

Full Length Research Paper

Primary nocturnal enuresis in children presenting to the outpatient Department of Khartoum ENT Teaching Hospital with adenotonsillar hypertrophy, Khartoum, Sudan

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ABSTRACT

Background: Primary Nocturnal Enuresis (PNE) is a common health problem seen in childhood. It has many risk factors that can play a role in its etiology including an untreated adenotonsillar hypertrophy (ATH) which is the most common etiology of obstructed sleep apnea (OSA). **Objective:** This study was undertaken to determine the prevalence of PNE in children with adenotonsillar hypertrophy (ATH) and to reveal the relation of PNE with severity of ATH in Sudanese children. **Material and Methods:** A total of two hundreds and ninety patients diagnosed with ATH were recruited in this prospective study with age ranging from 5 to 15 years. The study was conducted in Khartoum ENT teaching hospital from Jan. to May 2012. **Results:** From 290 patients with adenotonsillar hypertrophy, 114 (39.3%) were proved to have primary nocturnal enuresis. From these 114 children, 86 (75.4%) were wetting their beds at least once a week. Almost half of the study population had grade 3 adenotonsillar hypertrophy. However, no statistically significant relationship was found between frequency of primary nocturnal enuresis and grading of adenotonsillar hypertrophy. **Conclusion:** Prevalence of primary nocturnal enuresis in children with adenotonsillar hypertrophy was high (40%). Children presenting with nocturnal enuresis should be evaluated for adenotonsillar hypertrophy. There is no association between primary nocturnal enuresis and severity of upper airway obstruction caused by adenotonsillar hypertrophy.

Keywords: Adenotonsillar hypertrophy, Primary nocturnal enuresis, Upper airway obstruction, Children

INTRODUCTION

Enuresis is a common health problem worldwide. It is estimated that there are over 50 million children with enuresis throughout the world (Kahraman et al., 2013). Primary nocturnal enuresis is defined as repeated spontaneous voiding of urine during sleep in a child five years old who has never been dry at night for an

uninterrupted period of six months (Neveus et al., 2006). Approximately 20% of children at the age of 5 years wet the bed at least once monthly. About 1 -2% of teenagers and adult remain with primary nocturnal enuresis (Kahraman et al., 2013). Genetic influences are quite strong, the child likelihood to get the problem is about

75% if both parents were having enuresis. Psychological problems are unlikely to cause nocturnal enuresis but are more common if daytime symptoms are present (Thiedke, 2003). While behavioral problems are uncommon, however they are pronounced in secondary enuresis (Von Gontard et al., 1999), except ADHD which is more common in older children (Beayens et al., 2005). In children with enuresis an abnormally deep sleep pattern may occur (Neveus, 2003). Constipation occurs in nearly 75% of children with primary nocturnal enuresis (Robson et al., 2005). Parenteral stress are not uncommon (Hjalmas et al., 2004).

Treatment of PNE start with simple behavioral interventions and motivational therapy. Arousal alarm system and pharmacotherapy should be considered in older children. Parents should be reassured and counseled about eliminating guilt, shame and punishment (Fritz et al., 2004). Drugs given include imipramine and oral Desmopressin.

Obstructive sleep disordered breathing is common in children. 3-12% of children snore and obstructive sleep apnea (OSA) affects 1-10% of them. The most common etiology of OSA is adenotonsillar hypertrophy (ATH) (Hultcrantz et al., 1995) and consequences of untreated cases include failure to thrive, ADHD, behavioral problems, cardiopulmonary disease and enuresis. There is some evidence that adenotonsillectomy improve or cure nocturnal enuresis. It resolves after successful treatment of sleep disordered breathing (SDB) (Weider et al., 1991). One of the potential mechanisms accounting for increased prevalence of enuresis in the context of SDB may be related to the release of both atrial and brain natriotic peptides (BNPs) from cardiac myocytes (Umlauf et al., 1999).

In a very recent study it was found that BNPs increased among snoring children and seemed to correlate with severity of sleeping disturbance (Kaditis et al., 2006).

Lateral neck radiography or nasopharyngoscopic examination to evaluate the size of the adenoidal tissue and site of airway collapse are important (Messner, 1999). Several options are available for medical management (Marcus et al., 1995). Adenotonsillectomy remains the treatment of choice for children with obstructive sleep apnea. Numerous studies have documented improvement in snoring, OSA, behavior, growth and enuresis (Suen et al., 1995). Study from Stanbul (Cinar et al., 2001), revealed that among 321 children who were operated for adenotonsillar hypertrophy 35% had nocturnal enuresis. Other study by Books LJ, showed a high prevalence of enuresis in children with suspected sleep disordered breathing (41%) (Brooks and Topol, 2003). The aim of our study was to determine the prevalence of (PNE) in children diagnosed with ATH and to relate the severity of upper airway obstruction caused by ATH and PNE.

MATERIALS AND METHODS

This is a prospective study carried out in the outpatient department of Khartoum ENT teaching hospital, which is the biggest ENT hospital in Sudan, between January and May 2012. Two hundred and ninety (290) children from 5 to 15 years age diagnosed with adenotonsillar hypertrophy (ATH) were included in the study. The sample size was calculated using (Daniel Formula). The diagnosis of ATH was verified by using the standardized tonsillar hypertrophy grading scale. Data were collected using a specifically designed questionnaire including demographic characters, full history, enuresis history with details and physical examinations. Children with any cause of nasal obstruction other than adenotonsillar hypertrophy and children with secondary enuresis, urological anomalies, UTI and neuromuscular abnormality were excluded. The standardized tonsillar hypertrophy grading scale used was as follows:

- (0) Tonsils are entirely within the tonsillar fossa.
- (1+) Tonsils occupy less than 25% of the lateral dimension of the oropharynx, as measured between the anterior tonsillar pillars.
- (2+) Tonsils occupy less than 50% of the lateral dimension of the oropharynx.
- (3+) Tonsils occupy less than 75% of the lateral dimension of the oropharynx
- (4+) Tonsils occupy 75% or more of the lateral dimension of the oropharynx.

Soft tissue lateral neck radiography was done to confirm the ATH and urine analysis was made to detect any abnormalities.

Data was analyzed using SPSS program version 16. Permission to conduct this study was granted by ENT Hospital administration and head of the outpatient department. Verbal consent was taken from patients, parents and care givers.

RESULTS

A total of 290 children with ATH were recruited. 154 (53%) were girls and 136 (47%) were boys. The commonest age affected with ATH were between 5 and 9 years, 226 patients (78%), and only 64 (22%) were between 10 and 15. In 113 (39%) patients BMI was <5th centile, between 5th and 85th centile in 159 (54.8%), between 85th and 95th in 8 (2.8%) and only 10 (3.4%) their BMI was >95th centile (Table 1).

Snoring was present in 234 children (80.7%). From these 156 (75.4%) had daily snoring and 207 (88.5%) had snoring at least once per week.

Grades of children with ATH was as follows: (Figure 1) Grade 1: 30(10.3%), Grade 2: 96(33.1%), Grade 3: 140 (48.3%) and Grade 4: 24 (8.3%).

Table 1. Body Index for the study population Mass.

BMI Percentile	Frequency	Percentage
< 5	113	39.0
5 to < 85 to 90	159	54.8
>95	8	2.8
Total	10	3.4
	290	100.0

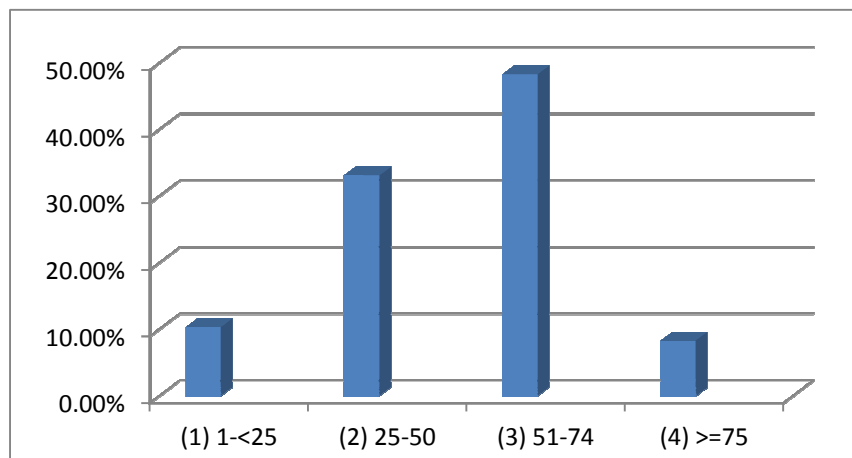


Figure 1. Standardized tonsillar hypertrophy grading scale.

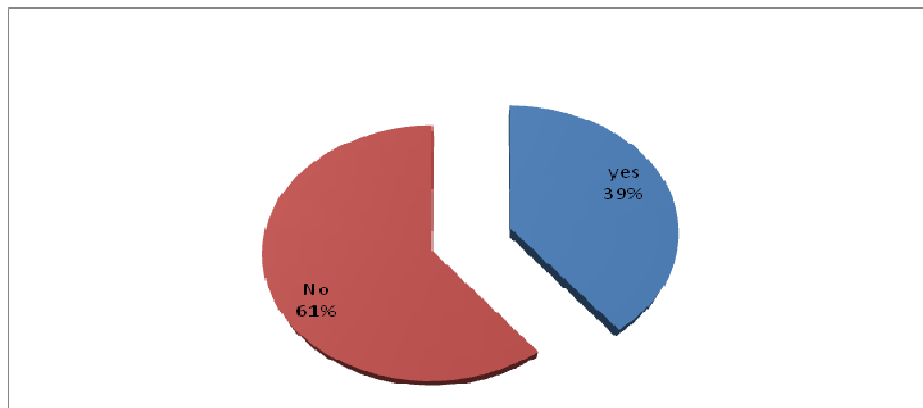


Figure 2. Primary nocturnal enuresis among the study population

Almost half of the patients had grade 3 ATH. There was statistically significant relationship between ATH grading scale and snoring with p value of 0.001.

When children with ATH were evaluated for the presence of primary nocturnal enuresis (PNE), a total of 114 (39.3%) were found to be affected (Figure 2).

From children with PNE 59 (51.75%) were males and 55 (48.25%) were females. The common affected age group was between 5 and 9 years were 101(88.6%) children, and only 13 patients (11.4%) were between 10 and 15 years. (Table 2)

Children who wets their beds every night were 51(44.7%) and who wets their beds at least once a week were 86(75.4%). (Table 3). Family history was found in 43 (37.7%) children who have ATH and enuresis. Although (80.7%) from children with ATH had history of snoring, there was no statistically significant correlation observed between the PNE and snoring (daily or weekly) with p value of 0.905 and 0.215 respectively. We also found no statistically significant correlation between frequency of primary nocturnal enuresis (per week or per month) and tonsillar hypertrophy grading scale with p

Table 2. Distribution of age in children with PNE.

Age	Frequency	Percentage	Cumulative Percentage
5	38	33.3	33.3
6	23	20.2	53.5
7	20	17.5	71.1
8	13	11.4	82.5
9	7	6.1	88.6
10	4	3.5	92.1
11	3	2.6	94.7
12	3	2.6	97.4
13	2	1.8	99.1
14	1	0.9	100.0
total	114	100.0	

Table 3. Frequency of PNE per week.

Days of bed wetting	Frequency	Percent	Valid %	Cumulative %
1	6	5.3	7.0	7.0
2	9	7.9	10.5	17.4
3	9	7.9	10.5	27.9
4	6	5.3	7.0	34.9
5	4	3.5	4.7	39.5
6	1	0.9	1.2	40.7
7	51	44.7	59.3	100.0
Total	86	75.4	100	
Missing System	28	24.6		
Total	114	100.0		

value of 0.690 and 0.629 respectively.

DISCUSSION

Primary nocturnal enuresis is more common in boys than girls (Kahraman et al., 2013), which also reported in our study in which there was an over-representation of the male gender among enuretic children. The common age range of our selected children was between 5 and 9 years (88.6%). This probably because the vast majority of our ATH patients from this age group (78%) and this is explained by the fact that spontaneous resolution of adenotonsillar hypertrophy occur with increasing age. Also PNE generally decrease with increasing age, as observed in Mahgoob study (Magdi and Shema, 2010), in Khartoum State, which showed prevalence of 13.3% among 5 to 7 years old children and decreased to 2.3% at 12 -14 years. In our series only a minority of children were at risk for being overweight (3.4%) and (39%) were underweight meaning that failure to thrive is common in children with sleep disordered breathing (SDB) due to ATH. The hypothesized etiology for FTT is increasing work of breathing (Lind and Lundell, 1982) and it is known that growth velocity increases after adenotonsillectomy. Our results were different from the study done by Joseph G. Barone in USA which showed that a large number (80%) of children with NE had some degree of obstructive sleep apnea and they were

overweight (Joseph et al., 2009).

In this study the percentage of PNE among the study population was almost 40% which is considered to be high and indicating a strong association between ATH and PNE. This is consistent with Farzean Firooze report which showed that in 86 patients who underwent adenotonsillectomy, 36 (42%) had nocturnal enuresis and the episodes of enuresis were decreased significantly after operation (Farzeen et al.). The results we obtained are also comparable, even with higher percentage, with those reported in similar published studies from Ain Shams University, which showed that 15.3% of children with sleep disordered breathing had primary nocturnal enuresis. Surgical intervention was done in all the enuretic children and improvement was observed in 29 children (87.8%) (Waleed et al., 2011). In Iran series which was done in 420 children admitted for adenotonsillectomy, 97 had a positive history of preoperative enuresis, with mean age of 48 months. Three months after adenotonsillectomy, enuresis had resolved completely in 51 (60.7%) and had shown relative improvement in 22 (26.2%) ($P < 0.001$) (Mohammad et al., 2013). A recent study from Turkey revealed a strong relationship between PNE and upper airway obstruction, but it was not declared for secondary nocturnal enuresis patients (Gülsoylu and Serkan, 2014). Family history was positive in 37.7% of our study subjects. Similarly, it has been reported that 53% of those had PNE had positive family history (Kanaheeswari, 2003).

One study has shown that in families where both parents had enuresis, 77 percent of children will also have enuresis. In families where only one parent had enuresis, 44 percent of children will be affected and only 15 percent of children will have enuresis if neither parent had enuresis. The study reported the importance of familial component and supporting genetic predisposition (Marc, 1999). In our study we found no apparent correlation between the severity of ATH and enuresis frequency. This is different from some other results which report that prevalence of nocturnal enuresis increased with increasing severity of obstructive sleep apnea (Su et al., 2011).

The study had some limitations in that it was prospective study in out patient set up depending on the one visit.

In conclusion prevalence of primary nocturnal enuresis in Sudanese children with ATH was high. However, there was no association between PNE and severity of upper airway obstruction caused by ATH. Our recommendations are that, any child presenting with PNE should be examined for adenotonsillar hypertrophy and further studies should be done to determine the effect of adenotonsillectomy on primary nocturnal enuresis.

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REFERENCES

- Beayens D, Roeyers H, Demeyere I, Verte S, Hoebeke P, VandeWalle J (2005). Attention-deficit/hyperactivity disorder (ADHD) as a risk factor for persistent nocturnal enuresis in children: a two-year follow-up study. *Acta Paediatr.* 94(11):1619-1625
- Brooks LJ, Topol HI (2003). Enuresis in children with sleep apnea. *J. Pediatric.* May; 142(5):515-8.
- Cinar U, Vural C, Cakir B, Topuz E, Karaman MI, Turgut S (2001). Nocturnal enuresis and upper airway obstruction International Journal of Pediatric Otorhinolaryngology. June 14; 59(2):115-118.
- Farzeen F, Rami B, Ahmet RA, Penelop A Longhurst. Resolution of diurnal incontinence and nocturnal enuresis after adenotonsillectomy in children. *The J. Urol.* May; 175(5): 1885-88.
- Fritz G, Rockeny R, Bernet W (2004). Practice parameter for the assessment and treatment of children and adolescents with enuresis. *J. Am. Acad. Child Adolesc Psychiatry.* 43(12):1540-1550
- GülSoylu Ö, Serkan Ö (2014). Clinical Study, Coexistence of Upper Airway Obstruction and Primary and Secondary Enuresis Nocturna in Children and the Effect of Surgical Treatment for the Resolution of Enuresis Nocturna. *Advances in Medicine* Volume July (2014), Article ID 656431, 4 pages
- Hjalmas K, Arnold T, Bower W (2004). Nocturnal enuresis: an international evidence based management strategy. *J. Urol.* 171(6 pt 2):2545-2561
- Hultcrantz E, Lofstrand-Tidestorm B, Ahlquist-Rasted J (1995). The epidemiology of sleep related breathing disorder in children. *Int. Pediatr. Otorhinolaryngol.* 32(suppl):S63-6.
- Joseph G, Barone C, Hanson D, Dajusta G, Kevin G, Sandra J England, Dona S (2009). Nocturnal Enuresis and Overweight are associated with Obstructive Sleep Apnea. *Pediatrics.* July; 124(1):53-59
- Kaditis AG, Alexopoulos EL, Hatz F (2006). Overnight change in brain natriuretic peptide levels in children with sleep disordered breathing. *Chest.* 130(5):1377-1384.
- Kahraman A, Dursun H, Akyol MB (2013). Non dipping phenomenon in children with monosymptomatic nocturnal enuresis. *J. Pediatr. Nephrol.* July 28:1099-1103.
- Kanaheswari Y (2003). Epidemiology of childhood nocturnal enuresis in Malaysia. *J. Pediatr.* Child Health. Mar; 39(2):118-23
- Lind MG, Lundell BP (1982). Tonsillar hyperplasia in children. A cause of obstructive sleep apneas, CO2 retention, and retarded growth. *Arch. Otolaryngol.* 108:650-4.
- Magdi AHM, Shema K (2010). Nocturnal Enuresis in Sudan. *Australian Medical Journal (Online)* May 11. available from www.ami.net.au
- Marc C (1999). Dartmouth-Hitchcock Medical Center, Lebanon NH, New Hampshire *Am Fam Physician.* Mar 1; 59(5):1205-1214
- Marcus CL, Ward SL, Mallory GB, Rosen CL, Beckerman RC, Weesemayer DE (1995). Use of nasal continuous positive airway pressure as treatment of childhood obstructive sleep apnea. *J. Pediatr.* 127:88-94.
- Messner AH (1999). Evaluation of obstructive sleep apnea by polysomnography prior to pediatric adenotonsillectomy. *Arch Otolaryngol Head Neck Surg.* 125:353-6.
- Mohammad SA, Shahriar A, Jalal P (2013). The Effect of Adenotonsillectomy on Pediatric Nocturnal Enuresis. *Iran J. Otorhinolaryngol.* Winter; 25(70): 37-40.
- Neveus T (2003). The role of sleep and arousal in nocturnal enuresis. *Acta Paediatr.* 92(10):1118-1123
- Neveus T, von Gontard A, Hoebeke P, Hjalmas K, Brauer S, Bower W (2006). The standardization of terminology of lower urinary tract function in children and adolescents: report from the standardization Committee of the international Children Continence Society. *J. Urol.* 176(1):314-324.
- Robson WL, Leung Ak, Van Howe R (2005). Primary and secondary nocturnal enuresis: similarities in presentation. *Pediatrics.* 115(4):956-959
- Su MS, Li AM, So HK, Au CT, Ho C, Wing YK (2011). Nocturnal enuresis in children: prevalence, correlates, and relationship with obstructive sleep apnea. *J. Pediatr.* Aug; 159(2):238-42.
- Suen JS, Arnold JE, Brooks LJ (1995). Adenotonsillectomy for treatment of obstructive sleep apnea in children. *Arch Otolaryngol Head Neck Surg.* 121:525-30.
- Thiedke CC (2003). Nocturnal enuresis. *Am. Fam. Physician.* 67:1499-1410
- Umlauf M, Kurtzer E, Valappil T, Burgio K, Pillion D, Goode P (1999). Sleep disordered breathing as a mechanism for nocturia: preliminary findings. *Ostomy Wound Manage.* 45(12):52-60
- Von Gontard A, Mauer-Mucke K, Pluk J, Berner W, Lehmkuhl G (1999). Clinical behavioral problems in day-and night-wetting children. *Pediatr. Nephrol.* 13(8):662-667
- Waleed FE, Samia AF, Samar MF (2011). Impact of sleep-disordered breathing and its treatment on children with primary nocturnal enuresis. *Swiss Med Wkly.* Jul 1;141: w13216. doi: 10.4414.
- Weider DJ, Sateia MJ, West RP (1991). Nocturnal enuresis in children with upper airway obstruction. *Otolaryngol Head Neck Surg.* 105:427-32.