Night-time symptoms and daytime sleepiness among patients with allergic rhinitis

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Introduction: Allergic rhinitis (AR) is a disease affecting not only the nose and eye but also sleep and emotion, leading to impairment of daily activity. Night-time symptoms with daytime sleepiness can directly or indirectly reduce performance at work or school. The aim of this study was to evaluate the night-time symptoms and daytime sleepiness among patients with AR.

Patients and methods: This study was conducted from March 2011 until March 2012 involving 354 patients with AR, aged between 12 and 75 years. All patients were interviewed for night-time symptoms, and a validated Malay version of Epworth Sleepiness Scale (ESS) questionnaire was used. Clinical and nasoendoscopic examinations were done.

Results: Most patients with AR reported nasal obstruction as the most bothersome night-time symptoms (43.5%). Other bothersome night-time symptoms were nasal or eyes itchiness (37.3%), repeated sneezing (39.2%), rhinorrhoea (36.7%), headache (24.8%), and facial pain or pressure (18.3%). Most patients (71.2%) had ESS less than or equal to 10 (normal); 22.8% had mild daytime sleepiness (ESS=11–15) and 6.8% had severe daytime sleepiness (ESS>15).

Conclusion: The relationship between nasal obstruction and daytime sleepiness is significant (P=0.0036). The presence of nasal obstruction is an indicator of daytime sleepiness among patients with AR.

Keywords: allergic rhinitis, daytime sleepiness, night-time symptoms

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Introduction

The relationship of allergic rhinitis (AR)-related sleep impairment is acknowledged in the Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines, in which presence of abnormal sleep will reclassify the severity of AR from mild to moderate or severe. [1] In addition, a study found that rhinitis is an independent important risk factor for assessing difficulty in maintaining sleep, early morning awakening, and daytime sleepiness. [2] Sleep disorders, including insomnia and sleep-disordered breathing, are exceedingly common in patients with AR and contribute greatly toward daytime function and quality of life.

Excessive daytime sleepiness (EDS) is defined by the International Classification of Sleep Disorder based on the behavior of falling asleep, including difficulty maintaining alertness or wakefulness and unintentionally falling asleep. [3] It is a symptom, not a disorder, that can have many different causes, ranging from sleep deprivation or inadequate sleep hygiene to drug effects and serious medical conditions.

In recent years, sleepiness has been used to mean sleep propensity; thus, EDS may be defined as a symptom arising at any time from an excessive propensity to become drowsy or to fall asleep, when the intention and expectation is to remain awake and alert at the time.[4] In the general population, it affects 18.9% of Brazilian community, and 8.9% of Japanese had abnormal Epworth Sleepiness Scale (EES) score of more than 10. [5,6] Kamil et al. [7] reported an EDS prevalence of 14.8% in Malaysian general population.

Few prevalence studies showed highly variable rates of EDS among college or university students, from as low as 4.1% in Japanese graduate students [8] to as high as 39.5% in Brazilian medical schools. [9] EDS also was documented to have occurred in 35.5% of medical students in a local university in Malaysia. [10] Although sleep deprivation was found to be the main cause, the possibility of AR causing disturbed night sleep, in turn causing EDS, was never explored. This study was aimed to determine the night-time symptoms and daytime sleepiness in patients with AR. It is important to establish the night-time symptoms and daytime sleepiness in AR, as treating the night-time symptoms will improve the quality of sleep and daytime sleepiness. Thus, patients with AR must be routinely asked and evaluated regarding their night-time symptoms, sleep quality, and daytime sleepiness. Similarly, patients displaying daytime sleepiness must be evaluated regarding the possibility of their daytime sleepiness being related to AR.

Material and Methods

Study design

This was a cross-sectional study. This study was carried out after obtainingt approval from the University Human Ethical Committee [approval number: USMKK/PPP/JEPeM; 237.4(2.6)] and was performed in adherence with the Declaration of Helsinki. The studied population comprised individuals with AR, who attended our outpatient otorhinolaryngology clinic for consultation and treatment. Patients between the ages of 12 and 75 years were selected.

We enrolled patients diagnosed as having AR by symptoms and supported with clinical findings and who consented for the study. The ARIA guidelines were used to define the diagnostic criteria for AR in this study. AR was defined as a symptomatic disorder of the nose characterized by one or more symptoms of itchiness, sneezing, rhinorrhoea, and nasal congestion, which were reversible spontaneously or with treatment. [1,11] Those who were on AR medications (either antihistamine, corticosteroid intranasal spray, or both) were included. Patients with nasal conditions such as polyps grade III, major nasal septum deviation, or adenoid hypertrophy (third and fourth degree) or patients with sleep disorder or illness affecting sleep such as neurological illness (epilepsy), lung disease (bronchial asthma or chronic obstructive pulmonary disease), and known case of obstructive sleep apnea were excluded. Patients on sedative medications and pregnant women were also excluded. Outcome was measured using night-time symptoms and ESS. [12] In both assessments, items were given scores ranging from 0 to 3. Scores for items in ESS were given based on the likelihood of falling asleep in each situation. For the night-time symptoms, items were scored based on how much bothersome the symptoms were. All data were analyzed using appropriate statistical test.

Procedure

All of the patients were subjected to clinical examination, which includes nasal endoscopy, and subsequently were interviewed regarding personal information and night-time symptoms, and all patients completed a validated Malay version of ESS. [13]

General examination

The consented patients underwent general examination and endoscopic nasal examination. General examination includes clinical features suggestive of AR such as allergic shiners (dark circle under the eyes owing to infraorbital venous congestion), salute sign at transverse nasal crease, Dennie–Morgan fold (fold or line in the skin below the lower eyelids and cobble stoning of pharyngeal mucosa), [14] and allergic facies, characterized by elongated face, open mouth with receding chin and overbite, and arching of the hard palate. [15]

Nasal endoscopic examination

Nasoendosopic examination, part of the assessment of patients with AR, was performed for all respondents. Hopkins rigid telescope 0° with diameter of 4 and 2.7 mm (Storz, Tuttlingen, Germany) was used to perform the procedure, and findings were viewed and recorded by high-definition video and digital image-capturing systems (AIDA; Storz). Typical endoscopic findings of AR looked for were pale or bluish color of turbinates, the mucosa of the turbinates appears edematous, engorged turbinate, and presence of mucoid secretions. [16] The examination was also done to exclude nasal polyps grade 3, severe nasal septum deviation, and presence of third- and fourth-degree adenoid hypertrophy.

Night-time symptoms

The interview consists of six night-time symptoms of AR. All the symptoms were among the most common questions included in AR questionnaire to assess quality of life. [17,18] The symptoms were scored from 0, for the symptoms that did not cause trouble, up to 3, for extremely troublesome night-time symptoms. The patients were asked to answer the interview based on symptoms that occur most of the nights in the past 12-month period.

Daytime sleepiness

After completing the interview and examination, all the patients were asked to fill in a separate ESS questionnaire. The ESS asks patients to rate on a scale of 0–3 their usual chances of dozing off in each of eight different situations or activities in recent times (0=would never doze and 3=a high chance of dozing). The total ESS score, ranging from 0 to 24, is the sum of eight-item scores. The higher the score indicates the higher the level of daytime sleepiness. In this study, ESS score of 11–15 was classified as mild daytime sleepiness and a score more than 15 was considered as severe daytime sleepiness.

Results

A total of 354 patients with AR were involved in this study. All of the patients enrolled in this study attended our outpatient otorhinolaryngology clinic. Of 354 patients included in this study, 207 (58.5%) patients were female and 147 (41.5%) were male. Female-to-male ratio is 1.4 : 1. From the collected data, AR affected mostly adult between the age group of 18–64 years (70%) followed by teenagers (23%) and elderly (7%) (Fig. 1).

Treatment of allergic rhinitis

All patients with AR were on treatment for their condition. Patients were either treated with antihistamine or corticosteroid intranasal spray or combined antihistamine and corticosteroid intranasal spray. Fig. 2 showed the distribution of treatment among studied patients.

Night-time symptoms

The most frequent night-time symptom experienced by patients with AR was nasal obstruction. Approximately 79% of patients with AR reported nasal obstruction on most nights during their worst nasal allergy attacks. More than half of the patients reported nasal or eyes itchiness (76.8%), repeated sneezing (73.7%), rhinorrhoea (70.9%), and headache (59.5%). Nearly half of the patients with AR reported facial pain or pressure on most of night during their worst nasal allergy attacks (Fig. 3).

Bothersome night-time symptoms

All patients were asked how bothersome their night-time symptoms were during nasal allergy attacks. Nasal obstruction was the most bothersome night-time symptom of AR (Fig. 4). Almost four of nine patients with AR reported nasal obstruction as extremely bothersome (15%) or moderately bothersome (28.5%) night-time symptom. Repeated sneezing was the second most bothersome symptom, 15.5% reported repeated sneezing as extremely bothersome and 23.7% reported it as moderately bothersome. Of nine patients with AR, nine reported nasal and eyes itchiness (37.3%) and rhinorrhoea (36.7%) as extreme or moderately bothersome. Approximately 24.8% reported headache and 18.3% of reported facial pain or pressure as extreme bothersome or moderately bothersome night-time symptoms.

Relationship between treatments and night-time symptoms

The mean score of patients using antihistamine alone is lower than the mean score of patients using corticosteroid intranasal spray alone. In terms of SD, patients using antihistamine alone has a lower SD, which is closer to 0 as compared with patients using corticosteroid intranasal spray alone (Table 1). The results indicate that there was

statistically significance difference between night-time symptoms among patients on antihistamine and corticosteroid intranasal spray (P=0.045).

Daytime sleepiness in patients with allergic rhinitis

ESS score of more than 10 reflects mild daytime sleepiness and score of more than 15 indicates severe daytime sleepiness. Figure 5 showed that one (22.8%) of five patients with AR had mild daytime sleepiness. Of 354 patients, 24 (6.8%) had severe daytime sleepiness.

Relationship between daytime sleepiness and nasal obstruction

Table 2 showed the association between daytime sleepiness (ESS score>10) and nasal obstruction. The result showed there was a significant correlation between daytime sleepiness in AR group and nasal obstruction (P=0.035). There was no significant association between other night-time symptoms and daytime sleepiness.

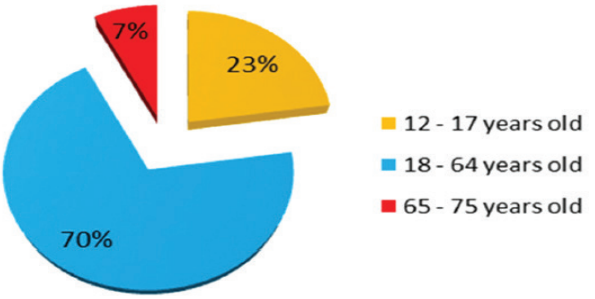

Fig 1 Age distribution among patients with allergic rhinitis

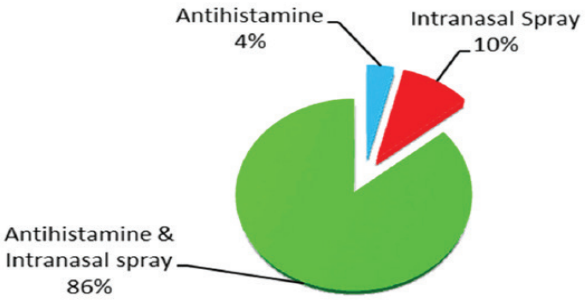

Fig 2 Distribution of treatment for patients with allergic rhinitis

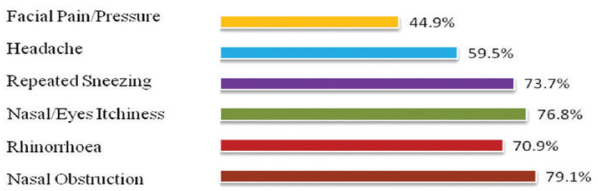

Fig 3 Frequency of night-time symptoms among patients with allergic rhinitis

Fig 4 Bothersome night-time symptoms among patients with allergic rhinitis

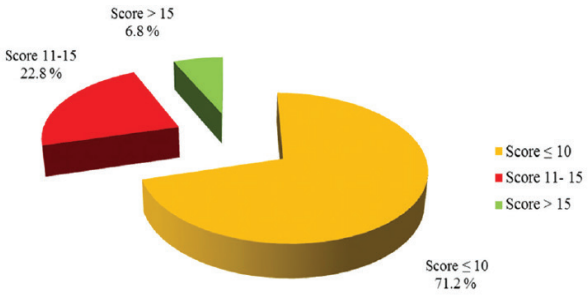

Fig 5 Epworth Sleepiness Scale score in patients with allergic rhinitis

Table 1 Relationship between treatment and night-time symptoms

	Treatment	N	Mean	SD	SEM
Night-time symptoms	Antihistamine	13	5.38	2.931	0.813
	Nasal spray	35	7.86	5.186	0.877

Table 2 Excessive daytime sleepiness and nasal obstruction

Group	Epworth Sleepiness Scale score category			
	<11	11-15	>15	Total
Allergic rhinitis group				
Nasal obstruction				
No				
Count	62	9	3	74
Within nasal obstruction (%)	83.8	12.2	4.1	100.0
Yes				
Count	192	68	20	280
Within nasal obstruction (%)	68.6	24.3	7.1	100.0
Total				
Count	254	77	23	354
Within nasal obstruction (%)	71.8	21.8	6.5	100.0
Within nasal obstruction (%)	75.9	17.9	6.3	100.0

P=0.035.

Discussion

Nasal obstruction is a very prominent and most troublesome symptom of AR to both children and adult. In our study, nasal obstruction (79.1%) and nasal or eyes itchiness (76.8%) associated with AR were the most reported symptoms affecting sleep. This was similar to the study reported by Stull et al. [19] in which nasal congestion was accounted by 73% of 404 patients with AR compared with other rhinitis symptoms. When asked about how bothersome the night-time symptoms were, almost four of nine of our patients with AR reported nasal obstruction as extremely bothersome (15%) or moderately bothersome (28.5%) night-time symptoms. Comparatively, a landmark survey of allergies in the USA [20] found that a higher percentage of patients with AR reported nasal congestion as extremely bothersome (40%) or moderately bothersome (38%).

Other symptoms, such as sneezing, rhinorrhoea, and nasal pruritus, may contribute to reduced sleep quality and sleep disturbance in AR. [21] Rhinorrhoea may be so troublesome to the patients with AR that it interfered with their sleep. Ocular itching has also been demonstrated as a cause of sleep disturbance. A total of two studies confirmed the association between ocular itch from AR and subjective sleep difficulty. [22,23] Data from our study indicated that repeated sneezing was the second most bothersome symptoms, with 15.5% of respondents reported repeated sneezing as extremely bothersome and 23.7% reported it as moderately bothersome. Three of nine patients with AR reported nasal or eyes itchiness (37.3%) and rhinorrhoea (36.7%) as usually extreme or moderately bothersome. Almost a quarter of patients (24.8%) reported headache and less than a quarter (18.3%) reported facial pain or pressure as extremely bothersome or moderately bothersome night-time symptoms.

Several explanations have been proposed to explain how nasal obstruction negatively affects breathing during sleep. The nose is the primary route of breathing during sleep by stimulating certain receptors in the nasal airways. Thus, nasal obstruction in patients with AR abolishes this neural regulation. [24] Furthermore, the evidence that this response is caused by neural regulation in human beings comes from studies that show the application of topical anesthesia in the nose and nasopharynx specifically increases nasal and pharyngeal resistance. [25] Another explanation is nasal obstruction in AR results in increased nasal airway resistance. It was reported that the airway resistance nearly triples when a patient lies down. [26] The increased in airway resistance causes nasal collapse that leads to microarousal. As the microarousal increases, sleep becomes fragmented and leads to unsatisfactory sleep. A population-based observational study by Young et al. [27] reported that patients with AR with nasal congestion had a 1.8 times more likely to have moderate to severe sleep-disordered breathing than individual without nasal congestion. Thus, the severity of AR is best represented by the sleep disturbance symptom as it is significantly associated with a more severe AR regardless of the type. This is in accordance with other studies and the ARIA guidelines [1,28].

Concomitantly, several studies demonstrated that by reducing nasal congestion, via means of intranasal corticosteroid, sleep quality was improved and subsequently decreased daytime sleepiness or fatigue. [29,30] In one study by Craig et al., [31] fluticasone propionate improved nasal congestion and quality of sleep; however, there were no significant changes in objective sleep measurements recorded using polysomnography. A meta-analytic data from 16 controlled trials involving 2267 patients with AR found that second-generation oral antihistamines were significantly less effective than intranasal corticosteroids in controlling nasal congestion. [32] Our study, however, showed that patients using antihistamine alone experienced less night-time symptoms as compared with patients using corticosteroid intranasal spray alone (P=0.045) (Table 3). This finding can be attributed to compliance to the treatment which can be affected by the difference in onset of action between these two drugs. The onset of action of corticosteroids intranasal spray is 7–8 h, slower than that of oral antihistamines (1–2 h). [33] The slower onset of action of intranasal corticosteroids influences patients' perception of efficacy, thus reduce their compliance [34].

Our study showed nasal obstruction (43.5%) was the most bothersome night-time symptoms of AR (Fig. 4). We also found significant association between nasal obstruction and ESS score (P=0.0036), thus proving that there is a significant relationship between nasal obstruction and daytime sleepiness among patients AR (Table 2). The significant relationship between nasal obstruction and daytime sleepiness in patients with AR in our study suggests that daytime sleepiness may be part of the AR

symptoms, and may be used to diagnose AR as well. On the contrary, those individuals with daytime sleepiness should be assessed for the possibility of underlying AR.

Our sample of patients with AR was recruited from patients under follow-up for AR. To standardize the data, all patients were diagnosed based on history and clinical finding. According to the consensus guideline on management of chronic inflammatory disease of the nose developed by Malaysia Society of Otorhinolaryngologists Head and Neck Surgeons, [16] the diagnosis of AR should be made based on concordance of a typical history of AR symptoms followed by signs suggestive of AR. In our study, other possible known condition/comorbid associated with daytime sleepiness and disturbed night sleeps were excluded, such as asthmatics, obstructive sleep apnea, and epilepsy. So did the medications known to cause sleepiness. The treatment performed on all study participants was also consistent with the current ARIA guidelines of the AR treatment. Thus, our survey results should be reasonably representative of AR in fairly stable conditions that are followed routinely at many specialty clinics.

Conclusion

The most bothersome night-time symptoms in patients with AR is nasal obstruction. In addition, there is a significant association between nasal obstruction and daytime sleepiness among patients with AR. Thus, the presence of nasal obstruction is an indicator of daytime sleepiness. To improve quality of life in AR, optimization of treatment with antihistamine and intranasal corticosteroids should be done together with patient education toward ensuring maximum compliance in their use of medications.

Acknowledgements

Conflicts of interest
There are no conflicts of interest.

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