptian study conducted by **Rady et al., (2017)**, the prevalence of NE among the school age Egyptian children was estimated to be between 10.4% and 15.7%. Another study carried out at Mansoura University Children Hospital (MUCH) found that 76.1% of school age children have primary nocturnal enuresis **(Mohamed et al., 2019)**. Nocturnal Enuresis is divided into both primary and secondary types. Primary Nocturnal Enuresis (PNE) refers to children who have never achieved continuous dry nights for six months, while Secondary Nocturnal Enuresis (SNE) refers to children who previously achieved nighttime dryness for at least six months then relapsed **(Netto et al., 2019)**. Lower urinary tract symptoms may be present or absent in enuretic children; Mono-symptomatic Nocturnal Enuresis (MNE) is called when only NE is present, while it is called Non Mono-symptomatic Nocturnal Enuresis (NMNE), in case other symptoms being present **(Al-Jaid et al., 2019)**.

Reduced functional bladder capacity, increased urine secretion at night (reduction in anti-diuretic hormone secretion) and failed of bladder emptying suppression due to lack of arousal from sleep, are three common causes of NE **(Mejias & Ramphul, 2018)**. Furthermore, it is a - problem has several risk factors either genetic, biological and psychosocial **(Hamed et al., 2017)**. Acute psychological trauma during early childhood resulting from assortment such as disturbed homes, parental conflicts, bullying at school, birth of a new sibling and consequent rivalry, compelled separation from the mother, and child abuse; especially that happening after 5 years of age are risk

factors to NE as these stressors lead to loss of even previously learned urethral sphincter control, especially in vulnerable children **(Walle et al., 2017)**.

Nocturnal Enuresis causes negative implications on both the enuretic children and their parents; for children, it affects their quality of life because of disturbed night sleep, daytime sleepiness, fatigue, mood disturbances and reduced scholastic achievement. It can be a source of embarrassment, shyness, isolation, aggression, guilt, low self-esteem causing them to refrain from sleepovers **(El-Sharawy et al., 2022)**. For parents, they may become frustrated nervous, angry, ashamed, and may punish their children because of being drained either financially or energetically **(Bulut & Nazir, 2020; & Sarici et al., 2016)**.

Pharmacological and non-pharmacological approaches are followed for treating NE problem as prolonging the crucial period of continuous calm sleep, improving the child's functioning during the daytime, including social and scholastic performance and relieving the emotional burden on children and their families **(Mahmoud et al., 2021)**. Combination of both pharmacological and non-pharmacological approaches is prescribed in some cases to have a quick and effective outcomes **(Abdullah et al., 2018)**. Non-pharmacological management strategies involve; physical care as limitation of the children's water intake before going to bed and waking them during the night one or two times to use the bathroom on a progressive schedule through dry bed training **(Paste, 2018)**.

Behavioral modification, motivating children to void, rewarding the children for having dry nights, recording their progress on charts, star charts, and rewarding systems can be used as positive reinforcement to encourage the desired behavior **(Abdullah et al., 2018)**. As well as maintenance of their privacy during voiding and clear explanation about their condition according to their age and understanding level are very important. Moreover, avoidance of children's punishment for bedwetting, and sharing experience with other families having children with the same diagnosis will give psychological support to parents and their children **(Essawy et al., 2018)**.

A small alarm apparatus can be used for prevention of NE; be attached to children sheets or underwear; as the alarm starts to ring when children being wet, then children are able to wake up and go to bathroom. Both parents and children in needs to be educated regarding usage of the alarm systems appropriately **(Fagundes et al., 2016)**. Finally, in recent years, electronic bladder diaries started to be more efficient for NE diagnosis and treatment; these diaries are children-centered and easy-to be kept; the traditional paper and pencil bladder diaries have poor completion rates. Thus, electronic bladder diaries have been proposed to overcome these difficulties **(Mint et al., 2016)**.

Pediatric nurses are in an important position as an initiator regarding the NE solution and to educational services for parents and their children about the NE problem and its management strategies **(Alhifthy et al., 2020)**. On top of that, parents are the primary caregivers who are responsible for helping their children learn the skills of being dry so they must have sufficient knowledge and competent practices regarding their enuretic children's condition. In addition, children should be involved in the treatment plan; for increasing their motivation to be dry and comply with the treatment plan **(Rogers & McLean, 2018)**. Hence, this study is designed to provide a bidirectional multimodal education intervention program for parents and their children with NE.

Significance of the study

Nocturnal Enuresis is one of the most frustrating disturbing problems for both children and their parents; causing significant social, psychological and clinical burdens and having a serious effect on both the children's and their families' quality of life **(Jönson Ring et al., 2017)**. Hiding the NE issue is common in many families in Egypt, due to social\cultural issues and not treating NE the way it must be, and letting children and others suffer silently; although the fact that parents tend to be secretive about the condition, they are financially, physically and mentally drained. So, parents need to be equipped with sufficient knowledge, needed skills and coping mechanisms when acting with their enuretic children for overcoming the problem. It is a hope to view both the enuretic children and their parents are capable of going on within their lives in a functionally sound manner, with proper time and resources handling, instead of suffering silently or using age-old remedies, so this study is conducted **(Bulut, 2019)**. Applying an educational program to be bidirectional focusing on both the enuretic children and their parents at the same time, is a unique research point still limited for assessing the program efficacy from different aspects either implications on both, or parental knowledge and reported practices or NE reduction which is a serious embarrassing problem.

Aim of the study

The current study aimed to evaluate the effectiveness of bidirectional multimodal intervention program on nocturnal enuresis reduction among school age children in Mansoura City, Egypt.

Research hypotheses:

H1: The bidirectional multimodal intervention program may expect to have a positive effect on the studied parents' knowledge and reported practices about NE.

H2: The negative implications of NE on both the studied parents and their children may expect to be decreased after the bidirectional multimodal intervention program implementation.

H3: The positive implications of NE on both the studied parents and their children may expect to be increased after the bidirectional multimodal intervention program implementation.

H4: The frequency of NE may expect to be reduced after the implementation of the bidirectional multimodal intervention program.

Method

Study design

A quasi-experimental research design (one group pretest and posttest), without random assignment was used in the current study; in which a single group of the studied population is pretested, exposed to manipulation of an independent variable, then post tested **(Spurlock, 2018)**.

Study settings

The study was carried out at two settings at Mansoura City, Dakhlia Governorate, Egypt; the first is the Involuntary Urination Outpatient Clinic (No. 9) at Mansoura University Children Hospital (MUCH), it receives children suffering from enuresis on Thursday from 9am to 3 pm and provides care for free to them all over Delta Governorates. The second is the Enuresis Clinic at Shams Center for Pediatrics and Newborns (private medical center), it receives children suffering from enuresis from Saturday to Thursday from 6pm to 11pm. It is also an emergency and reception center for children - 24 hours.

Subjects and Sampling

A purposive sample of 126 parents (first direction) and their children (126), who are suffering from nocturnal enuresis (second direction) who attended the previously mentioned settings and had the following inclusion criteria regardless of their parents' characteristics: children who aged from 6 to 12 years, both genders, suffered from NE only, free from any chronic diseases or disabilities, free from any developmental delays, neurological or behavioral problems and accepted to participate at the study.

Sample size

To determine the sample size, **based on a power analysis calculation of Faul et al., (2007)** with a small effect size at 0.35, power set at 0.95, α error set at 0.05, and an attrition rate of 15%. Therefore, 126 school age children is the minimum required sample.

Tools of data collection

Two tools were used for data collection after reviewing the relevant preceding studies:

Tool I: A Structured Interview Questionnaire Form for the Studied Parents: It was developed by the researchers in Arabic format after reviewing the related literatures mainly. It comprised four parts, as the following:

Part (1): Socio-demographic Characteristics of the Studied Parents (Pretest): It included parents' age, occupation, education, residence and income.

Part (2): The Studied Parents' Knowledge about NE (Pretest, immediate post and post 3 months): It contained 13 MCQ questions representing data regarding (source of knowledge, definition, types and causes of NE, child age and certain number of times to urinate at night to be considered to have NE, treatment modalities, psychological effects of NE and time of pediatrician consultation .

Scoring system

Each item of parents' knowledge was scored one for each correct answer, while the wrong and unkown answers were scored zero. The scores were summed up to get the total score for the parents' knowledge; the total knowledge scores were categorized into good ; in case of > 65% of total scores were obtained, fair in case of 50% to 65% of total sores were obtained and poor in case of< 50% of total scores were obtained **(Mohamed et al., 2019)**.

Part (3): The Studied Parents' Reported Practices about NE (Pretest, immediate post and post 3 months): It contained four MCQ questions representing data regarding physical, psychological, pharmacological & non-pharmacological therapies and behavior modifications of their children with NE **(Osman et al., 2016; Mohammed et al., 2014; Ismail et al., 2013)**.

Scoring system

Each item of parents' reported practices was scored one point for each correct step, while the wrong step and unknown were scored zero . The score was summed up to get the total score for the parents' reported practices. The total scores were categorized as a satisfactory practice of their children NE in case of ≥ 65% of total scores were obtained and unsatisfactory; in case of < 65% of total scores were obtained **(Mohamed et al., 2019)**.

Part (4): The Implications of Children's NE on their Parents (Pretest and post 3 months): It consisted of certain items such as not receptive to the problem, feel ashamed, troublesome, angry and nervous, punish children, active encouragement and praised their children for being dry **(Osman et al., 2016)**.

Tool (II): A Structured Interview Questionnaire Form for the Studied Children:

It was developed by the researchers in Arabic format after reviewing the related literatures. It comprised four parts, as the following:

Part (1): Socio-demographic Characteristics of the Studied Children (Pretest): It consisted of child's data such as age, gender, birth order and number of siblings.

Part (2): Nocturnal Enuresis History of the Studied Children (Pretest): It consisted of type, onset, duration and causes of NE, wake up after wetting the bed, time the child gets wet, size of the wet patch in the bed and family history of NE.

Part (3): Implication of Nocturnal Enuresis on the Studied Children (Pretest & 3 months posttest): It comprised certain items as feelings of (embarrassment, nervousness, sadness, worry and difference to other children), sleeping without interruption, sleepover, low self-confidence and poor academic achievement **(Elbahnasawy & Elnagar, 2015)**.

Part (4): The Studied Children's Frequency of Bedwetting (Pretest & 3 months posttest): It included assessing the frequency of bed wetting either every night, more than once a week or every week, as an indicator of the program success.

Content validity:

The study tools' content validity were assessed for (their length, overall appearance, format, wording, content, sequence of items, clarity and coverage) and revised by five experts panel in the field of Pediatric and Community Health Nursing from the Faculty of Nursing, Mansoura University. Their suggested modifications were done, such as simplifying some words to be understood, rephrasing and omitting of some sentences and arranging some sentences according to its sequence.

Content reliability:

Cronbach's alpha coefficient test was used to assess the internal consistency of the study tools; r = 0.85, 0.79 and 0.73 for tool I (parts 2, 3 & 4 respectively) and r = 0.82 and 0.86 for tool II (parts 3 & 4 respectively).

Pilot study:

A pilot study was applied on ten percent of the studied parents and their children (No.=13) who were selected randomly. It was conducted to evaluate the study tools' clarity, feasibility and applicability and to recognize the expected obstacles which may hinder the researchers from data collection and the overcoming measures, also, to estimate the required time to fill in the study tools. Subjects of the pilot were excluded from the chief study sample.

Ethical considerations:

The researchers attained an ethical approval from the Faculty of Nursing, Mansoura University Research Ethics Committee on the study proposal (Ref.No.p.0284). An official permissions were obtained from the director of the MUCH, the head of the outpatient clinics as well as the manager of Shams Center of Pediatrics and Newborns to carry out the study after explanation of the study purpose and nature. An informed oral consent was obtained from parents and their children before conducting the study after purpose and nature of the study explanation. The collected data anonymity and confidentiality were confirmed and used for research purposes only. Subjects were informed that they have the right for voluntary participation in the study, withdrawal from the study any time.

Study framework:

The framework of the study was carried out according to four phases as the following:

Phase (1): Preliminary assessment phase (Before implementation of the bidirectional multimodal program):

The target groups in the current study were two groups at the same study setting; the studied parents represent the first direction and the studied children represent the second direction so the researchers entitled the program as bidirectional program. In both settings, each parent was interviewed individually in the waiting area to assess their socio-demographic characteristics, knowledge, reported practices and implications of their children NE problem on them using tool (I) parts (1, 2, 3 & 4 respectively). Additionally, each child was interviewed in the presence of his/her parent to assess their socio-demographic characteristics, NE history, implications of NE problem on them and frequency of bedwetting using tool (II) parts (1, 2, 3&4 respectively).

Phase (2): Planning phase: Development of the bidirectional multimodal program:

Based on the preliminary assessment data of the target groups; the program was formulated as shown in tables (1).

Description of the bidirectional multimodal program and its educational sessions:

An Arabic simple language was used while introducing the scientific material of the booklet. The booklet was given to each parent during the first session, after the assessment phase for attracting their attention, motivation and enabling them from reviewing its content when needed. The content was presented into four modules; module one; NE in children, presenting urinary system and control of urination, definition, incidence, types, risk factors, causes, time of pediatrician consultation and diagnosis of NE; module two; misconceptions and

facts about the NE problem in children; module three; implications of NE on both parents and their children; module four; various treatment modalities used in the management of NE in children.

The researchers addressed in the program, variety of the teaching materials and methods to address the research issue and its various treatment modalities in a more comprehensive figure, so the researchers entitled the program as multimodal program. There was an application of the multimodal teaching methods and materials for health information delivery to the target group such as PowerPoint presentation, discussion, brainstorming, printed booklet, printed colorful handouts, printed colorful brochures, story about NE and audiovisual material.

Phase (3): Implementation of the program:

Implementation of the program **took about two months**, as the researchers attended one day (Thursday) at Involuntary Urination Outpatient Clinic of MUCH from 9.00 am to 3.00 pm and four days weekly (Monday, Tuesday, Wednesday and Thursday) at the Private Medical Center from 6.00 pm to 11.00 pm to collect the data and meet the target group in the waiting area. The researchers introduced themselves to the studied parents and their children and gave them a brief idea regarding both the aim and nature of the study. The researchers met the study subjects individually or in groups from parents with their enuretic children according to the availability of them to present the educational sessions of the program. The researchers gave four sessions each session continued for 45 minutes, as each session

Phase (4): Evaluation phase: Evaluation of the effectiveness of the bidirectional multimodal program (Immediate post and post 3 months):

The studied parents were interviewed to evaluate their knowledge, reported practices, implications of their children NE problem on them immediately post and post 3 months after the program implementation using tool (I) parts (2,3&4 respectively) and parents' feedback regarding the program was also evaluated post 3 months of its implementation using tool (I) part (5). In relation to the studied children, they were evaluated regarding the implications of NE on them and frequency of bed wetting (3 months posttest) using tool (II) parts (3 & 4 respectively).

Statistical analysis

The collected data were coded, organized, categorized, and analyzed using the statistical package for social studies (SPSS) version 24. Categorical variables were described using the frequencies and percentages. Data were presented by using descriptive statistics in the form of frequencies and percentage. Arithmetic mean ± standard deviation and Median were used for continuous variables and percentages for categorical variables. Chi-square of association were used to compare between two groups or more regarding one qualitative variable. One way repeated measure ANOVA and Friedman tests were used for test changes in mean scores over three time points within one group. Two way repeated measure ANOVA was used to determine whether there is an interaction between two factors (time and different condition) on the dependent variable. The effect sizes for Repeated Measure ANOVA test was denoted by the partial eta squared (ηp2) (squared curvilinear correlation coefficient).While Pearson correlation coefficient test was used to create correlation between two quantitative variables to clarify positive or negative correlation. The final results were considered not significant if $p > 0.05$, significant if $p \leq 0.05$.

Results

Table (1): Socio-demographic characteristics of the studied parents (n=126):

Socio-demographic characteristics of the studied parents	Fathers		Mothers	
	No.	%	No.	%
Age\years				
20 - <30	52	41.3	16	12.7
30- <40	72	57.1	100	79.4
40-<50	2	1.6	10	7.9
Mean ± SD	40.51±4.98		34.33±4	
Educational level				
Basic	9	7.1	9	7.1
Technical	63	50	73	57.9
Bachelor	37	29.4	22	17.5
Master or PhD	17	13.5	22	17.5
Occupation				
Employed	126	100	54	42.9
House wife	------	------	72	57.1
Residence of parents				
Rural	62		49.2	
Urban	64		50.8	

Table (2): Percentage distribution of the studied parents according to their knowledge scores about NE pre, immediate post and three months post program (n=126)

Parents' knowledge	Pre			Immediate post			Post 3 months			F Test	p
	G %	F %	P %	G %	F %	P %	G %	F %	P %		
Definition & types of NE.	44.4	28.6	27	100	0	0	94.4	5.6	0	135.935	0.000*
MD	**1**			**2**			**2**				
Frequency of urination at night & age to be enuretic.	3.2	70.6	3.2	100	0	0	92.9	7.1	0	238.576	0.000*
MD	**1**			**2**			**2**				
Causes of NE.	6.3	13.5	80.2	97.6	2.4	0	93.7	6.3	0	1111.98	0.000*
Mean ±SD	**3.68±1.57**			**8.58±0.82**			**8.02±1.08**				
Psychological effects of NE.	8.7	14.3	77	100	0	0	93.7	6.3	0	705.586	0.000*
Mean ±SD	**3.89± 1.71**			**8.15± 0.84**			**7.57±1.09**				
Time of consultation & treatment modalities.	4	22.2	73.8	93.7	6.3	0	84.9	15.1	0	820.089	0.000*
Mean ±SD	**2.03± 0.83**			**4.53± 0.61**			**4.37± 0.73**				
Total scores of knowledge.	4.8	15.1	80.2	100	0	0	98.4	1.6	0	1415.88	0.000*
Mean ±SD	**11.56± 4.37**			**25.27± 1.66**			**23.84± 2.36**				

MD: *Median,* ***F:*** *Repeated Measure ANOVA,* ***(*)*** *statistical significant at p ≤0.05*
G= *Good,* ***F=*** *Fair and* ***P=*** *Poor*

Table (3): Percentage distribution of the studied parents according to their reported practices scores about care for their children with NE pre, immediate post and three months post program (n=126)

Parents' reported practices	Reported practices scores						F	P
	Pre		Immediate post		Post 3 months			
	A	B	A	B	A	B		
	%	%	%	%	%	%		
Physical care.	42.1	57.9	100	0	98.4	1.6	623.567	0.000*
Mean ±SD	**7.04±1.92**		**11.61±0.56**		**10.54±1.18**			
Psychological care.	16.7	83.3	100	0	96	4	234.403	0.000*
MD	**0**		**6**		**5**			
Pharmacological & non-pharmacological therapies.	29.4	70.6	100	0	85.7	14.3	575.357	0.000*
Mean ±SD	**4.75±1.37**		**7.8±0.47**		**6.89±0.98**			
Behavior modifications.	0	100	96.8	3.2	85.7	14.3	1748.018	0.000*
Mean ±SD	**4.59±1.25**		**10.51±0.95**		**8.86±1.65**			
Total scores of reported practices	0	100	100	0	95.2	4.8	3108.008	0.000*
Mean ±SD	**17.82 ± 3.84**		**35.6 ± 1.81**		**31.12 ± 2.93**			

MD: *Median, F: for Repeated Measure ANOVA,* ***(*)*** *statistical significant at p ≤0.05*
A: *Satisfactory* ***B:*** *Unsatisfactory*

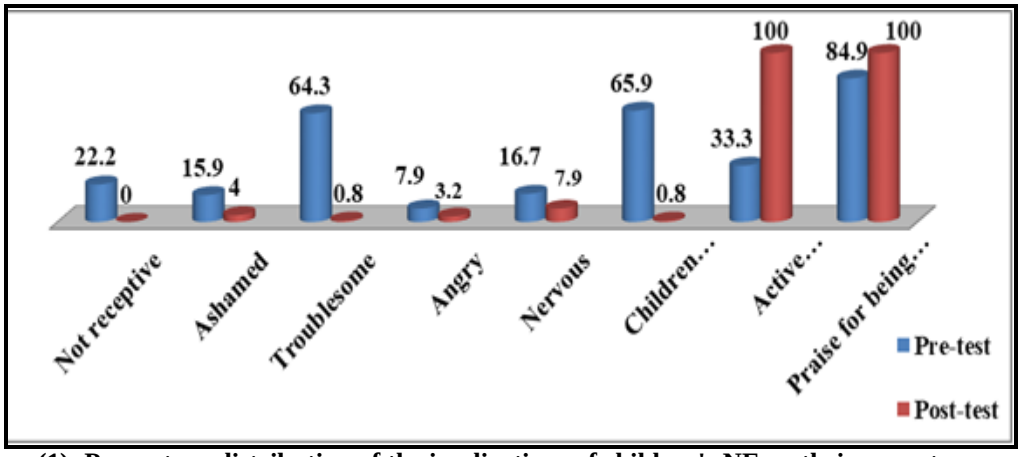

Figure (1): Percentage distribution of the implications of children's NE on their parents pre and p ost three months of the program implementation (n=126)

Table (4): Distribution of the studied children according to their socio-demographic characteristics (n=126)

Socio-demographic characteristics of the studied children	No.	%
Age in years:		
6 -<8	47	37.3
8-<10	62	49.2
10≤12	17	13.5
Mean ±SD	**8.06±1.29**	
Gender:		
Boy	79	62.7
Girl	47	37.3
Birth order:		
First and alone	5	4
First	35	27.8
Second	83	65.9
Third and more	3	2.4
Number of siblings:		
None	5	4
1-2	62	49.2
≥ 3	59	46.8

Table (5): Percentage distribution of the studied children's NE history (n=126)

The studied children's NE history	No.	%
Type of NE:		
Primary	106	84.1
Secondary	20	15.9
Onset of NE:		
Less than 6 years	24	19
From 6 to 8 years	93	73.8
From 9 to 12 years	9	7.1
Duration of NE:		
Less than one year	11	8.7
One year to less than three years	110	87.3
Three years and more	5	4
Waking up after wetting the bed:		
Yes	78	61.9
No	48	38.1
Time of getting wet:		
At midnight	12	9.5
After midnight	47	37.3
Towards the morning	67	53.2

 # More than one answer was selected

Table (5): Cont'd: Percentage distribution of the studied children's NE history (n=126)

The studied children's NE history	No.	%
Size of the wet patch at the bed:		
Usually large	40	31.7
Variable	86	68.3
Causes of NE:		
Organic/physical causes: #		
Urinary tract infection	11	8.7
Weakness of the bladder muscles	49	38.9
Chronic constipation	2	1.6
Small bladder size	42	33.3
Both physical and psychological causes	73	57.9
Family history of NE:		
Yes	57	45.2
No	69	54.8

Table (6): Percentage distribution of the implications of NE on the studied children pre and post 3 months of the program implementation (n=126)

Implications of NE on the studied children	Pre		Post 3 months	
	No.	%	No.	%
Feel embarrassed	124	98.4	64	50.8
Feel nervous	71	56.3	42	33.3
Feel sad	119	94.4	66	52.4
Feel worry	99	78.6	45	35.7
Feel different to other children	109	86.5	42	33.3
Sleepover	48	38.1	105	83.3
Sleep without interruption	49	38.8	105	83.3
Poor academic achievement	109	86.5	46	36.5
Low self confidence	123	97.6	64	50.8

 # More than one answer was selected.

Table (7): Distribution of the studied children according to their frequency of bedwetting pre and post three months of the program (n=126)

Frequency of bedwetting	Pre		Post 3 months	
	No.	%	No.	%
Every night	5	4	0	0
More than once a week	118	93.7	56	44.4
Once a week	3	2.4	70	55.6

Table (8): Correlation between the studied parents' total knowledge and reported practices scores about NE pre, immediate post and post three months of the program (n=126):

Predictor	Total knowledge score					
	r			p-value		
	Pre	Immediate Post	Post 3 months	Pre	Immediate Post	Post 3 months
Total reported practices score	0.420	0.539	0.476	0.000*	0.000*	0.000*

***r:** Pearson correlation coefficient test* ***(*)** Statistical significant at p ≤0.01*

Table (9): Differential effect of the study settings on the studied parents' total knowledge and reported practices scores about NE:

Study settings	Knowledge Paired $\bar{X}$ (95% CI)	Reported practice Paired $\bar{X}$ (95% CI)
MUCH	19.82 (19.27 : 20.38)	27.42 (26.86 : 27.99)
Private Center	20.759 (20.12 : 21.39)	29.19 (28.54 : 29.85)
F	4.758	16.487
p-value	0.031*	0.000**
ES	$\eta_p^2 = 0.037$	$\eta_p^2 = 0.117$

F: for repeated measure ANOVA, **ES**= Effect size, **ηp2** = partial eta squared
(*) Statistical significant at p≤ 0.05, $\bar{X}$ = Mean, **CI** = Confidence Interval

Table (1): Clarified that, 57.1% and 79.4% of the studied children's fathers and mothers were in the age group ranging from 30 to less than 40 years old respectively, with mean age of 40.51 ± 4.98 years for their fathers and 34.33 ± 4 years for their mothers respectively. Regarding the studied parents' level of education, one half and more (50% and 57.9%) of the studied children's fathers and mothers had technical education. All of the studied children's fathers were employed while more than one half (57.1%) of the studied children's mothers were housewives. Concerning the studied parents' residence, slightly more than half (50.8%) were from urban areas.

Table (2): Revealed that the minority of the studied parents (4.8%) versus 100% and 94.4% of them had good total knowledge scores pre, immediate post and post 3 months of program implementation respectively with a statistical significant difference at p= 0.000.

As displayed in **table (3):** none of the studied parents had satisfactory total reported practices scores about care for their children with NE pre-program compared to 100% and 95.2% of them immediate post and post 3 months after program implementation respectively with a statistical significant difference at p= 0.000.

Figure (1): Showed that one third and majority (33.3% and 84.9%) of the studied parents reported that they encouraged and praised their children for being dry at night pre-program, while these percentages increased to 100% post three months post program. It was noted that slightly less than two thirds (64.3% and 65.9%) of them felt troublesome and punished their children respectively pre-program in comparison of only 0.8% of them post three months of the program.

It was observed from **table (4):** That, slightly less than one half (49.2%) of the studied children's age ranged from eight to less than ten years with a mean age 8.06± 1.29 years. Less than two thirds of them (62.7% and 65.9%) were boys and the second among their siblings, respectively and less than half of them (49.2%) had one to two siblings.

Table (5): demonstrated that, the majority (84.1% 87.3%) of the studied children had primary NE and suffer from NE for a period ranging from one to two years, respectively. Additionally, more than half of them (53.2%) wet their beds towards the morning with 68.3% of them had a variable size of wet patch at their beds. The same table displayed that, more than half of them (57.9% and 54.8%) had NE due to

both physical & psychological causes and hadn't a family history of NE, respectively.

Table (6): Presented that, pre-program, 98.4%, 56.3%, 94.78.6 and 86.5% of the studied children felt embarrassed, nervous, sad, worry and different to other children respectively. While these negative implications of NE decreased post 3 months of program implementation to 50.8%, 33.3%, 52.4%, 35.7% and 33.3% respectively. Additionally, 38.1%, 38.8%, 86.5% and 97.6% of them couldn't do sleepovers, couldn't sleep without interruptions, had poor academic achievement and had low self-confidence respectively preprogram. In contrast, these percentages changed to 83.3%, 83.3%, 36.5 and 50.8% respectively three months post program to evidence that the program changed the negative implications of NE on the studied children to positive ones.

Table (7): Described that the vast majority of the studied children (93.7%) had bedwetting more than once a week pre-program. While, post 3 months after program implementation, more than one half (55.6%) of them had bedwetting once a week.

Table (8): Portrayed that there was a positive correlation between the studied parents' total knowledge and reported practices scores about NE pre, immediate post and three months after the program implementation ($r = 0.420$, 0.539 and 0.476) respectively with a statistical significant difference at $p = 0.000$.

Table (9): Described that there were statistical significant differences between the studied parents' knowledge and reported practices and the study settings ($p = 0.031$& 0.000) with small and intermediate effects between the two settings (ES= 0.037& 0.117). Moreover, the implementation of the program in different settings affects the parents' total knowledge and reported practices scores over time.

Discussion:

The study results clarified that the majority of the studied parents had poor total knowledge score about NE pre-program, while all and most of them had good total knowledge scores immediate post and post 3 months after program implementation, with a statistical significant differences. The findings of the current study are in agreement with **Mohamed et al., (2019)** who carried out an Egyptian study to assess the effect of health education learning package (HELP) application on mothers of enuretic children, who found that most of the mothers (96.6%) had poor total score of knowledge related to NE pre-HELP application; however, post-HELP application with three months and six months, the majority (90.9% and 85.2%) of them had good total score of knowledge respectively and significant differences were found between pre, post three months and post six months of HELP application ($p \leq 0.05$).

Additionally, the findings of the current study are in agreement with **(El kersh et al., 2022; Mahmoud et al., 2021; Essawy et al., 2018; Paste, 2018 & Osman et al., 2016)**. The current and previous research results prove our research hypothesis (I). From the researchers' point of view, these results return to, the studied parents were in a high need for being knowledgeable regarding NE, and the educational program was successful in satisfying their learning needs through knowledge acquisition and retention; as it was simple and easy.

Moreover, the present study findings revealed that none of the studied parents had satisfactory total reported practices scores about care for their children with NE pre-program compared to all and most of them immediate post and post 3 months after program implementation with a highly statistical significant differences. This findings are congruent with **Mahmoud et al., (2021)** who executed an Egyptian study to assess the educational intervention effectiveness on mothers of children suffering from nocturnal enuresis and mentioned that, there were statistically significant differences between pre, post three months and post six months of program application ($p= 0.000$). On top of that, our actual study results are in harmony with the previous researches results of **(El kersh et al., 2022; Mohamed et al., 2019; Essawy et al., 2018; Paste, 2018; Fagundes et al., 2016; Osman et al., 2016)** that confirm our research hypothesis (I). The researchers viewed that, parents had unsatisfactory practices, their children had poor care and inadequate hygienic measures and vice versa. Furthermore, applying the educational program give parents an opportunity to enhance and strengthen their practices that in turn leads to changes in care given to their enuretic children and affect their children's outcomes.

Concerning the implications of children's NE on their parents, the current study results showed that parents had negative implications towards their children's NE problem pre-program. While, post three months after program implementation these negative implications decreased and the positive implications increased. The findings of the current study are similar to the study findings of **Rady et al., (2017)** who performed an Egyptian study aimed to examine the relation between parental perception and school age enuretic children perceived competence, who stated that around three quarters were not receptive and felt ashamed (77.5% and 75%) respectively and 53.3% of them felt troublesome, while minority of them felt angry, nervous and punished their children for enuretic episode (44.2% and 34.2%) respectively. While majority of them were active by encourage

with words of comfort and praised their children for being dry (81.7% &83.3% respectively). A similar studies done by **(Khalil et al., 2021; Mahmoud et al., 2021; Yılmaz et al., 2021; Mohamed et al., 2019; Ahmed, Mohammed, 2018; Fagundes et al., 2017; Fagundes et al., 2016 & Osman et al., 2016)** are supported our results and confirmed our study research hypothesis (II&III). The researchers attribute the current study results to the observed knowledge gain and practices improvement. The program about NE provided the studied parents with the required support, motivation and confidence to help their children achieve more dry nights this, in turn, influences their negative implications and turned them into positive ones.

Nocturnal enuresis not only affects children but also parents and whole family, who end up living drastically. Although the family tends to be secretive about the condition, they end up taking a huge toll financially, physically as well as mentally **(Khalil et al., 2021)**. Additionally, most of parents believe the NE is an uncontrolled condition this leads them taking on a hopeless attitude towards the problem. Parents may become frustrated with their child's wetting because it is a drain of time, energy, and money. Some parents punish their children in response to their bedwetting **(Bulut & Nazir, 2020)**. It might cause parents to experience anxiety and guilt, which in turn leads to incompetence in their parenting skills and abilities. This can result in problematic relationships with their children **(Bulut, 2019)**. Feelings of the parents may range from being worried to frustrated, sad to angry, and even tired. Children may be able to sense these feelings in parents. Children may feel responsible for their parent's reactions and for upsetting the household **(Elbahnasawy & Elnagar, 2015)**.

Additionally, punishment isn't useful approach for solving the NE problem, as punishment is physically abusive and will affect both physical and psychological status of children, increasing the bedwetting episodes and causing depression for children. It must be clearly expressed that bedwetting is not the child's fault this will maximize children feeling good about themselves and repairing their self-esteem and self-image will be started. As supported by the International Children's Continence Society (ICCS) which ensure the importance of following psychological care for children with NE to enhance their adherence to treatment **(Wright, 2020)**.

Regarding the studied children's NE history, the existing study results manifested that, the majority of the studied children had PNE, nearly two fifth and one third of them had weakness bladder muscles and small bladder size respectively as physical causes of NE, and more than two fifth of the studied children had a family history of NE. The current study findings are corresponded with **(Dang & Tang, 2021; Huang et al., 2020; Abu Salem et al., 2020; Kamal & Mahrous, 2019; Bahnasy et al., 2018; Fagundes et al., 2017; Abu Salem et al., 2016;& Sarici et al., 2016).** On the other hand, the current study results are clashed with the Egyptian studies of **(El kersh et al., (2022) & Ahmed et al., (2022)** respectively who accounted that 61.7% of studied children had SNE and urinary tract infection was the most significant cause associated with NE followed by constipation and parasitic infection respectively. The existing study results are compatible with the relevant literatures as many studies showed that, most children with NE fall into the primary group, the NE decrease functional bladder capacity and increased detrusor activity and there is a strong family history of NE in siblings and parents, suggesting a genetic predisposition.

Over and above, it was illustrated from the present study results that NE had negative implications on the studied children pre-program compared to three months post program implementation. NE negatively influences the interpersonal relationships, self-esteem and social performance of affected children which can increase the risk for emotional and behavioral problems. As well as, NE is an embarrassment source for children causing them to refrain from sleepovers **(Shaheen et al., 2021; Wang et al., 2019; Mohamed et al., 2018; Jönson Ring et al., 2017; Abu Salem et al., 2016; Sarici et al., 2016; El-bahnasawy & Elnagar, 2015)**. The present study results achieved our research hypothesis (II &III). It is important to explain and provide information about NE to the parents and children has a significant effect on compliance with treatment in children, treatment success, prevent children from being psychologically affected, improve their quality of life and decreased recurrences as supported by a recent study of **(Yilmaz & Büyük, 2021)**.

Regarding the studied children's frequency of bedwetting, the finding of the current study interpreted that the frequency of bedwetting was decreased after post 3 months after program implementation than pre-program**.** The current study result is corresponded with the study result of El **kersh et al., (2022)** who performed an Egyptian study to explore the effect of learning package implementation on NE control for children and their mothers and found that, enuretic children showed an improvement in control their enuresis after the learning package the implementation. The current study result is also conformable to the study results of **(Mahmoud et al., 2021; Mohamed et al., 2019 & Osman et al., 2016)**. The current and previous studies results are confirmed our research hypothesis

(IV). From researchers point of view, a marked decrease in the frequency of bedwetting might be due to the improvement in parents' knowledge and reported practices after implementing the intervention, and decreased the negative implications of NE on both parents and their children and increased the positive ones which in turn led to positive health outcomes among the studied children as an indicator of our program success. Moreover, parents and children were adhered to the management modalities recommended by the educational program provided.

Ultimately, we can mention, parents' perception regarding their child's NE problem can make the difference in how a child feels about his bedwetting problem and himself. Also, parental perception plays an important role on the nature of response to the child's management plan which leads to better outcomes. Additionally, it is important to take the positive steps together as a team (parent and child) in getting through the problem of NE; they should work on ways to reduce feelings of failure and search for ways to enhance good feelings. Thus, treatment of NE is important not only for the children but also for the whole family. After the successful treatment, the whole family can be relieved psychologically, have a better social life and have some financial improvements. Hence, it is imperative to provide educational and psychological support for parents and their enuretic children that can alleviate the burden on their shoulders, and this way; they can fully concentrate on the treatment.

Conclusion

The main results showed that, parents' level of knowledge and reported practices about NE were dramatically improved after the program implementation with statistically significant differences between pre, immediate post and post three months of program implementation. Furthermore, the negative and positive implications of NE respectively on both parents and their children were decreased and increased respectively post 3 months of program implementation. In addition, the children's frequency of bedwetting was decreased post 3 months after the program implementation.

Recommendations:

Based on the findings of the current study, it is recommended that:

- Continuous educational program for parents of children with NE is essential to update their knowledge and skills about advanced treatment strategies.
- Repetition of the study on a larger sample size is required for data generation.

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