Paediatrica Indonesiana

p-ISSN 0030-9311; e-ISSN 2338-476X; Vol.58, No.3(2018). p. 116-22; doi: http://dx.doi.org/10.14238/pi58.3.2018.116-22

Original Article

Habitual snoring and primary enuresis in children

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Abstract

Background Obstructive sleep-disordered breathing is assumed to be associated with primary enuresis in children. Prolonged enuresis may cause developmental and emotional disorders, as well as poor school performance.

Objective To determine the relationship between habitual snoring and primary enuresis in children.

Methods A cross-sectional study was conducted in Muara Batang Gadis District, North Sumatera in April 2016. Subjects were children aged 5-14 years. *The Sleep Disturbance Scale for Children (SDSC) Questionnaire* was used to measure the symptoms of sleep disordered breathing; the *International Association Child and Adolescent Psychiatry and Allied Professions (IACAPAP) Questionnaire* was used to assess for the presence of primary enuresis. The questionnaires were answered by the children's parents. Data were analyzed using Chi-square and logistic regression tests. A P value of <0.05 was considered to be statistically significant.

Results The mean age of 110 participants was 9.23 (SD 2.16) years. Twenty-seven (24.5%) subjects snored more than three nights per week (habitual snorers) and 18 (16.4%) subjects had primary enuresis. There was a significantly higher percentage of habitual snorers with enuresis than that of snorers without enuresis (55.5% *vs.* 18.4%, respectively) (P<0.05).

Conclusion There is a significant relationship between habitual snoring and primary enuresis. **[Paediatr Indones. 2018;58:116-22; doi: http://dx.doi.org/10.14238/pi58.3.2018.116-22]**.

Keywords: *: enuresis; habitual snoring; children*

Enuresis, which frequently occurs in children, is strongly related to sleep-disordered breathing (snoring).[1,2] Snoring therapy, with adenotonsillectomy or intranasal corticosteroid treatment, resulted in decreased incidence of enuresis in children.[3-5] Enuresis has long term effects if it is not well managed.[6] Enuresis may impact a child's development. Children may experience internal or external behavioral disorders, low self-esteem, poor grades in school, and even emotional disturbances.[7]

Habitual snoring is associated with enuresis. Snoring is the most common clinical manifestation occuring in children with obstructive sleep apnea (OSA).[8] Children with OSA do not have good quality sleep, resulting in decreased antidiuretic hormone (ADH) secretion. This drop in ADH can lead to micturition at night (nocturnal enuresis).[9]

Sex, age, low parental educational level, low

This study was presented at the *Pertemuan Ilmiah Tahunan Ilmu Kesehatan Anak VIII/PIT IKA VIII* (The 8th Annual Scientific Meeting of Child Health), Makassar, September 17-21, 2016.

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socioeconomic status, and history of enuresis in the family are the variables which have been associated with enuresis and habitual snoring in children.[10] To date, enuresis and habitual snoring remain a problem for children in developing countries including Indonesia.

This study aimed to assess for a relationship between enuresis and habitual snoring in children.

Methods

This cross-sectional analytic study was conducted in the Muara Batang Gadis District, Mandailing Natal Regency, North Sumatera, in April 2016. The target population in this study was children aged 5-14 years; subjects were obtained using a simple, random sampling method. The exclusion criteria were urinary tract infection, spina bifida, cerebral palsy, or diabetes mellitus. Informed consent was obtained from subjects' parents or guardians. This study was approved by the Health Research Ethics Committee, University of Sumatera Utara Medical School.

Subjects underwent physical examinations and anthropometric measurements. Tonsil size was determined from direct inspection. The size was graded into 4 stage (T1-T4): T1 was normal size tonsil, T2 was hypertrophied tonsil with its medial edge reaching the midline of palatal arch, T3 was hypertrophied tonsil with kissing of both medial edges, and T4 was hypertrophied tonsil with no space between both medial edges. Subjects underwent urinalysis with urine rapid test to rule out urinary tract infection. Blood glucose level was measured with bedside rapid test (*Gluco dr*) to rule out hyperglycemia. The *SDSC Questionnaires*[11] to measure snoring were distributed to subjects and filled by their parents or sitters while the *IACAPAP Questionnaires*[1] were used to assess for the presence of primary enuresis. Demographic data were also obtained by interviews. All data were tabulated into a master table and appropriate statistical analyses were conducted.

The relationship between habitual snoring and enuresis was determined using Chi-square test. The risk factors for enuresis were analyzed using logistic regression test. The same test was used to determine the relationship between demographic factors and habitual snoring. Analyses were performed with statistical software *Statistical Package for Social Sciences (SPSS) version 15.0*. Results were considered to be significant for P values <0.05 with 95% confidence intervals.

Results

A total of 110 children were enrolled. The baseline characteristics of subjects are shown in **Table 1**. Subjects' mean age was 9.23 (SD 2.16) years. There were equal numbers of male and female subjects. On physical examination, 63 (57.3%) children had normal tonsils. No subjects had neurological, urinary tract, or metabolic disorders, nor did any have a history of medication usage which may affect diuresis.

All subjects lived with their parents, 27 (24.5%) had 3 siblings, and 26 (23.6%) lived with 6 other family members. Half of the subjects had siblings with history of enuresis and 54 (49.2%) had fathers with history of enuresis. The prevalence of obesity in this study was only 0.9% (1/110). Subjects were divided into groups: with and without enuresis, and with and without snoring. The prevalence of enuresis was 16.4% and the prevalence of snoring was 24.5% (**Table 2**).

Table 1. Baseline characteristics of subjects

Characteristics	(N=110)
Mean age (SD), years	9.23 (2.16)
Sex, n (%)	
Male	55 (50)
Female	55 (50)
Tonsils, n (%)	
T1-T1	63 (57.3)
T2-T2	22 (20.0)
T3-T3	25 (22.7)
History of enuresis in siblings, n (%)	
Yes	55 (50)
No	55 (50)
History of enuresis in fathers, n (%)	
Yes	54 (49.1)
No	56 (50.9)
History of enuresis in mothers, n (%)	
Yes	38 (34.5)
No	72 (65.5)
Obesity, n (%)	
Yes	1 (0.9)
No	109 (99.1)
Median number of house dweller (range), person	6.50 (3-13)

Table 2. Distribution frequency based on enuresis and snoring

Characteristics	(N=110)
Enuresis, n (%)	18 (16.4)
Yes	92 (83.6)
No	
Snoring, n (%)	
Yes	27 (24.5)
No	83 (75.5)

There were equal numbers of boys and girls in this study. In snoring group there was a domination of female (15/27) while in non-snoring group we found a male domination (51.8%) (**Table 3**). Tonsillar examination showed that 15/27 children in the snoring group had enlarged tonsils (T3-T3). In the non-snoring group, the majority of children (60/83, 72.3%) had normal tonsils. The history of enuresis in siblings, fathers, and mothers varied between the groups. In the snoring group, a history of enuresis in siblings and fathers was more common than a history of enuresis in mothers.

The non-enuresis group showed a different pattern. The majority of children had no enuresis history in siblings, fathers, or mothers. There were 2 obese children in the study, one in the snoring group and one in the non-enuresis group. In the enuresis group, 10/18 subjects were male, while the non-enuresis group was predominantly female (47/92, 51.1%). Normal tonsils (T1-T1) were observed in 7/18 of the enuresis group and 56/92 (60.9%) of the non-enuresis group. Histories of enuresis in fathers and mothers of the non-enuresis group were higher compared to those of the enuresis group (non-enuresis: 44/92, 47.8% and 28/92, 30.4%, respectively, vs. enuresis: both 10/18). The history of enuresis in siblings in the enuresis group was higher than in the non-enuresis group (13/18 *vs.* 42/92, 45.7%, respectively). There was no significant difference in obesity among subjects (**Table 4**).

Logistic regression test was conducted to analyze the risk factors of enuresis and snoring, including age, sex, obesity, number of siblings, history of enuresis in siblings, fathers and mothers, number of house dwellers, and tonsil size. History of enuresis in mothers and tonsil size were significantly associated with enuresis in children who snored (P=0.020 and 0.004, respectively). Of the two factors, large tonsil size was protective. The incidence of enuresis in subjects with snoring actually decreased 0.14 times with increasing tonsil size. Hence, the major risk factor for enuresis in the snoring group was history of enuresis in mothers, with an increased rate of

Table 3. Characteristics of subjects based on snoring and non-snoring

Characteristics	Snoring (n=27)	Non-snoring (n=83)	P value
Sex, n (%)			
Male	12	43 (51.8)	0.506
Female	15	40 (48.2)	
Tonsils, n (%)			
T1-T1	3	60 (72.3)	<0.001
T2-T2	9	13 (15.7)	
T3-T3	15	10 (12.0)	
History of enuresis in siblings, n (%)			
Yes	15	40 (48.2)	0.506
No	12	43 (51.8)	
History of enuresis in fathers, n (%)			
Yes	18	36 (43.4)	0.035
No	9	47 (56.5)	
History of enuresis in mothers, n (%)			
Yes	16	22 (26.5)	0.002
No	11	61 (73.5)	
Obesity, n (%)			
Yes	1	0 (0)	0.245
No	26	83 (75.5)	
Median number of house dweller (range), person	6 (4-13)	7 (3-11)	0.670

Table 4. Characteristics of subjects based on enuresis and non-enuresis

Characteristics	Enuresis (n=18)	Non-senuresis (n=92)	P value
Sex, n (%)			0.06
Male	10	45 (48.9)	
Female	8	47 (51.1)	
Tonsils, n (%)			0.150
T1-T1	7	56 (60.9)	
T2-T2	4	18 (19.6)	
T3-T3	7	18 (19.6)	
History of enuresis in siblings, n (%)			0.039
Yes	13	42 (45.7)	
No	5	50 (54.3)	
History of enuresis in fathers, n (%)			0.549
Yes	10	44 (47.8)	
No	8	48 (52.2)	
History of enuresis in mothers, n (%)			0.04
Yes	10	28 (30.4)	
No	8	64 (69.6)	
Obesity, n (%)			1.000
Yes	0	1 (1.1)	
No	18	92 (98.9)	
Median number of house dweller (range), person	6.5 (4-11)	6.5 (3-13)	0.954

enuresis of 18.132 times compared to the non-snoring group (**Table 5**).

Chi-square test revealed that snoring and enuresis in children had a statistically significant relationship (P=0.001) (**Table 6**).

Table 5. Risk factors analysis for enuresis in subjects with habitual snoring

Variables	Constant	Wald	P value*
Age	0.973	0.012	0.912
Sex	6.037	2.456	0.117
Number of siblings	1.751	0.510	0.475
History of enuresis in siblings	2.721	1.060	0.303
History of enuresis in fathers	0.117	2.879	0.900
History of enuresis in mothers	18.132	5.420	0.020
Number of house dwellers	0.459	0.833	0.361
Obesity	0.000	0.000	1,000
Tonsil size	0.140	8.488	0.004

Table 6. Relationship between habitual snoring and enuresis

	Enuresis	No enuresis	Total	P value*
Snoring	10	17	27	0.001
No snoring	8	75	83	
Total	18	92	110	

Discussion

Enuresis is a frequently neglected problem, mainly in children and adolescents. Several studies have recently shown that the prevalence of enuresis in children and adolescents is quite high. A previous study reported an enuresis prevalence of 25.9% in 4,203 children.[33] Another study reported a lower prevalence rate of enuresis in children in a rural area in India of 11.13%.[34] Another study conducted in Slovenia reported a prevalence of 12.8%.[35] A similar result was reported in Iran with prevalence rate of 11.01%.[36] The prevalence of enuresis in Indonesia from several studies was about 10.9%.[37] In our study, 18 of 110 children had enuresis, based on the *IACAPAP Questionnaire*.[1] The prevalence of enuresis was 16.4%, with 10 (9.1%) males and 8 (7.3%) females.

The risk factors of enuresis are socioeconomic, psychological, and genetic. Seventy-80% of children with enuresis had genetic disorders.[1] However, a previous study found that the risk factors of enuresis were socioeconomic status and the presence of urinary tract infection.[34] Similarly, another study found that psychological factors, socioeconomic level, and urinary tract infection were the risk factors of enuresis.[36]

Snoring is an important sign of an airway problem. This issue has caught much attention in developed countries, but not in Indonesia. Snoring can be classified into 2 types: habitual and non-habitual. The incidence of occasional snoring ranges from 26-30%, while habitual snoring is 5-7%. Habitual snoring needs to be managed because it can develop into obstructive sleep apnea syndrome (OSAS) and causes serious problems in children. The incidence of OSAS is approximately 0.1%-5.7% and increases with age, obesity, tonsil enlargement, and the other risk factors.[21] A previous study reported a prevalence rate of 27.3% for snoring in US children aged 6-18 years.[38] Similarly, our prevalence rate for snoring in children aged 5-14 years was 24.5%.

The relationship between habitual snoring and enuresis in children is still under debate. In a study of 42 children aged 3.5-14.5 years with sleep disturbances, as measured by polysomnography, the gold standard sleep quality assessment, 7 (16.7%) were found to have enuresis.[27] The authors concluded that habitual snoring and enuresis in children were significantly associated. In addition, Alexopoulos et al. reported that 135 (7.3%) of 1,821 children aged 5-14 years had habitual snoring and 7.4% of them had nocturnal enuresis. They, too, found that habitual snoring was associated with enuresis.[26] In our study, there was a significant relationship between habitual snoring and enuresis in children; 10/18 children who had habitual snoring also had enuresis. It was proven that there was a relationship between habitual snoring and enuresis in this study.

Snoring may cause a shallow state of sleep, leading to decreased antidiuretic hormone (ADH) secretion. Decreased ADH disrupts water retention in the bloodstream so that urine production increases. As such, this pathophysiology may explain how habitual snoring in children can cause enuresis. In our study there is a correlation between habitual snoring will cause enuresis in children.[20,26] There was a significantly higher percentage of habitual snorers with enuresis than that of snorers without enuresis (10/18 *vs.* 15.4%, respectively) ($P<0.05$).

A Sudan study of 290 children with tonsillar hypertrophy aimed to assess for relationships between tonsilar hypertrophy accompanied by snoring and/or enuresis; 114 (39.3%) of the subjects had enuresis. This finding led the authors to conclude that children with enuresis must be examined for tonsilar enlargement.[14] An Iranian study in 2013 was done to determine the prevalence of enuresis in children who had undergone tonsillectomy. A total of 420 children were enrolled, and 97 of them had a history of enuresis. Of these 97, only 84 agreed to participate in the study. Three months after tonsillectomy, 51 (60.7%) children no longer had enuresis and 22 (26.2%) children had improved enuresis symptoms ($P<0.001$). Enuresis did not improve in the remaining 11 subjects. Hence, the authors concluded that adenotonsillectomy can improve enuresis in children with adenotonsillar hypertrophy.[39]

The limitations of our study were its small sample size, small number of subjects with enuresis, using a questionnaire instead of polysomnography to assess snoring, and lack of data on tonsillectomies performed prior to the study.

In conclusion, there is a significant relationship between habitual snoring and enuresis in children. History of enuresis in mothers and small tonsil size are risk factors for enuresis in this study. In contrast, history of enuresis in fathers and siblings and tonsilar hypertrophy are not the risk factors for enuresis in snorers. There are significant differences in histories of enuresis in siblings and mothers between enuresis and non-enuresis groups. In the other hand, history of enuresis in fathers, obesity, and number of house dwellers are similar in both groups.

Conflict of Interest

None declared.

Funding Acknowledgment

The authors received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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