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ORIGINAL ARTICLE

A new checklist method enhances treatment compliance and response of behavioural therapy for primary monosymptomatic nocturnal enuresis: a prospective randomised controlled trial

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Abstract

Purpose The aim of the study was to demonstrate the benefits of a newly-established written checklist of behavioural instructions for monosymptomatic nocturnal enuresis.

Methods From a total of 96 parents with children who complain of bedwetting three or more nights per week for at least 14 days, 79 were randomly divided into three groups. Group I ($n=27$) were instructed to apply only behavioural therapy as a written guideline, Group II ($n=26$) were instructed to apply behavioural therapy with a written checklist for parents to fully complete and Group III ($n=26$) received desmopressin treatment plus verbal behavioural therapy. All participants were analysed in respect of compliance and the response rate to treatment over a time period of 8 weeks.

Results A total of 63 participants completed the study period. The participants in all three groups were similar in terms of the age of the child and the parents, number of siblings, and the educational and economic status of the parents ($p>0.05$). High rates of treatment compliance were determined for the participants with the checklist compared to those with written guideline. No statistically significant difference was determined between Group II and III in respect of compliance rates ($p=0.12$). The treatment response rates of the participants in Group I were significantly lower compared to those of Group II and III ($p=0.001$) with no statistical difference determined between Groups II and III ($p=0.15$).

Conclusion The success rate of behavioural therapy for MNE can be increased with the newly-designed method of a written checklist form of behavioural instructions.

Keywords Behavioural therapy · Checklist · Desmopressin · Nocturnal enuresis

Introduction

Monosymptomatic nocturnal enuresis (MNE) is defined as involuntarily night-time bedwetting after the age of 5 years without any other lower urinary tract symptoms and without a history of bladder dysfunction [1]. MNE can lead to developmental and psychosocial problems for the child and can have a negative impact on family life [1, 2]. It has been recommended that collaboration with children and their parents is a crucial aspect of tackling this common condition [2].

Behavioral therapy can be effective and guidelines have recommended that this should be the first-line treatment for MNE on the basis of the attitude of the child and parents [2, 3], while some recent studies have presented opposing concerns [4, 5].

Behavioral therapy is defined as "standard urotherapy or basic bladder advice" consisting of a variety of verbal recommendations such as urination before going to sleep at

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night, restriction of daily fluid intake, decreasing fluid volume before bedtime and rewards for dry nights [1–5]. However, to date these instructions have not been documented as a written list. The available literature was analysed and several recommendations as standard urotherapy were extended and developed as a written checklist to instruct the parents (Table 1) [2]. The aim of this study was to investigate the efficiency of this newly established checklist consisting of a number of written behavioral instructions for MNE.

Materials and methods

Written informed consent was obtained from the parents participating in the study. The children with MNE and their parents were randomised into three groups according to the therapy applied. The prospective controlled trial was conducted in accordance with the Declaration of Helsinki and was approved by the Local Ethics Committee. This trial is registered with ClinicalTrials.gov, number NCT03510975.

This prospective randomised study was conducted in the Urology Department at Ankara Training and Research Hospital, Medical Science University, Ankara, Turkey between January 2015 and December 2017. A total of 96 patients, ages 6–15 years with primary MNE were included in the study. The criterion for inclusion in the study was MNE and bedwetting frequency of three or more nights per week for at least 14 days of observation.

A detailed physical examination was made of each child to rule out abnormal physical development, and the presence of congenital abnormalities, genitourinary or neurological diseases. Laboratory tests were applied of urine analysis, serum creatinine, blood urine nitrogen, sodium, potassium, and complete blood count, and ultrasonography or plain X-ray if necessary were applied.

After detailed medical history, physical and laboratory examination, the patients with active urinary tract infection, non-mono symptomatic nocturnal enuresis (NMNE), nocturnal polyuria, endocrinological disease such as diabetes mellitus or diabetes insipidus which can cause polyuria, the presence or history of renal disease, hypertension or genitourinary or congenital abnormality, neurological or psychological disease, and previous medical or alarm therapy for nocturnal enuresis were excluded from the study. Patients with a voiding frequency of >8 times per day, urgency, or urinary incontinence in the bladder diary were classified as NMNE.

Out of a total of 96 children, 79 with complaints of MNE were randomly selected from the Urology Outpatient Clinic and were divided into three group blocks and stratified by computer generated pseudo-random numbers according to the therapies, which were defined by the investigators before recruitment (Fig. 1). Group I ($n=27$) were instructed to apply only written guideline forms of behavioural therapy, Group II ($n=26$) were instructed to apply behavioural therapy with a written checklist for parents to fully complete and Group III ($n=26$) received desmopressin treatment plus verbal behavioural therapy.

For each study participant, a record was made of medical history, demographic data including the age of the child and the parents, number of children in the family, the educational and economic status of the parents, and number of wet nights (Table 2). The economic status of the family was defined by the hunger and poverty limits set by the Turkish Statistical Institute [6].

Table 1 Instructions forming a check-list for parents with a child with monosymptomatic nocturnal enuresis [2]

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Encourage your child voiding at least once every 2 h							
Minimize intake of fluids after dinner unless undertaking excessive physical activities							
Wake and lift your child for voiding during the night							
Advise your child to keep a calendar of wet and dry nights							
Use reward systems for good behaviour including dry nights, avoiding fast-food or drinking excessive water, etc							
Advise your child to use an optimal posture to relax pelvic-floor muscles, facilitating good bladder voiding and bowel movements							
Advise your child to drink a sufficient amount of water (total of at least 30 mL per kg of body weight)							
Encourage your child to avoid holding urine							
Encourage your child to eat foods that soften stools and to avoid foods that harden stools							
Encourage your child to eat a healthy diet							

Complete each box separately for every day. For example [$\surd$] or (X)

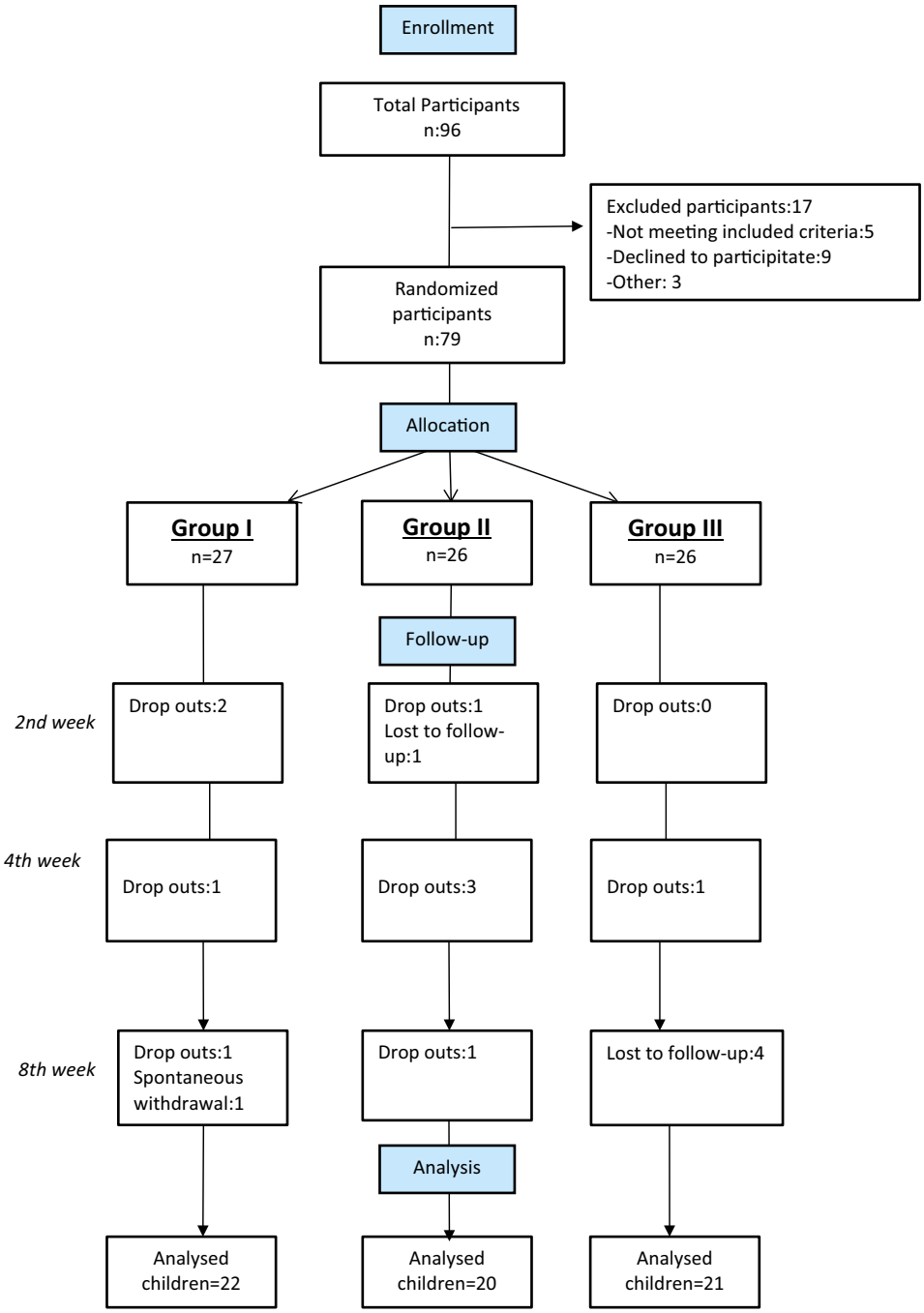

Fig. 1 Flow diagram of the study

All parents were advised to keep a 3-day bladder diary and record wet nights. The parents in Group I applied written behavioural instructions, which were the same as those in the checklist. At the beginning of the study, they received the behavioural instructions as a written guideline only, not in checklist form. The 25 parents in Group II were instructed to complete a checklist composed of written instructions over an 8-week period. The children had to register their wet nights via a daily voiding diary. The 25 children in Group III received 120 µg desmopressin in melt form (Minirin®, Ferring International Center, Saint-Prex, Switzerland) once daily before going to bed for 2 months plus verbal behavioral instructions. The details and instructions about the drug and its use were given to all of the children and their parents. Every 2 weeks, all of the study participants were checked up on in respect to their compliance rate to the behavioural therapy (written or checklist form) or medical treatment and to analyse the response of the children with the daily voiding diary.

Table 2 Study participants (children and parents) characteristics

	Group I (written guideline)	Group II (checklist)	Group III (desmopressin)	*p* value
Children				
Sex				
Boy	13	14	13	0.23
Girl	9	6	8	
Age (years)	9.5 (6–14)	8.5 (6–15)	9 (5–14)	0.53
Wet night days/14 days	5 (3–7)	6 (3–7)	6 (3–7)	0.43
Daytime voiding frequency	4 (3–7)	4.5 (3–7)	4 (3–7)	0.73
Average daytime voided volumes (mL)	155 (120–230)	147.5 (110–215)	145 (120–200)	0.33
Maximum voided volume (mL)	182.5 (145–265)	197.5 (150–300)	182.5 (155–250)	0.20
Fluid intake (mL/24 h)	1125 (900–1450)	1150 (950–1350)	1075 (900–1450)	0.5
Genetic inheritance				
Yes	13	11	12	0.81
No	9	9	9	
Parents				
Age				
< 20	1	0	0	0.23
20–30	9	8	6	
30–40	8	10	12	
> 40	4	2	3	
Number of children				
1	6	3	4	0.83
2	6	8	7	
> 2	10	9	10	
Educational level				
Elementary graduate	10	10	11	0.94
High school graduate	7	5	6	
University graduate	5	5	4	
Economic status				
Low	10	6	7	0.92
Medium	8	8	8	
High	4	6	6	

Treatment compliance

Treatment compliance was recorded based on the daily voiding diary and control of the checklist or untaken pills. The participants brought back empty pill packages. Treatment compliance was calculated as the parents' own oral statements (Group I), completion of the checklist form (Group II) or a percentage of the number of pills taken (Group III) during the study period. Compliance was stratified as 75–100% (compliant), 50–74% (partial) and 0–49% (non-compliant) for all groups [7].

Treatment response

Complete responders were defined as children with ≤ 1 wet night per week in the last 14 days of therapy (90–100%). Partial responders were defined as children with > 1 wet night per week but > 50% reduction in the number of wet nights compared to before therapy (50–89%). Non-responders were defined as patients with < 50% reduction in wetting frequency in the last 14 days of therapy. Non-compliant patients and non-responders were together referred to as treatment failure at the end of the study period [8]. Analysis of treatment response was performed by a single independent urologist blinded to the study groups.

Statistical analysis

The data analysis was performed using SPSS for Windows, version 11.5 (SPSS Inc., Chicago, IL, United States). A sample size of at least 18 patients per group was calculated to detect a significant difference of 0.2 with 0.8 power and 0.95 confidence interval. The normality of the distribution was tested with P–P plot and Kolmogorov–Smirnov tests.

Descriptive statistics for variables with a normal distribution, non-normal distribution and categorical variables were shown as mean ± standard deviation, median (min–max) and the number and percent of cases. Categorical variables were analysed using the Chi squared test, and Kruskal–Wallis variance analysis was used for intergroup comparisons of continuous variables (post hoc: Bonferroni). A p value less than 0.05 was considered statistically significant.

Results

Of the 79 participants, 63 completed the study period. A total of 16 were withdrawn from the study for a variety of reasons (Fig. 1). The data of all children and their parents in each group were analysed at the end of 8 weeks. The characteristics of the participants were similar in all three groups ($p > 0.05$; Table 2).

Although the education and economic level was relatively low and nearly similar in all of the groups, the participants with the checklist (Group II) were seen to be more compliant to apply behavioural therapy, but this was not found to be statistically significant (Fig. 2). In the evaluation of treatment compliance, the participants in Group I were found to pay less attention to the behavioural instructions ($p = 0.008$; Fig. 2). No significant difference was determined in the compliance rates of Groups II and III ($p = 0.12$), whereas Group II was determined to be highly compliant to behavioural therapy compared to the other groups (Fig. 2).

The treatment response rates of the participants in Group I were far lower than those of Groups II and III ($p = 0.001$). No statistically significant difference was determined between Groups II and III in respect to the treatment response rate ($p = 0.15$). No adverse effects were observed in Group III related to the desmopressin treatment.

Discussion

The checklist method was first used in aviation to minimize accident risk and fatalities [8]. After achieving successful results in this sector, this method was introduced into the healthcare system [9]. In 2009, the World Health Organisation developed the WHO Surgical Safety Checklist to reduce surgical complications and deaths. Since the checklist method started to be used in operating rooms, it has been clearly seen to reduce complications, surgical site infections and mortality [10]. Through this key mechanism, checklists create a positive atmosphere, improve communication between team members and promote better teamwork [8, 11].

Although the first treatment option for MNE is behavioral therapy, it is not as effective as other treatment modalities such as an alarm or desmopressin [1]. The success rates of these modalities have been reported as approximately 80% [12, 13], while success rate of urotherapy ranges between 18 and 22% [4, 5]. The findings of the present study showed

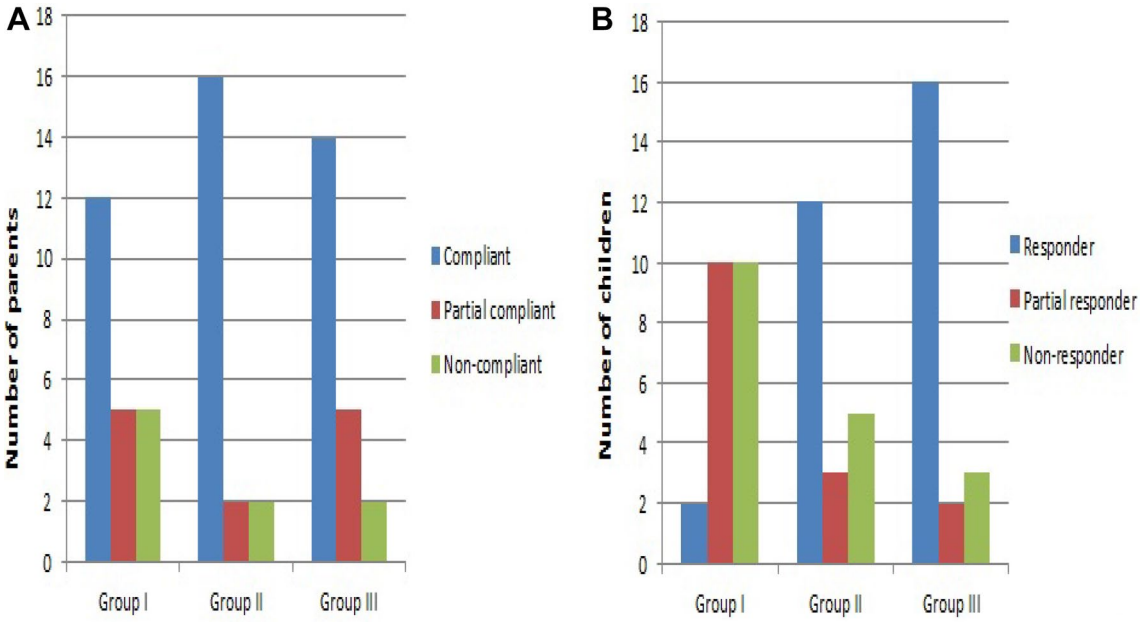

Fig. 2 The treatment compliance (**a**) and response rates (**b**) of the participants. The participants with written instructions only were found to be less compliant and responsive to the behavioural treatment than the other participants (Group I vs II, $p = 0.22$ and $p = 0.001$, respectively; Group I vs III, $p = 0.001$ for both; Group II vs III, $p = 0.12$ and $p = 0.15$, respectively)

that the written checklist method increased the success rate of the extended urotherapy up to 60% (Fig. 2b).

It is believed that the aim of behavioural therapy is to achieve an attitude to stay dry during the whole night. This can be learned through a number of behavioural instructions to provide a normal psychological and healthy condition. There are several instructions to children and parents, including lifting and waking the child from sleep to urinate, limitation of evening fluids, keeping star charts and giving rewards to encourage the desired behaviours (such as dry nights or fluid restriction) and bladder training to control urinary incontinence. A history of enuresis in siblings, inability to store urine in the bladder, impaired sleep arousal, constipation, day-time urinary incontinence, sleep disturbances such as apnoea or upper airway obstructive symptoms and the psychological statuses of both the child and the parents have been considered to be the causes of nocturnal enuresis. These risk factors can be grouped into three main topics: sleep arousal disturbance, overactivity of the bladder muscle and overproduction of urine at night [1–4, 8].

However, the parent's role in nocturnal enuresis treatment is not fully known. Several studies have reported that educational programmes about the condition, used to raise awareness and motivate parents and children, can increase the success rate of behavioural therapy [2, 14]. A recent study showed that it may be possible to increase the success rate of behavioral therapy by increasing the parent's knowledge about MNE and by enhancing the parent's awareness and motivation regarding this therapy [2, 15]. Moreover, engaging both children and their parents in this process may prevent excessive time spent for treatment, minimize treatment costs and improve family relationships [2].

The main reason for treatment failure, which has been reported as up to 30%, is not regularly receiving medication or following the recommendations [8, 16, 17]. Characteristics of parents that may have a negative impact on response and compliance rates of MNE therapy include low economic status and education level, fragile marital or familial relationships, a high number of siblings and psychological problems [18].

Parents with normal psychology or an emotional healthy condition are a more important part of the psychological development of children with MNE and play a critical role in the treatment [19]. This recent study showed that the incidence of children with MNE was relatively higher in families with a low socio-economic level. In addition, parents with low socio-economic and education level seem to be less compliant with the treatment when the disease period prolonged. An intolerant attitude of the parent toward this condition may result in declining compliance and response rates [20]. The present study demonstrated that the checklist method increased the compliance of parents with treatment, even if they have a low socio-economic status (Fig. 2a).

A further reason for treatment failure is the parental lack of knowledge about MNE [21]. This recent study reported that the educated parents with expanded detailed information about the disease had much higher rates of compliance with treatment. The findings of that study showed a similarity to the present study results. These parents seem to choose incorrect attitudes such as punishment or physical and emotional abuse toward their child with MNE and this can lead to disruption of interfamilial relationships [20]. Furthermore, it should be emphasized that this new method is able to increase their awareness of the disease and maintaining motivation of the therapy process at a steady state for a long time. The results of this study showed that the compliance and response rates of MNE therapy increased due to expanding the knowledge of enuresis of the children's parents and raising their awareness of and motivation for the therapy process through the use of a written checklist even if they had a low socio-economic level.

The main limitation of this study was the lack of long-term follow-up data. Another limitation was no internal validity to the check-list to ensure it was a true and valuable report of behaviour therapy each day. Furthermore, the numbers in each group were too small to perform multivariate analysis within each group using parameters of parental age, education or income level or the birth order of the children who were treated in this study. Nevertheless, this is the first study to have evaluated the benefits of a new checklist method for behavioural therapy of primary MNE.

Conclusion

Behavioural therapy for children with MNE is the first line of treatment modality according to guidelines; however, there is still controversy about the benefits and effectiveness of this therapy. The findings of this study have shown that the rates of treatment compliance and response to behavioural therapy for primary MNE can be improved with a written checklist of behavioural instructions.

Authors' contributions AMH: protocol/project development, data collection or management. MFK: manuscript writing/editing, data analysis. YY: protocol/project development, manuscript writing/editing. CNY: data collection or management, data analysis. OGD: protocol/project development, data analysis.

Compliance with ethical standards

Conflict of interest The authors declare they have no conflict of interests.

Ethical standards The present study has been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

Informed consent Patients gave their informed consent prior to their inclusion in the study.

References

1. Caldwell PH, Nankivell G, Sureshkumar P (2013) Simple behavioural interventions for nocturnal enuresis in children. Cochrane Database Syst Rev 7:CD003637. https://doi.org/10.1002/14651858.cd003637.pub3
2. Neveus T, Eggert P, Evans J, International Children's Continence Society et al (2010) Evaluation of and treatment for monosymptomatic enuresis: a standardization document from the International Children's Continence Society. J Urol 183(2):441–447. https://doi.org/10.1016/j.juro.2009.10.043
3. Franco I, von Gontard A, De Gennaro M (2013) Evaluation and treatment of nonmonosymptomatic nocturnal enuresis: a standardization document from the International Children's Continence Society. J Pediatr Urol 9:234–243
4. Tkaczyk M, Maternik M, Krakowska A et al (2017) Evaluation of the effect of 3-month bladder basic advice in children with monosymptomatic nocturnal enuresis. J Pediatr Urol 13(6):615.e1–615.e6. https://doi.org/10.1016/j.jpurol.2017.03.039
5. Cederblad M, Sarkadi A, Engvall G, Nevéus T (2015) No effect of basic bladder advice in enuresis: a randomized controlled trial. J Pediatr Urol 11(3):1531.e1–1531.e5. https://doi.org/10.1016/j.jpurol.2015.03.004
6. Turkish Statistical Institute. Turkish statistical institute website. 2016. http://www.turkstat.gov.tr/UstMenu.do?metod=temelist. Accessed 14 Apr 2018
7. Van Herzeele C, Alova I, Evans J et al (2009) Poor compliance with primary nocturnal enuresis therapy may contribute to insufficient desmopressin response. J Urol 182(Suppl 4):2045–2049
8. Gawande A (2011) The checklist manifesto: how to get things right. Metropolitan. Books of Henry Holt and Co., New York
9. World Health Organization. Implementation manual WHO surgical safety checklist 2009. http://apps.who.int/iris/bitstream/handle/10665/44186/9789241598590_eng.pdf. Accessed 9 Aug 2018
10. Haynes AB, Weiser TG, Berry WR et al (2009) A surgical safety checklist to reduce morbidity and mortality in a global population. N Engl J Med 360(5):491–499
11. Takala RSK, Pauniaho SL, Kotkansalo A et al (2011) A pilot study of the implementation of WHO surgical checklist in Finland: improvements in activities and communication. Acta Anaesthesiol Scand 55(10):1206–1214
12. Fai-Ngo Ng C, Wong SN, The Hong Kong Childhood Enuresis study Group (2005) Comparing alarms, desmopressin and combined treatment in Chinese enuretic children. Pediatr Nephrol 20:163–169
13. Kruse S, Hellstrom AL, Hanson E, Hjälmås K, Sillén U, Swedish Enuresis Trial (SWEET) Group (2001) Treatment of primary mono symptomatic nocturnal enuresis with desmopressin: predictive factors. Br J Urol 88:572–576
14. Baeyens D, Lierman A, Roeyers H, Hoebeke P, Walle JV (2009) Adherence in children with nocturnal enuresis. J Pediatr Urol 5(2):105–109
15. Moulhee NMS (2012) Effect of the educational program upon parents' knowledge of nocturnal enuretic children. World J Med Sci 7(3):137–146. https://doi.org/10.5829/idosi.wjms.2012.7.3.1102
16. De Guchtenaere A, Raes A, Walle CV et al (2009) Evidence of partial anti-enuretic response related to poor pharmacodynamic effects of desmopressin nasal spray. J Urol 181(1):302–309
17. Schulpen TW (1997) The burden of nocturnal enuresis. Acta Paediatr 86:981–984
18. Lazarus RS, Dodd HF, Majdandzic M et al (2016) The relationship between challenging parenting behaviour and childhood anxiety disorders. J Affect Dis 190:784–791
19. Doganer YC, Aydogan U, Ongel K et al (2015) The prevalence and sociodemographic risk factors of enuresis nocturna among elementary school-age children. J Fam Med Prim Care 4:39–44
20. Meydan EA, Mahmut Civilibal M, Elevli M, Duru NS, Civilibal N (2012) The quality of life of mothers of children with monosymptomatic enuresis nocturna. Int Urol Nephrol 44:655–659. https://doi.org/10.1007/s11255-011-0087-7
21. Schlomer B, Rodriguez E, Weiss D, Copp H (2013) Parental beliefs about nocturnal enuresis causes, treatments, and the need to seek professional medical care. J Pediatr Urol 9:1043–1048. https://doi.org/10.1016/j.jpurol.2013.02.013