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ORIGINAL RESEARCH

Prevalence of Insomnia Among Patients with Bronchial Asthma

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Background: Insomnia is commonly reported in patients with asthma. However, the prevalence of insomnia and its relationship to asthma control have not been established.

Objective: To determine the prevalence of insomnia in adults with asthma and to evaluate the association between insomnia and level of asthma control.

Methods: This is a cross-sectional study of 200 patients recruited from pulmonary clinics at a tertiary care center. Adults (age ≥16 years) diagnosed with asthma by the primary treating physician were recruited over a 6-month period from December 2018 to May 2019. Asthma and insomnia severity were assessed using the Asthma Control Test and Insomnia Severity Index (ISI).

Results: The mean age of participants was 51±17 years, and 67% were female. Insomnia (ISI score ≥10) was present in 46.5% of the participants. The severity of insomnia was inversely related to the level of asthma control: moderate-to-severe insomnia was more frequent in patients with uncontrolled asthma (43%) than in those with partially controlled asthma (25%) or well-controlled asthma (12%) ($P < 0.05$ for all comparisons).

Conclusion: Insomnia is common among patients with asthma, especially those with suboptimal asthma control. Further investigations are required to more fully understand the complex relationship between asthma and insomnia.

Keywords: prevalence, asthma, insomnia, asthma control, Insomnia Severity Index

Introduction

Asthma is a common inflammatory respiratory disease characterized by intermittent symptoms of wheezing, dyspnea, cough, and chest tightness, combined with variable airflow obstruction, bronchial hyperresponsiveness, and chronic airway inflammation.[1,2] The prevalence of asthma varies worldwide, ranging from approximately 5% to 20% in most countries.[3–7]

Sleep disturbances and poor sleep quality are common among patients with asthma and are associated with poor quality of life. The causes of sleep disturbance are multifactorial and related to poor asthma control, as well as associated comorbidities, such as gastroesophageal reflux disease (GERD), obstructive sleep apnea, chronic rhinitis, and depression.[8–17] Insomnia is a frequent occurrence in patients with asthma and is characterized by difficulty with falling asleep, difficulty maintaining sleep, awakening too early, and daytime impairment resulting from the disturbed sleep. Insomnia symptoms have been reported in approximately one-third of patients with asthma, and the presence of these symptoms has been associated with worse of quality of life, more severe asthma symptoms, and increased health care utilization.[18] Nevertheless, limited data are available regarding the association between asthma severity and insomnia.[19,20]

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The objectives of this study were to determine the prevalence of insomnia among a sample of adults with asthma in Saudi Arabia and to evaluate the relationship between insomnia and level of asthma control.

Materials and Methods

This cross-sectional study consisted of 200 adults with asthma recruited from pulmonary clinics at King Abdulaziz Medical City in Riyadh, Saudi Arabia, from December 2018 to May 2019. All adults (age ≥16 years) with asthma evaluated during the study period (n=222) were invited to participate in the study, but 22 declined. The diagnosis of asthma was based on the primary treating physician's diagnosis plus documentation of reversible airflow obstruction on spirometry with a positive bronchodilator response and/or positive methacholine challenge test.[1] Patients with the following conditions were excluded from the study: known sleep-disordered breathing, depression, other psychiatric illness, chronic obstructive pulmonary disease, interstitial lung disease, primary diagnosis of bronchiectasis, other chronic lung disease, neuromuscular disease, heart failure, liver disease, and renal failure. Patients with a smoking history of >10 pack-years were also excluded from the study.

The level of asthma control was assessed using the validated Arabic version of the Asthma Control Test (ACT).[14–16] ACT is a validated instrument for assessing asthma control, with scores ranging from 5 to 25. Based on ACT scores, the level of asthma control was classified into three groups: well-controlled, ACT = 20–25; partially controlled, ACT = 16–19; and uncontrolled, ACT = 5–15.[17,18]

Insomnia was assessed using the Arabic version of the Insomnia Severity Index (ISI).[21] ISI is a well-validated instrument for evaluating insomnia symptoms. It consists of seven items, which assess falling asleep, difficulty maintaining sleep, waking up too early, dissatisfaction with sleep quality, daytime impairments resulting from the sleep disturbance, sleep problems noticed by others, and distress caused by sleep difficulties. Total ISI scores range from 0 to 28, with scores ≥10 indicating the presence of insomnia with an 86.1% sensitivity and 87.7% specificity. Based on final ISI scores, the severity of insomnia was classified into four groups: no insomnia, ISI = 0–7; sub-threshold insomnia, ISI = 8–14; moderate insomnia, ISI = 15–21; and severe insomnia, ISI = 22–28.[21,22]

The study protocol was approved by the Institutional Review Board Committee at King Abdullah International Medical Research Center (SP18/368/R), and all participants provided written informed consent.

Statistical Analysis

All analyses were conducted using the Statistical Package for Social Sciences (SPSS v. 25.0; Armonk, NY, USA). Mean and standard deviation were used to summarize normally distributed data, whereas median and interquartile range were used for non-normal distributions. Categorical data were summarized as frequency and percentage. Demographic and clinical variables were compared between patients with and without insomnia using Student's *t*-test or chi-square test, as appropriate. Logistic regression analysis was used to identify risk factors associated with insomnia. P values <0.05 were considered statistically significant.

Results

Demographic and clinical characteristics of the study participants are detailed in Table 1. Insomnia (ISI ≥ 10) was reported in 93 of 200 participants, for a prevalence rate of 46.5%. The insomnia group was predominantly female (73%), with a mean age of 54 ± 16 years. Demographics, asthma duration, and degree of airflow obstruction were not different between patients with and without insomnia. Sleep duration was shorter (P = 0.01) and ACT scores were lower (P = 0.001) in the insomnia group than in the no insomnia groups.

The severity of insomnia differed across levels of asthma control. The prevalence of moderate or severe insomnia was higher in patients with uncontrolled asthma (43%) than in patients with partially controlled asthma (25%) or well-controlled asthma (12%) (P < 0.05 for all comparisons) (Table 2).

On multivariate regression analysis, the presence of insomnia (ISI ≥ 10) was significantly associated with older age (odds ratio [OR] = 1.02), obesity (OR = 3.32), absence of GERD symptoms (OR = 0.41), partially controlled asthma (OR = 8.45), and uncontrolled asthma (OR = 3.59) (P < 0.05 for all factors) (Table 3).

Table 1 Baseline Characteristics in Patients with Different Levels of Asthma Control

Characteristic	All (n=200)	Insomnia (n=93)	No Insomnia (n=107)	P value
Age (years)	51 ± 17	54 ± 16	47 ± 17	0.18
Female	135 (67)	68 (73)	67 (63)	0.11
Married	146 (73)	67 (72)	79 (74)	0.78
Educated‡	176 (88)	80 (86)	96 (90)	0.42
BMI (kg/m^2)*	31 (9.6)	32 (10)	29 (8.8)	0.50
Ever smoked	7 (3)	3 (3)	4 (4)	0.84
Coffee/tea intake	3.0 ± 3.0 / 2.0 ± 1.8	3.6 ± 3.6 / 2.0 ± 1.9	2.6 ± 2.7 / 1.8 ± 1.7	0.18/ 0.15
Sleep duration, hours*	6 (2)	5 (3)	6 (2)	0.01
Comorbid conditions				
Allergic rhinitis	96 (48)	43 (46)	53 (50)	0.64
GERD	38 (19)	12 (13)	26 (24)	0.04
Diabetes mellitus	71 (35)	35 (38)	36 (34)	0.56
Hypertension	90 (45)	51 (55)	39 (36)	0.01
Asthma control test score	17 ± 4.9	15 ± 4.4	19 ± 4.5	0.001
FEV1, % predicted	76 ± 19.3	83 ± 23.2	77 ± 22.7	0.32
FVC, % predicted	82 ± 22.6	83 ± 22.7	82 ± 20.7	0.34
FEV1/FVC, % predicted	77 ± 15.7	79 ± 12.9	77 ± 15.6	0.45
ISI score	10 ± 7.2	16 ± 4.5	4±2.9	0.001

Notes: Data were expressed as mean ± standard deviation or as a number (percentage) unless otherwise specified. *Median (interquartile range). ‡Educated: achieved more than primary school.

Abbreviations: BMI, body mass index; GERD, gastroesophageal reflux disease; ISI, Insomnia Severity Index.

Table 2 Insomnia Severity Index Comparisons According to Level of Asthma Control

	Asthma Control			
	Well-Controlled (n=67)	Partially Controlled (n=55)	Uncontrolled (n=78)	P value
Total ISI score, median (IQR)	2 (6)	9 (10)	12 (9)	<0.001
Insomnia, ISI ≥10	13 (19%)	27 (49%)	53 (68%)	<0.001
Insomnia severity				
No insomnia (ISI = 0–7)	52 (78%)	23 (42%)	15 (19%)	<0.001
Sub-threshold insomnia (ISI = 8–14)	7 (10%)	18 (33%)	30 (38%)	
Moderate insomnia (ISI = 15–21)	7 (10%)	10 (18%)	24 (31%)	
Severe insomnia (ISI = 22–28)	1 (2%)	4 (7%)	9 (12%)	

Abbreviations: IQR, interquartile range; ISI, Insomnia Severity Index.

Table 3 Factors Associated with the Presence of Insomnia

	Odds Ratio	95% CI	P value
Age (years)	1.02	1.00–1.05	0.04
Female	1.55	0.72–3.36	0.26
Married	0.70	0.33–1.50	0.37
Educated‡	1.05	0.37–2.97	0.93
Ever smoked	1.61	0.27–9.55	0.60
Coffee/tea intake	0.57	0.17–1.95	0.37
BMI ≥30 kg/m^2	3.32	1.15–9.62	0.03
Allergic rhinitis	1.01	0.52–1.97	0.97
GERD	0.41	0.17–0.96	0.04
Partially controlled asthma	8.45	3.68–19.39	0.001
Uncontrolled asthma	3.59	1.49–8.64	0.004

Note: ‡Educated: achieved more than primary school.
Abbreviations: BMI, body mass index; CI, confidence interval; GERD, gastroesophageal reflux disease.

Discussion

In this study, we determined the prevalence of insomnia among a sample of adults with asthma seen in specialized pulmonary clinics at a tertiary care center in Saudi Arabia and examined the association between insomnia and level of asthma control. We found a high prevalence of insomnia, with almost one-half of all patients reporting insomnia symptoms (ISI ≥ 10). Moreover, asthma control was inversely related to insomnia; insomnia was more common in patients with partially controlled or uncontrolled asthma than in those with well-controlled asthma.

The high prevalence of insomnia in our sample of asthmatic patients (46.5%) was consistent with the prevalence rates of 22% to 47% reported in the literature.[19,20,23–28] In their study of 714 participants in the Severe Asthma Research Program III, Luyster et al[19] found an insomnia prevalence rate of 37%. Among 470 asthmatic patients from Nordic countries who participated in the European Community Respiratory Health Survey II, Sundberg et al[20] observed an insomnia prevalence rate of 20% in men and 45% in women.

Our results also revealed that the prevalence and severity of insomnia differed across different levels of asthma control. Insomnia was reported by 68% of the patients with uncontrolled asthma, 49% of the patients with partially controlled asthma, and only 19% of those with well-controlled asthma. Moreover, moderate or severe insomnia was more frequent among patients with uncontrolled or partially controlled asthma than in patients with well-controlled asthma. In the abovementioned study by Luyster et al,[19] the presence of not well-controlled asthma (ACT score ≤19) was associated with a 2.4-times increased risk of insomnia. Furthermore, not well-controlled asthma was reported by 78% of the patients with insomnia and 53% of those without insomnia.[19] Sundbom et al[20] also reported a higher prevalence of insomnia in patients with uncontrolled asthma (32%) than in those with partially controlled asthma (20%) or controlled asthma (20%). A bidirectional association is noted between asthma and chronic insomnia. A prospective study conducted by Brumpton et al[31] which include 17927 participants who are free from asthma at baseline; 686 were diagnosed with asthma during the 11-year follow-up. The study showed three times increase in the risk of incident asthma in patients with chronic insomnia.[31]

The association between insomnia and absence of GERD was unexpected finding and a strong possibility exists that the association is a chance finding due to small number of patients with GERD (n=38). Previous studies showed high prevalence of GERD in patients with insomnia.[29,30]

This study has some limitations that warrant consideration. First, it is a cross-sectional study, which precludes us from making causal inferences regarding the association between insomnia and asthma control. Second, the study included a relatively low number of participants, and these participants were recruited from subspecialty clinics at a tertiary center

and were predominantly women. Thus, there is a possibility of selection bias, and our findings may not be generalizable to other settings with different resources. Third, the lack of a matched control group without asthma prevented us from comparing the prevalence of insomnia between adults with and without asthma. Fourth, theit is a cross-sectional study conducted over a short period. Both asthma and insomnia vary in their severities throughout the seasons, which influences asthma control and insomnia. It also needs to be taken into consideration as it can affect the prevalence of insomnia and the severity of asthma. Lastly, objectives measurements of sleep disturbance, such as sleep studies for OSA and sleep diaries, were not done.

Conclusions

Insomnia is common among patients with asthma, especially those with suboptimal asthma control. Further studies are required to better understand the complex relationships between asthma and insomnia.

Data Sharing Statement

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate

The study was approved by the institutional review board of King Abdullah International Medical Research Center (KAIMRC) in Riyadh, Saudi Arabia. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments. Written informed consent was obtained from all participants.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no competing interests.

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