Introduction

Nocturnal enuresis is a common problem that is troubling for children and their families.

It is the involuntary voiding of urine that occurs at night in the absence of congenital or acquired central nervous system defect among children over 5 years of age ***(Glazener et al., 2003)*** and ***(Lyth and Bossons, 2004).***

A single explanation for nocturnal enuresis has been elusive. The condition is multifactorial. Numerous etiological factors have been investigated and various theories have been proposed.

Genetic predisposition is the most frequently supported etiologic variable. Studies found that if both parents were enuretic, their offspring have a 77% risk of complaining of primary monosymptomatic nocturnal enuresis ***(Norgaard et al., 1997).***

Positive family history is present in 65 % to 85% of children with nocturnal enuresis. If the father was enuretic the

relative risk of the child was 7.1, if the mother was enuretic the relative risk was 5.2 ***(Bailey, 1999)***.

In addition certain chromosomal loci (5, 13, 12 and 22) have been implicated ***(Djurhuus, 1999) (Fregusson, 1986)***.

Primary nocturnal enuresis was thought to be a psychologic condition, but it is appear that psychologic problems are the result of enuresis not the cause ***(Wan et al., 1997).***

There is small but significant risk for psychiatric disorders and problems with social adjustment in enuretic children beyond the age of 10 years ***(Jarvelin et al., 1988)***. Studies showed that patients with primary nocturnal enuresis seems to have a poorer sense of belonging to society and have lowered self-esteem ***(Stromgren and Thomsen, 1990).***

Bladder problems as a cause of nocturnal enuresis have been contradictory. Extensive urodynamic testing has shown that bladder function falls within normal range in children with primary monosymptomatic nocturnal enuresis ***(Djurhuus, 1999).***

On the other hand studies showed that functional bladder capacity may be less in those with primary nocturnal enuresis ***(Thiedke, 2003).***

During normal development there is establishment of a circadian rhythm in the secretion of ADH ***(Devitt et al., 1999).*** A nocturnal rise in this hormone would decrease the amount of urine produced at night. It may be that children with primary monosymptomatic nocturnal enuresis are delayed in achieving this circadian rise in ADH and thus may developed nocturnal polyuria. This nocturnal polyuria overwhelms the ability of the bladder to retain urine until the morning ***(Thiedke, 2003).***

Neither nocturnal polyuria nor diminished function bladder capacity adequately explains why children with nocturnal do not wake up to void. Controversy has existed for many years about whether enuresis reflect a sleep disorder ***(Naveus and Hetta 1999).*** Sleep EEG have demonstrated no differences or only nonspecific changes in children with or without nocturnal enuresis. On the other hand Sophisticated EEG energy analysis has indicated both greater depth of sleep

and impaired arousal in enuresis ***(Hunsballe, 1999)***. Parents consistently maintain that their children with nocturnal enuresis are "deep sleepers," compared with their offspring who are not bed-wetters ***(Naveus and Hetta, 1999).***

Children with minor neurological dysfunction are more prone to nocturnal enuresis, particularly if belonging to a lower social class ***(Lunsinget al., 1993).*** Children with attention deficit hyperactivity disorders are 2.7 times more likely to have enuresis than the general children population ***(Robson et al., 1997).***

Some studies show significant decrease or complete cure of nocturnal enuresis after surgical removal of obstruction ***(Weider et al., 1991).***

It is an alarm that emits a sound when child wets the bed. The alarm has been shown to be the most effective treatment for nocturnal enuresis ***(Friman, 1995).***

Compared with other skill-based or pharmacologic treatment, the bed wetting alarm has a higher success rate

(75%) and a lower relapse rate (41%) ***(Monda and Husmann, 1995).***

In some children with a small bladder capacity the use of bladder-retention training during the day may help increase bladder capacity at night. This training is accomplished by having the child hold his or her urine for increasing period of time ***(Cenderon, 1999).***

Negative reinforcement involves reassuring the parents and the child. Removing the guilt associated bed–wetting and provide emotional support to the child ***(Thiedke, 2003).***

In Positive reinforcement system, the child puts stickers on a chart or earns points for every night he or she remain dry. Once a certain number of stickers or points have been earned the child is given a prize ***(Thiedke, 2003).***

The child is given age-appropriate responsibility, in a nonpunitive way, for the consequence of bed-wetting. Younger children may be asked to strip wet linens from bed, whereas older children may be expected to do laundry ***(Thiedke, 2003).***

A synthetic analogue ADH its act by decreasing urine volume at night and by decreasing intra vesicular pressure ***(Tullsk, 1999).***

The action of imipramine in nocturnal enuresis is understood half the anticholinergic effect of the drug may result in a decrease in bladder contractility that lead to increased bladder filling and improved functional bladder capacity ***(Monda and Husmann 1995).***

A drug with anticholinergic effects has been successfully used for bladder instability and / or sphincter- detrusor-dyssynergy. Its role in treatment of nocturnal enuresis is to excludes these organic abnormalities ***(Varan et al., 1996).***

Indomethacin, a potent NSAID ***(Al-waili, 2000).*** This drug reduce wet night, while adverse effect were not noticed ***(Al-waili, 2000).***

Aim of the Work

Assessment of the efficacy of the enuresis alarm in the treatment of primary monosymptomatic nocturnal enuresis in Egyptian children.

Nocturnal Enuresis

Definitions:

Enuresis is defined in the D S M-IV-TR as the repeated voiding of urine into the bed or clothes at least twice per week for at least three consecutive months in a child who is at least 5 years of age ***(Fritz et al., 2004).***

Neveus et al defined enuresis as repeated, spontaneous voiding of urine during sleeping in child five years and older ***(Neveus et al., 2006).***

Types of enuresis:

According to previous periods of dryness,

Primary enuresis (80% of cases):

Enuresis in child who has never established urinary continence for more than six months ***(Neveus et al., 2006).***

Secondary enuresis (20% of cases):

Resumption of enuresis after at least six months of urinary continence ***(Neveus et al., 2006).***

According to time of day,

Nocturnal enuresis:

Enuresis that occurs during sleep.

Day time wetting:

Urinary incontinence that occurs while child is awake ***(Fritz et al., 2004).***

According to presence of symptoms,

Monosymptomatic (uncomplicated enuresis):

Enuresis without urinary tract symptoms other than nocturia and no history of bladder dysfunction ***(Neveus et al., 2006).***

Nonmonosyptomatic enuresis:

(Polysymptomatic or complicated)

Enuresis with urinary tract symptoms (e.g., increase or decrease in voiding frequency, daytime wetting, urgency, hesitancy, straining, weak or intermittent stream, posturation dribbling, holding maneuver, sensation of incomplete emptying, Lower abdominal or genital discomfort, chronic constipation or encopresis) ***(Nevus et al., 2006).***

Prevalence:

Bedwetting is a common problem throughout the world ***(Butler and Heron, 2007).***

Butler and Heron reported recent prevalence data based on the Avon longitudinal study of parent and child (ALSPAC).

ALSPAC is an ongoing study of 13973 infants with an estimated date of delivery between 1 April 1991 and 31 December 1992. Questionnaires were obtained from the parent at 15, 24, 38, 54, 65, 78, 91, and 115 months of age. The authors reported on data obtained from questionnaires obtained at the latter fife ages. Based on the diagnostic and statistical manual of mental disorder (D S M)-IV definition of nocturnal enuresis as wetting at least twice a week, the age related prevalence was 8.4, 6.0, 4.0, 2.6, and 1.5%, respectively. For infrequent bedwetting, which butler and heron defined as less than twice a week, the prevalence was 21.6, 16.2, 12.8, and 8.2% respectively.

Butler (2008) reported that nocturnal enuresis affects 5-10% of children of lower school age and perhaps 0.5- 1% of

adults, and that there are no major cultural or racial differences in nocturnal enuresis prevalence.

Nocturnal enuresis is three time more common than daytime wetting and affects 6-7% of younger children and 2-8% of older children ***(Stein et al., 2001).***

It occurs three more times more often in boys ***(Miller, 1993).***

Neurophysiology

Normal achievement of continence

Dryness at night usually follows achievement of continence by day. During the second year of life, children start to develop the ability to voluntarily relax the external urethral sphincter and initiate voiding, even in the absence of the desire to void. By approximately age 4 years, all children with normal bladder function should have acquired this ability.

Urinary continence depends on two main factors, one inherent, and one acquired.

1) The inherent factor is the presence of an intact and strong internal urethral sphincter, which is a collageno-muscular tissue cylinder that extends from the urinary bladder neck to the perineal membrane in both sexes, males, and females.
2) The acquired factor, is an acquired behavior gained by learning and training in early childhood, how to maintain a high alpha sympathetic tone at the internal urethral sphincter keeping it closed all the time till voiding is needed and/or desired.

(de Groat, and Booth, 1993; Andersson and Arner, 2004)

Physiology of micturation in children:

The physiology of micturition and the physiologic basis of its disorders are subjects about which there is much confusion, especially at the supraspinal level. Micturition is fundamentally a spinobulbospinal reflex facilitated and inhibited by higher brain centers such as the pontine micturition center, subject to voluntary facilitation and inhibition.

In healthy individuals, the lower urinary tract has two discrete phases of activity: the storage (or guarding) phase, when urine is stored in the bladder; and the voiding phase, when urine is released through the urethra. The state of the reflex system is dependent on both a conscious signal from the brain and the firing rate of sensory fibers from the bladder and urethra. At low bladder volumes, afferent firing is low, resulting in excitation of the outlet (the sphincter and urethra), and relaxation of the bladder. At high bladder volumes, afferent firing increases, causing a conscious sensation of urinary urge. When the individual is ready to urinate, he or she consciously initiates voiding, causing the bladder to contract and the outlet to relax. Voiding continues until the bladder empties

completely, at which point the bladder relaxes and the outlet contracts to re-initiate storage. The muscles controlling micturition are controlled by the autonomic and somatic nervous systems. During the storage phase the internal urethral sphincter remains tense and the detrusor muscle relaxed by sympathetic stimulation. During micturition, parasympathetic stimulation causes the detrusor muscle to contract and the internal urethral sphincter to relax. The external urethral sphincter (sphincter urethrae) is under somatic control and is consciously relaxed during micturition ***(de Groat, and Booth, 1993; Andersson and Arner, 2004).***

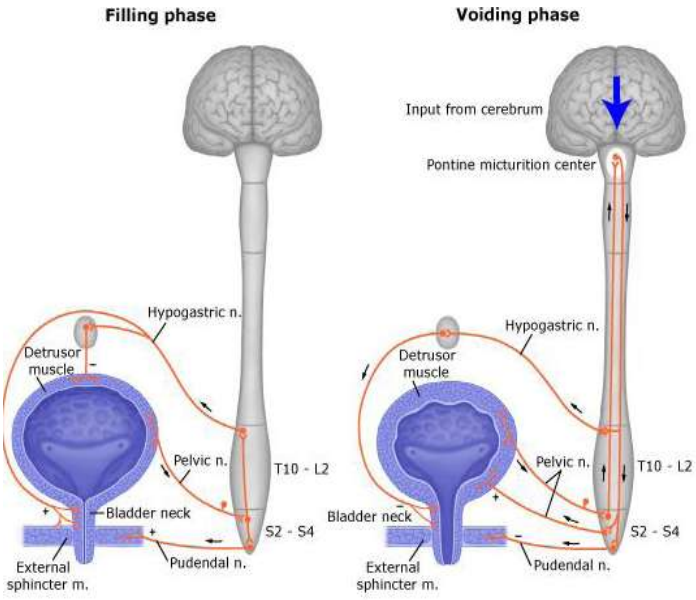

Fig. (1): Neural circuits that control continence and micturition.

Nocturnal Enuresis

Primary nocturnal enuresis is caused by disparity between bladder capacity and nocturnal urine production and the child's failure to awaken in response to a full bladder ***(Hjalmas et al., 2004).***

The remarkable fact is that the great majority of children sleep dry for 8-9 hours or more while some time finding it hard to wait for only a couple of hours during day time. Thus, nocturnal dryness requires functions that are not present during daytime. These are **(1) -** reduction of nocturnal urine production so that it doesn't exceed bladder capacity; and/or **(2)-**that the bladder detruser muscle is efficiently inhibited and relaxed; and **(3) -** that the sleeping child is awakened by a full bladder, alternatively that the micturition reflex is inhibited so that the child is allowed sufficient time to wakeup before micturition ensues ***(Hjalmas, 2002).***

Thus, the basic pathophysiology of nocturnal enuresis is simple in that the bladder gets filled to capacity during sleep and needs to be emptied. There are two main factors, working singly or in combination, causing the bladder to become full.