Sleep Disordered Breathing in Thai Primary School Children

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Background: *Sleep disordered breathing (SDB) represents a spectrum of breathing disorders, ranging from snoring to obstructive sleep apnea. A parental questionnaire-based report of SDB has been used to identify SDB among children. There has been a little report in Thai children.*
Objective: *The present study aimed to determine the prevalence and risk factors of SDB among primary school pupils in Pathumthani province, Thailand.*
Material and Method: *A cross-section survey was conducted on all pupils in 6 primary schools in Patumthani Province, by using the modified questionnaire from Tucson Children's Assessment of Sleep Apnea study (TuCASA). SDB symptoms of relevant questions were self-reported by their parents to determine habitual snoring and witnessed sleep apnea.*
Results: *Of 3,240 pupils, there were 2,892 completing questionnaires (response rate of 89.3%). The prevalence of parental-reported habitual snoring and witnessed sleep apnea were 4.3% and 1.3%, respectively. Habitual snoring was significantly associated with male gender (adjusted odds ratio, aOR = 1.9; 95% CI: 1.1 to 3.6), passive smoking (aOR = 2.2, 95% CI: 1.1 to 4.5), obesity (aOR = 4.7, 95% CI: 2.6 to 8.5), allergic rhinitis (aOR = 2.4, 95% CI: 1.5 to 3.9) and asthma (aOR = 1.7; 95% CI: 1.1 to 2.9). The significant risk of witnessed sleep apnea was allergic rhinitis (aOR = 5.8 (95% CI: 1.8 to 18.9) and asthma (aOR = 2.3, 95% CI: 1.2 to 6.4).*
Conclusion: *Sleep disordered breathing (SDB) is a little found in Thai primary school children. Allergic rhinitis and asthma were significant risk factors of habitual snoring and witnessed sleep apnea. Obesity and passive smoking were associated with habitual snoring. We recommend that children who had risks as respiratory allergic disease, obesity and passive smoking should be screened for SDB symptoms.*

Keywords: *Sleep disordered breathing, Primary school children, Habitual snoring, Witnessed sleep apnea, Risk factor*

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Sleep disordered breathing (SDB) represents a spectrum of breathing disorders, ranging from habitual snoring, witnessed sleep apnea to obstructive sleep apnea (OSA). Snoring is the most common presenting complaint of children with OSA[1,2]. Pediatric SDB has become widely recognized as a progressive disorder that causes significant morbidities including neurobehavioral, cognitive, and cardiovascular complications[3,4]. Early detection can minimize morbidities. Screening methods by questionnaire and clinical assessment have been used to identify SDB among children[1,5-8]. But it does not allow for a definite diagnosis of OSA[9]. Polysomnography (PSG) is the gold standard for diagnosing OSA and for grading its severity. However, PSG may not be feasible to be performed in community setting.

The prevalence of OSA in school age children was reported between 1 and 4%[9,10]. Diagnostic performance of reporting snoring and specific symptoms for SDB varies due to variation in the definition and population setting[6-8]. However, the questionnaire is useful in quantifying burden of SDB in epidemiological studies. The present study aimed to determine the prevalence of SDB in Pathumthani, Thailand by using the modified questionnaire from Tucson Children's Assessment of Sleep Apnea study (TuCASA)[1]. Risks factors for SDB were explored.

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Material and Method

A cross-section survey was conducted between May and December, 2013 on all pupils studying

in 6 primary schools, 3 public state and 3 private schools, in Pathumthani Province located in the central part of Thailand. Screening questionnaire from Tucson Children's Assessment of Sleep Apnea study (TuCASA)[1] was forward and backward translated by English speaking doctor. Then the questionnaire was reviewed and modified by the pediatric pulmonologist in the hospital, in order to assess sleep-disordered breathing (SDB) among Thai children. The self-administered parental-reported questionnaire contained snoring and related symptoms with 5 point frequency scale. Habitual snoring and witnessed sleep apnea conditions were defined by relevant screening questions. Habitual snoring was defined as snoring frequency of 6 to 7 nights a week. Allergic rhinitis, asthma and atopic dermatitis were defined by parental-reported of relevant questions. Obesity was defined as weight more than 120% of the median weight for height.

Data collecting form including the screening questionnaire for SDB, demographic and family characteristics, and written informed consent forms were sent to all parents with a letter explaining the purpose of the study and how the data would be handled confidentially. Once completed, the parents were asked to send it back to the research team using a stamped envelope provided by the research team. The study was approved by the ethic committee of Thammasat University.

Statistical analysis

All analyses were done using statistical software STATA version 12.1. The categorical characteristics were described by count and percent. The continuous characteristics were described by mean and standard deviation. The prevalence was calculated with its 95% confidence interval. Risk factors for habitual snoring and witnessed apnea were analyzed by logistic regression. Multiple logistic regression models were used to determine the risk factors associated with habitual snoring and witnessed apnea. The models included allergic rhinitis, asthma, atopic dermatitis, gender, obesity and passive smoking. Significant risk factors were defined as a Wald statistic gave a *p*-value of 0.05. The adjusted odds ratio (aOR) of each significant factor was reported with their 95% confidence intervals.

Results

Of 3,240 pupils in 6 selected schools, there were 2,892 completing questionnaires (response rate of 89.3%) for analysis. Most informants were pupils' mothers presented in the Table 1. The prevalence of parental-reported habitual snoring and witnessed sleep apnea was 4.3% (95% confidence interval: 3.6 to 5.1%) and 1.3% (95% confidence interval: 0.9 to 1.8%) respectively. The prevalence of parental-reported ever having allergic rhinitis, asthma, and atopic dermatitis was 32.7% (95% confidence interval: 31.0 to 34.4%), 11.9% (95% confidence interval: 10.7 to 13.1%), and 11.5% (95% confidence interval: 10.4 to 12.7%) respectively. Characteristics of pupils with habitual snoring and witnessed sleep apnea were presented in Table 2.

There were several significant factors associated with habitual snoring summarized in the univariate analysis in Table 3. Habitual snoring was significantly associated with male gender (aOR = 1.9: 95% confidence interval: 1.1 to 3.6), passive smoking (aOR = 2.2, 95% confidence interval: 1.1 to 4.5), obesity (aOR = 4.7, 95% confidence interval: 2.6 to 8.5), allergic rhinitis (aOR = 2.4, 95% confidence interval: 1.5 to 3.9) and asthma (aOR = 1.7, 95% confidence interval: 1.1 to 2.9), respectively.

The significant risk of witnessed sleep apnea was allergic rhinitis (aOR = 5.8 (95% confidence interval: 1.8 to 18.9) and asthma (aOR = 2.3, 95% confidence interval: 1.2 to 6.4), summarized in Table 4.

Discussion

The prevalence of habitual snoring in Thai primary school pupils in our study of 4.3% was

Table 1. Characteristics of pupils

Characteristics	Total (n = 2,892)	
	Frequency	Percent
Informants		
Father	645	22.3
Mother	1,941	67.1
Others	306	10.6
Mean age in years (SD)	7.9 (1.3)	
Gender: male	1,460	50.5
Obesity	610	21.1
Passive smoking	772	26.7
Household dog	905	31.3
Household cat	416	14.4
Allergic rhinitis	946	32.7
Asthma	344	11.9
Atopic dermatitis	333	11.5

Table 2. Characteristics of pupils with habitual snoring and witnessed sleep apnea

Characteristics	Habitual snoring (n = 124)			Witnessed sleep apnea (n = 38)		
	Frequency	Percent	*p*-value	Frequency	Percent	*p*-value
Informants			0.061			0.426
Father	17	13.7		9	23.7	
Mother	85	68.5		22	57.9	
Others	22	17.8		7	18.4	
Mean age in years (SD)	7.8 (1.4)		0.785	7.9 (1.2)		0.863
Gender: male	81	65.3	0.003*	20	52.6	0.844
Obesity	66	53.2	<0.001*	12	31.6	0.262
Passive smoking	42	33.9	0.102	11	28.9	0.807
Household dog	59	47.6	0.001*	19	50.0	0.054
Household cat	18	14.5	0.533	6	15.8	0.775
Diagnosed of allergic rhinitis	68	54.8	<0.001*	28	73.7*	<0.001*
Diagnosed of asthma	63	50.8	<0.001*	23	60.5*	0.004*
Diagnosed of atopic dermatitis	24	19.4	0.049*	15	39.5*	0.003*

Table 3. Risk factors of habitual snoring by multivariable analysis (n = 124)

Risk factors	Adjusted odds ratio	95% CI	*p*-value
Allergic rhinitis	2.4	1.5 to 3.9	<0.001*
Asthma	1.7	1.1 to 2.9	0.041*
Atopic dermatitis	1.8	0.7 to 4.3	0.180
Obesity	4.7	2.6 to 8.5	<0.001*
Gender: male	1.9	1.1 to 3.6	0.030*
Passive smoking	2.2	1.1 to 4.5	0.031*

Table 4. Risk factors of witness sleep apnea by multivariable analysis (n = 38)

Conditions	Adjusted odds ratio	95% CI	*p*-value
Allergic rhinitis	5.8	1.8 to 18.9	0.013*
Asthma	2.3	1.2 to 6.4	0.035*
Atopic dermatitis	1.4	0.2 to 8.1	0.715
Obesity	2.7	0.8 to 8.7	0.091
Gender: male	1.3	0.4 to 4.3	0.626
Passive smoking	1.4	0.2 to 8.0	0.730

approximately to the reported prevalence of 3.3% to 10.9% from previous studies[3,5,10,12,13]. The prevalence of witness sleep apnea of 1.3% was comparable to the reported prevalence among Hong Kong primary school children[5]. Prevalence rates differed across the studies due to variation of the definition of SDB, the questionnaire being used and study populations.

We found that male gender was significantly associated with habitual snoring (aOR = 1.9, 95% CI; 1.1 to 3.6, *p*-value 0.030) but not with witnessed sleep apnea (aOR = 1.3, 95% CI; 0.4 to 4.3, *p*-value = 0.626). This observation was similar to the report from previous studies[5,12,14,15]. The association between obesity and habitual snoring was observed in our study with the adjusted odds ratio of 4.7 (95% CI; 2.6 to 8.5, *p*-value <0.001), similar to the results in other studies[12,15,16]. The relationship between obesity and snoring may related to a reduction in pharyngeal airway diameter produced by deposit of adipose tissue in the upper airways[17]. However, Our study did not found the significant association of obesity with witnessed sleep apnea.

Like previous studies[12,14,16], passive smoking was significantly associated with habitual snoring, (aOR = 2.2, 95% CI: 1.1 to 4.5, *p*-value = *0.031*). Smoking can provoke pharyngeal inflammation and mucosal edema that causing obstruction and collapse of the pharyngeal airway, and thus increase the risk of snoring[18,19].

Allergic rhinitis was found to be a significant risk of habitual snoring (aOR = 2.4, 95% CI: 1.5 to 3.9, *p*-value <0.001) and a stronger risk of witnessed sleep apnea (aOR = 5.8, 95% CI; 1.8 to 18.9, *p*-value = 0.013). The association between allergic rhinitis and sleep breathing disorder was established in previous studies[5,10,12,13,16]. Allergic rhinitis are associated with nasal mucosa inflammation, nasal mucosal edema and mucous secretion that leads to nasal obstruction. Nasal

obstruction results in upper airway obstruction. Similarly, asthma was significantly associated with habitual snoring and witnessed sleep apnea (aOR = 1.7 and 2.3 respectively). The association was also found in the reports from other studies[12,15]. The relationship between asthma and sleep breathing disorder appears to be bidirectional. Children with asthma were more likely to develop habitual snoring and obstructive sleep apnea, and children with SBD were more likely to develop asthma[20].

There were some limitations of the study. Firstly, the schools in this study were not selected by proportional sampling. However, both public state and private schools where pupils with different socioeconomic status studied were recruited in the study. Generalizability of the prevalence should be cautious due to the problem of selection bias. Secondly, definition of SDB including habitual snoring and witnessed sleep apnea, and allergic diseases in this study were based on self-administered parental reports, due to performing the study in community setting. So inaccuracy measurement of the conditions may be the problem.

In conclusion, Sleep disordered breathing (SDB) is a little found in Thai primary school children. Allergic rhinitis and asthma were significant risk factors of habitual snoring and witnessed sleep apnea. Obesity and passive smoking were associated with habitual snoring. We recommend that children who had risks as respiratory allergic disease, obesity and passive smoking should be screened for SDB symptoms.

What is already known on this topic?

Sleep disordered breathing (SDB) represents a spectrum of breathing disorders, ranging from habitual snoring, witnessed sleep apnea to obstructive sleep apnea (OSA). Screening methods by questionnaire have been used to identify SDB among children.

What this study adds?

Sleep disordered breathing (SDB) is a little found in Thai primary school children. Allergic rhinitis and asthma were significant risk factors of habitual snoring and witnessed sleep apnea. Obesity and passive smoking were associated with habitual snoring. We recommend that children who had risks as respiratory allergic disease, obesity and passive smoking should be screened for SDB symptoms

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Potential conflicts of interest

None.

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ภาวะหายใจผิดปกติขณะหลับในเด็กไทยชั้นประถมศึกษา

ภาสกร ศรีทิพย์สุขโข, ประภาศรี กุลาเลิศ, อารยา ศรัทธาพุทธ, นครินทร์ ธนกิติวิรุฬ

ภูมิหลัง: ภาวะหายใจผิดปกติขณะหลับมีความรุนแรงตั้งแต่นอนกรนเสียงดังไปจนถึงภาวะอุดกั้นของทางเดินหายใจส่วนต้นที่มีการหยุดหายใจ แบบสอบถามประเมินอาการนอนกรนของเด็กโดยให้ผู้ปกครองเป็นผู้ตอบนำมาใช้ในการคัดกรองเด็กที่ภาวะนอนกรนได้ ยังมีการศึกษาน้อยในเด็กไทย

วัตถุประสงค์: เพื่อศึกษาหาความชุกและปัจจัยเสี่ยงของภาวะหายใจผิดปกติขณะหลับในเด็กชั้นประถมศึกษาที่ศึกษาในโรงเรียนประถมศึกษา จังหวัดปทุมธานี

วัสดุและวิธีการ: การศึกษาแบบตัดขวางเก็บข้อมูลนักเรียนชั้นประถมศึกษาทุกคนจำนวน 6 โรงเรียนในจังหวัดปทุมธานีใช้แบบสอบถาม ซึ่งดัดแปลงมาจากแบบสอบถามของ Tucson Children's Assessment of Sleep Apnea study (TuCASA) โดยให้ผู้ปกครองเป็นผู้ตอบแบบสอบถามเกี่ยวกับอาการนอนกรนดังเป็นประจำ (habitual snoring) และอาการหยุดหายใจขณะนอนหลับ (witnessed apnea)

ผลการศึกษา: ส่งแบบสอบถาม 3,240 ชุด ตอบกลับมา 2,892 ชุด (ร้อยละ 89.3) พบว่ามีผู้ปกครองรายงานเด็กมีอาการนอนกรนดังเป็นประจำร้อยละ 4.3 และมีอาการหยุดหายใจขณะนอนหลับร้อยละ 1.3 จากการศึกษาปัจจัยเสี่ยงของอาการนอนกรนดังเป็นประจำพบว่าเพศชายมีความเสี่ยงต่อการเกิดอาการนอนกรนเป็น 1.9 เท่า (aOR = 1.9; 95% CI, 1.1 ถึง 3.6), การสัมผัสควันบุหรี่มีความเสี่ยง 2.2 เท่า (aOR = 2.2, 95% CI: 1.1 ถึง 4.5), ภาวะอ้วนมีความเสี่ยง 4.7 เท่า (aOR = 4.7, 95% CI: 2.6 ถึง 8.5), โรคจมูกอักเสบจากภูมิแพ้มีความเสี่ยง 2.4 เท่า (aOR = 2.4, 95% CI: 1.5 ถึง 3.9) และโรคหืดมีความเสี่ยง 1.7 เท่า (1.7; 95% CI: 1.1 ถึง 2.9) อีกทั้งโรคจมูกอักเสบจากภูมิแพ้และโรคหืดยังเป็นปัจจัยเสี่ยงต่ออาการหยุดหายใจขณะนอนหลับซึ่งมีค่า aOR = 5.8, 95% CI: 1.8 ถึง 18.9 และ aOR = 2.3, 95% CI: 1.2 ถึง 6.4 ตามลำดับ

สรุป: ภาวะหายใจผิดปกติขณะหลับเป็นภาวะที่พบได้น้อยในเด็กนักเรียนไทยชั้นประถมศึกษา โดยโรคจมูกอักเสบจากภูมิแพ้และโรคหืดเป็นปัจจัยเสี่ยงสำคัญต่อการเกิดอาการนอนกรนดังเป็นประจำและอาการหยุดหายใจขณะนอนหลับในเด็ก อีกทั้งภาวะอ้วนและการสัมผัสควันบุหรี่ยังเป็นปัจจัยเสี่ยงต่อการเกิดอาการนอนกรนดังเป็นประจำด้วย จากผลการศึกษานี้จึงมีข้อแนะนำว่าเด็กที่มีโรคภูมิแพ้ระบบทางเดินหายใจ ภาวะอ้วนและสัมผัสควันบุหรี่เป็นเด็กกลุ่มเสี่ยงที่ควรได้รับการตรวจคัดกรองภาวะหายใจผิดปกติขณะหลับ