Prevalence of Chronic Rhinitis in Thai Patients with Obstructive Sleep Disordered Breathing

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Objective: *To prospectively identify the prevalence of chronic rhinitis (CR) and findings from objective nasal airway evaluation in Thai patients with obstructive sleep disordered breathing (OSDB) in a sleep clinic.*

Material and Method: *Seventy patients, 44 males and 26 females, with OSDB were recruited. All were asked to complete Epworth sleepiness scale (ESS), questionnaires regarding nasal symptoms including scores to assess the severity of CR, and objective nasal airway measurements. Nasal airway resistance (NAR) was measured by active anterior rhinomanometry and nasal volume and minimal cross-sectional area (MCA) were measured by acoustic rhinometry (before topical decongestion).*

Results: *Fifty-nine patients (84.3%) had a history of nasal obstruction, rhinorrhea, sneezing, and itching of either intermittent or persistent pattern, regardless of severity, for more than one month. Forty-six patients (65.7%) had active symptom of nasal obstruction. About 23% of patients had NAR higher than and 33% had MCA lower than 1 SD from the mean of normative values in healthy Asians. Both subjective and objective nasal parameters did not have a statistically significant correlation with the scores of ESS.*

Conclusion: *A substantial proportion of patients with OSDB in the sleep clinic had co-existing CR symptoms and a tendency to be abnormal in objective nasal parameters when compared to general population. Careful history recording and a thorough evaluation of the nasal airway are, therefore, essential in these patients.*

Keywords: *Chronic rhinitis, Snoring, Obstructive sleep apnea, Obstructive sleep disordered breathing, Thai*

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Obstructive sleep disordered breathing (OSDB) is a collective term that encompasses a spectrum of disorders ranging from primary snoring and upper airway resistance syndrome to obstructive sleep apnea (OSA). During sleep, patients with OSDB develop repetitive episodes of partial or complete collapse of the upper airway causing a fragmented sleep with or without a significant oxygen desaturation. If left untreated, particularly in severe cases, it may lead to several health consequences including hypertension[1], cardiovascular diseases[2], increasing risk of accidents[3], and impaired quality of life[4].

Chronic rhinitis (CR) is highly prevalent in general population and can be found as a co-existing problem in patients with OSDB. CR may be classified into allergic rhinitis (AR) or non-allergic rhinitis (non-AR), however, both of which may present with similar symptoms including nasal obstruction, rhinorrhea, sneezing, and itching. As nose is the first boundary and accounts for more than 50% of the total airway resistance, nasal obstruction, which is a main symptom of CR, may induce more negative intraluminal pressure predisposing individuals to more collapsibility of the airway and contribute to pathogenesis of OSDB[5-7]. Although not entirely clear, several theories have been established to explain the mechanisms of the effect of CR on OSDB[5-8]. Apart from obstruction, various inflammatory mediators, postural changes and some therapeutic agents such as antihistamines may also have direct effects on sleep regulation and sleep quality[5,8]. In a study of Young et al, subjects with nasal congestion due to AR were 1.8 times more likely to have moderate to severe OSDB than subjects with AR without nasal congestion[9].

Estimated prevalence of this problem may vary from 9% to 42% with regard to AR depending on its definition, methods used, and populations surveyed[8,10,11]. This is especially seen in developed countries with an increasing prevalence rates dating from the last decades. However, the prevalence of CR specifically in patients with OSDB has been very little

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focused. Since the impacts of CR are not only the pathogenesis of OSDB but its treatment also affects the improvement of sleep quality[5,8,12] and compliance of continuous positive airway pressure (CPAP) therapy[13,14], the fundamental knowledge in the relationship of both conditions is considered to be essential.

The aim of the present study was, therefore, to prospectively identify the prevalence of CR and findings from objective nasal airway evaluation in patients with OSDB which should not be overlooked during clinical management of OSDB.

Material and Method

The present prospective study was conducted between January 2007 and January 2008 after an approval from Siriraj Institutional Review Board (SIRB). Since the present study was a preliminary report of prevalence of CR in Thai patients with OSDB, which was unknown, the authors tried to recruit consecutive patients who were newly diagnosed to be OSDB. The inclusion criteria were patients aged over 18 years old who had a history of habitual snoring with and without excessive sleepiness seeking medical consultation. Polysomnography (PSG) was done to confirm diagnosis in a majority of patients. The exclusion criteria were patients who had coexisting active sinonasal disorders such as acute or chronic rhinosinusitis, nasal polyps, severe deviated nasal septum, nasal valve collapses, or history of previous intranasal surgery. The authors also excluded the patients who were allergic or intolerant to topical decongestant, patients with underlying hematologic disease, unstable cardiovascular problems, psychiatric or emotional problems, language or cognitive difficulties that might reduce the reliability of self-administered questionnaires, and patients who did not complete the follow-up protocol. Seventy patients fulfilled the selection criteria and were enrolled from an outpatient ENT clinic at Siriraj hospital after getting written informed consents. Although not mandatory, the authors had advised all patients to have allergy skin tests and PSG for the best long-term treatment plan. However, no distinction was made between patients who had AR and non-AR since both can present with nasal congestion that contributes to the pathogenesis of OSDB.

Subjective evaluation

All participants were asked to complete questionnaires including general demographic data (age, sex, body mass index; BMI), sleep-related history, and nasal symptoms including scores to assess the severity of nasal obstruction, rhinorrhea, itching, and sneezing during past 2 weeks. The authors defined nasal symptoms score 0 as no symptom, 1 as mild, 2 as moderate, and 3 as maximal symptom severity. Since there has been no universal consensus on the definition of CR, the authors used the definition from the consensus of rhinologists from seven medical schools who established the Rhinosinusitis Registry research project in Thailand. They defined CR as the presence of nasal obstruction, rhinorrhea, sneezing, and itching regardless of patterns or severity, for more than one month[15]. All subjects also completed the Thai version of Epworth sleepiness scale (ESS)[16], which is a validated self-administered questionnaires to assess the degree of sleepiness during eight common situations where subjects are asked to rate their chance of dozing in recent times on a scale of 0 to 3 in each situation. The total score of ESS can range from 0 to 24 in which a lower score means less sleepiness.

Objective evaluation

Nasal airway resistance (NAR) of all patients was assessed by active anterior rhinomanometry (RMM), (ATMOS 300, Germany), which measured nasal airflow at pressure difference of 75 Pascals (Pas) before and after applying intranasal decongestant as internationally recommended. The volumes of nasal cavities (VOL) and minimal cross sectional area (MCA) were measured by acoustic rhinometry (ARM), Eccovision; System V 3.54, Germany, which can easily evaluate intranasal structures by analyzing reflected sound waves introduced through the nares within a short period of time. The VOL in the present study was measured as the area between anterior nares and the distance at 6 cm deep inside nasal cavities. The authors also performed intranasal endoscopy to exclude other pathology in all patients. Since there is no universal consensus available at present, the authors arbitrarily defined patients with high NAR if their NAR was greater than means of normal values[17] plus 1 standard deviation (SD), and low MCA or low VOL if their values were lesser than 1 SD below the means of normative data[18] in healthy Asians.

Statistical methods

The prevalence of CR and objective nasal airway parameters were reported in percentages of proportion. Quantitative data were reported in mean ± SD. The correlation between continuous

variables and ESS was tested by Spearman's correlation coefficients. Statistical analysis was performed with the IBM SPSS (version 18.0, New York, USA).

Results

Seventy OSDB patients that included 44 males and 26 females, with ages ranging from 18 to 82 years old, were recruited in the present study. The mean BMI and ESS of subjects were 26.1±5.0 kg/m^2 and 9.5±5.1, respectively. Forty-two patients had PSG results (10 primary snoring, six mild OSA, 12 moderate OSA, 14 severe OSA), and 28 did not. Only 18 patients had skin prick test done (12 positive and 6 negative to common aeroallergens in Thailand) due to a very long waiting list. The severity of rhinitis symptoms is shown in Table 1 and the objective nasal airway parameters are shown in Table 2. Patients with OSDB had higher means of NAR, lower means of VOL and MCA compared with normal values in healthy Asians[17,18]. Fifty-nine patients (84.3%) had a history of nasal obstruction, rhinorrhea, sneezing, and itching either intermittent or persistent pattern regardless of severity for more than one month (Table 3). Forty-six patients (65.7%) had symptoms of nasal obstruction at least mild degree at the time of examination. The prevalence of potentially abnormal objective nasal airway parameters in patients with OSDB is presented in Table 3. In subsequent analysis, the authors found that both subjective and objective nasal airway parameters did not have a statistically significant correlation with the scores of ESS as shown in Table 4.

Discussion

CR is highly prevalent in the general population and can be found as a common coexisting problem in patients with OSDB. It has an impact not only on the etiology but also on the treatment outcomes of OSDB and sleep quality after reversing of nasal obstruction. Nasal steroids have been proven to improve subjective quality of sleep in patients with non-AR or AR adults who had OSA in randomized controlled studies[19]. Surgery to improve nasal patency in selected patients with OSDB may additionally reduce snoring, improve quality of life, and improve CPAP compliance[5,8,12-14], although it is an inadequate treatment for most of OSA patients by itself. However, the prevalence of CR specifically in patients with OSDB is unclear. Since there is currently no universal consensus of the definition of CR, the authors, thus, reported its prevalence from both subjective symptoms based on the consensus of rhinologists involving a large

Table 1. Severity of rhinitis symptoms (n = 70)

symptoms	Range	Mild (n)	Moderate (n)	Severe (n)
Obstruction	0-3	24	16	6
Rhinorrhea	0-2	27	9	0
Itching	0-3	22	10	2
Sneezing	0-3	34	10	6

The severity of symptoms was presented in four-point rating scales; scores 0 = no symptoms, 1 = mild; 2 = moderate, and 3 = severe.
n = numbers of patients with various symptoms from a total of 70 patients

Table 2. Objective nasal airway parameters and their normative values in Asians

	Before decongestant (mean ± SD)	Normative values[17,18] (mean ± SD)
NAR	0.28±0.24	0.22±0.10
MCA	0.49±0.14	0.53±0.10
VOL	6.60±1.73	7.92±3.14

NAR = nasal airway resistance; MCA = minimal cross-sectional area; VOL = nasal volume

Table 3. Prevalence of chronic rhinitis in patients with obstructive sleep disordered breathing by different proposed definitions (n = 70)

Definitions	n	Percentages (%)
Patients with any symptoms last >1 month	59	84.3
Patients with obstructive symptom	46	65.7
Patients with high NAR	16	22.9
Patients with low MCA	23	32.9
Patients with low VOL	8	11.4

NAR = nasal airway resistance; MCA = minimal cross-sectional area; VOL = nasal volume; n = numbers of patients; Percentages = proportion of patients from a total of 70 patients

Table 4. Spearman's correlation coefficients between nasal airway parameters and Epworth sleepiness scale (n = 70)

	Correlation coefficients (r)	p-value
Nasal obstructive symptom	0.06	0.60
Nasal airway resistance	-0.17	0.17
Minimal cross-sectional area	-0.04	0.71
Nasal volume	-0.05	0.75

multi-center trial, the Rhinosinusitis Registry in Thailand[15] and objective nasal airway parameters in this prospective study.

The results of the present study showed that 59 patients (84.3%) with OSDB had a diagnosis of CR by the authors' definition. However, nasal obstruction was found in 46 patients (65.7%) as a main symptom and almost half of them presented with moderate to severe degree at the time of examination. These findings demonstrated a substantially higher prevalence of CR in OSDB patients than those in the general population of western countries which were reported to be from 9% to 42% with regard to AR[8,10,11] and that of Thais which was reported to be 13.2%[20]. Although the authors' prevalence was greatly beyond expectations due to the uncertainty of subjective reports from patients and a relatively small sample size, it was in the same direction with the studies of Canova et al[21] which perennial AR was found about five times more in OSA patients than in controls. It is possible that the prevalence of CR has been increasing continuously in recent years along with an increasing awareness of OSDB.

Regarding objective nasal airway evaluation, the authors found that there were about 23% of patients had NAR higher than 1 SD from the mean of normative values[17] and 33% or one-third had MCA smaller than 1 SD from the mean of normative values of healthy Asian subjects[18]. Thus, it is possible that patients with OSDB tend to have higher NAR and smaller MCA than in general population. The sites of nasal airflow obstruction may be primarily due to pathologies at nasal valves, inferior turbinates, or obstruction from any pathology. These findings underline the importance of comprehensive nasal airway assessment in all patients with OSDB.

There were both strengths and limitations in the present study. Firstly, the definitions of CR used in the authors' investigation may not be universally accepted. Nonetheless, this is a common problem for reporting and interpreting prevalence of CR symptoms worldwide since there has been no consensus on this issue to date[8,10,11]. To reduce biases from the results, the authors, thus, also reported the prevalence of CR by using objective nasal airway parameters to increase the strength of study. Although, one may argue that the correlation of nasal obstruction between objective and subjective evaluation of patients is uncertain[22], the physician should still attempt to objectively assess in addition to accepting the patient's perception. Secondly, the authors did not classify CR into AR or non-AR, which may not lead to the best plan of long-term treatment. Nevertheless, the authors believe that most cases were in AR group as it is reported in general population. Since both AR and non-AR can have nasal obstruction as a presenting symptom and the treatment of which is similar, the authors, therefore, decided to report both conditions in the term of CR. Thirdly, this study represented only the OSDB patients seeking for medical consultation in a tertiary care setting. Therefore, the prevalence of CR was likely to be higher than the general population and its applicability may not be suitable for general practitioner. Finally, because we had a relatively small number of subjects, the interpretation of results may be false. However, the present study was probably among few investigations focusing on the prevalence of CR in adult patients with OSDB. This stimulates the awareness of co-existence of both problems, particularly in Asians. Whenever possible, the authors encourage other investigators to put these issues into account so that more comprehensive studies in larger groups of subject will be conducted in the near future.

Conclusion

The prevalence of CR in Thai patients with OSDB was substantially high, although significant variability of definitions is still existed. In patients who have symptoms or signs suggestive of OSDB, careful history taking and thorough evaluation of the nasal airway are essential to identify the underlying nasal pathology since it has a significant impact not only on the pathogenesis of OSDB but also on the treatment outcomes.

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Potential conflicts of interest

None.

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ความชุกของเยื่อบุจมูกอักเสบเรื้อรังในผู้ป่วยไทยที่มีภาวะหายใจผิดปกติขณะหลับชนิดอุดกั้น

ปารยะ อาศนะเสน, วิชญ์ บรรณหิรัญ, นพพงศ์ โฆษิตชัยวัฒน์, ฉวีวรรณ บุนนาค

วัตถุประสงค์: เพื่อหาความชุกของเยื่อบุจมูกอักเสบเรื้อรังและลักษณะของจมูกที่ตรวจพบด้วยเครื่องมือในผู้ป่วยไทยที่มีภาวะหายใจผิดปกติขณะหลับชนิดอุดกั้นในคลินิกนอนกรน

วัสดุและวิธีการ: มีผู้ป่วยจำนวน 70 ราย โดยเป็นเพศชาย 44 ราย และเพศหญิง 26 ราย เข้าร่วมในการศึกษา โดยผู้ป่วยทุกรายได้รับแบบสอบถามระดับความง่วงนอนเอ็บเวิรธ์ และอาการต่าง ๆ ทางจมูกซึ่งมีคะแนนสำหรับประเมินความรุนแรงของเยื่อบุจมูกอักเสบเรื้อรัง ผู้ป่วยทุกรายได้รับการตรวจจมูกด้วยเครื่องมือสำหรับวัดความต้านทานของทางเดินหายใจส่วนจมูก (nasal airway resistance; NAR) ด้วยเครื่อง active anterior rhinomanometry (RMM) และตรวจปริมาตรของจมูก (nasal volume) รวมถึงพื้นที่หน้าตัดที่แคบที่สุดของจมูก (minimal cross-sectional area; MCA) ด้วยเครื่อง acoustic rhinometry (ARM) ก่อนได้รับยาพ่นจมูกเพื่อลดการบวม

ผลการศึกษา: พบว่ามีผู้ป่วยจำนวน 59 ราย จากทั้งหมด 70 ราย หรือร้อยละ 84.3 ที่มีอาการคัดจมูก, น้ำมูกไหล, คันจมูก และจาม ในทุกระดับความรุนแรงเกิน 1 เดือน และในจำนวนนี้มี 46 ราย หรือร้อยละ 65.7 มีอาการคัดจมูกเป็นอาการสำคัญ โดยพบว่าร้อยละ 23 ของผู้ป่วยมีค่าความต้านทานของทางเดินหายใจส่วนจมูก (NAR) สูงกว่าปกติ และร้อยละ 33 ของผู้ป่วยมีพื้นที่หน้าตัดที่แคบที่สุดของจมูก (MCA) น้อยกว่า 1 เท่า ของค่าเบี่ยงเบนมาตรฐานจากค่าเฉลี่ยของประชากรชาวเอเชีย (1 SD) อย่างไรก็ตามทั้งอาการของผู้ป่วยและผลจากการตรวจด้วยเครื่องมือพบว่าไม่มีความสัมพันธ์ที่มีนัยสำคัญทางสถิติกับคะแนนจากแบบสอบถามระดับความง่วงนอนเอ็บเวิรธ์

สรุป: จากการศึกษาพบว่าในผู้ป่วยที่มีภาวะหายใจผิดปกติขณะหลับชนิดอุดกั้นจำนวนมากที่รับการรักษาในคลินิกเฉพาะโรคมีเยื่อบุจมูกอักเสบ ร่วมด้วยโดยมีแนวโน้มที่ผิดปกติจากการตรวจด้วยเครื่องมือทางจมูกเมื่อเทียบกับค่าเฉลี่ยของประชากรทั่วไป ดังนั้นการซักประวัติและการตรวจค้นอย่างละเอียดของความผิดปกติดังกล่าว จึงเป็นพื้นฐานที่สำคัญอย่างสูงในการดูแลผู้ป่วยเหล่านี้