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The Pittsburg sleep quality index in asthmatic patients: A case-control study

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ABSTRACT

Introduction: Sleep disturbances are common in asthmatic patients. The purpose of this study was to evaluate sleep quality in asthmatic patients in a local setting.

Materials and Methods: In the present case-control study, the sleep quality of asthma patients was assessed using the Pittsburgh Sleep Quality Index (PSQI), in 76 clinically stable asthmatic patients at the outpatient clinic compared to 76 healthy subjects in the control group. Poor sleep quality is classified as a PSQI score of more than 5.

Results: The mean PSQI score in patients was significantly higher than the control group. The number and percent of cases with poor sleep quality and all subdomains of PSQI score were statistically more than the control group. Poor sleep quality significantly increased by age only in females.

Conclusion: According to the results of the present study, the sleep quality of the majority of asthma patients was not desirable. It is necessary for policy makers and health managers as well as physicians to focus on this aspect of the patient's health as well. It is recommended to have a sleep health consultation in a pulmonary clinic.

Keywords: bronchial asthma, quality of sleep, Pittsburgh

Introduction

Asthma is a heterogenous chronic inflammatory disease of airway affected 6.6% to 11% of populations worldwide^{1,2} and 8.9% of the total population in our country¹⁻³. According to the latest report of the Global Initiative for asthma (GINA), the death rate of disease declined in the last decade, however, burden of the disease has increased considerably. "The prevalence and morbidity of the disease is a global concern"¹.

Incidence, prevalence, severity, and management of the disease have been affected by sex-hormonal changes throughout life. This relationship is complicated and exact mechanisms remained partially unidentified. Therefore, more research needs to reach a gender-based diagnosis and control plan of disease⁴.

Despite recent progress in guidelines of the disease, still, 30 to 50% of adolescent-adult patients still have severe symptoms that interfere with their daily life¹. The contribution of different lifestyle changes was hardly estimated^{1,2,5}.

About one-third of the general population has suffered from insomnia^{6,7}. Although sleep disturbances have shown significant effects on overall health and life quality, evidence suggests that they are under-reported and under-treated⁸ and need more attention in population health surveys^{7,9}. Rapid life modernization in communities increases sleep disorders and their metabolic consequences¹⁰. Female cases remarkably have reported poor PSQI scores. This is not only due to more stress and anxiety and sex hormonal changes during the life course but also variability in self-reported subjective sleep quality and sleep disturbances in women¹¹.

Poor sleep quality as PSQI > 5 was reported in asthmatic patients in Brazil (80%)¹², Saudi Arabia (66%)¹³, USA (93%)¹⁴ and China (69.9%)¹⁵ and Italy (58.3%)¹⁶. Sleep disturbances are prevalent due to night-time respiratory physiologic changes¹⁶ and common drug side-effects on sleep^{2,17} even in stable out-patient cases, besides a significant number of patients who did not report night-time symptoms diagnosed as nocturnal asthma by physicians^{2,17,18}. A large prospective observational study has shown asthma and female sex as independent risk factors for obstructive sleep apnea¹⁹. Therefore, a successful management plan of the disease need

precise sleep quality assessment as the majority of the nocturnal symptoms have remained undiagnosed^{12,17,18}.

Sleep disturbances are prevalent in chronic diseases not only due to pain and stress but also the pathophysiology of the diseases. This relationship has been confirmed by designing case-control studies²⁰⁻²². Sleep disorders have been estimated between 35 to 70% in diabetes type 2²², hypertension²¹, and migraine²⁰. Adverse health consequences of sleep disturbances could be explained by increasing inflammatory markers and consequently rise in the risk of metabolic and non-metabolic diseases such as hypertension, metabolic syndrome, obesity, depression, Alzheimer, and cancer²³⁻²⁵. Depressive symptoms have been reported significantly higher in asthma than with other chronic diseases²⁶.

The aim of this study was to evaluate sleep quality and its predictive factors among adults with asthma and healthy control. The results of this study can help to improve health and reduce the burden of the disease.

Material and Methods

This case-control study included 76 adult asthma patients referred to University pulmonary clinic in Semnan City and 76 age and sex-matched healthy controls. The inclusion criteria were as follows: patients aged more than 18 years who were diagnosed with asthma by specialists based on spirometry results, forced expiratory volume (FEV1) of less than 80% of the predicted value, FEV1/forced vital capacity (FVC) of less than 0.7, FEV1 change of more than 12% from the initial value, and absolute change in FEV1 of less than 200 mL after taking two to three puffs of a short-acting bronchodilator. The exclusion criteria were the presence of malignancy or other severe incurable diseases such as major depression, congestive heart failure, kidney failure, and liver failure, or insomnia, sleep disorders, or being engaged in shift work, as described before²⁷. This study was approved by the Ethics Committee of the Semnan University of Medical Sciences, Semnan, Iran.

A total of 152 ambulatory subjects equal or more than 18 years of age subjects were included in the study via random convenience sampling method after signing the informed consent.

Demographic data, including age, marital status, job, and education, were recorded.

Pittsburgh Sleep Quality Index Questionnaire PSQI²⁸ is a subjective sleep quality questionnaire and collects data about patients' attitudes about sleep during the last four weeks. PSQI contains seven component scales: sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Every scale of the questionnaire is scored between 0 and 3. Scores of 0, 1, 2, and 3 in each scale, respectively, indicate the normal state, mild problem, moderate problem, and severe problem. The sum of the scores obtained from the seven domains form the total score which is between 0 and 21. A total score of 6 or more indicates poor sleep quality¹⁶. Persian version of PSQI questionnaire has shown Cronbach's alpha coefficient 0.77²⁹. Continuous variables are displayed as means and standard deviation (SD), and tables of frequency and relative frequency are used to describe categorical variables. Analysis of variance (ANOVA), independent t-test, and Pearson's correlation coefficient were used to analyze the data. All analyses were performed using the SPSS Statistics software version 16 (IBM, Armonk, NY). A p-value <0.05 was considered statistically significant.

Results

The mean age of the asthmatic group was 46.8 (13.8), while in the control group, it was 44.2 (11.8). Age, gender, and place of residence were compatible between both groups. The number of subjects with poor sleep quality was 90 (59 %). It includes 62 (81%) of patients and 28 (37%) of controls.

Table 1 the general characteristics of asthmatic/control

Variable	Asthmatic Cases N (%)	Controls N (%)	P-value
Age (yrs)*	46.8 (13.8)	44.2 (11.8)	0.2
Gender, female / male	43(56.6) / 33(43.4)	44(57.9)/ 32(42.1)	0.8
Place of residence, urban / rural	61(80.3) / 15(19.7)	65(85.5)/ 11(14.5)	0.38
PSQI >5	62 (81.6)	28 (37.0)	<0.001

PSQI score mean (standard deviation) was 7.1 (4.3) and Median (IQR) was 6 (5). Table 2 presents significant differences in the mean scores of quality of sleep as measured by PSQI in patients with asthma and control group. The most and least scores in both groups has shown

in sleep latency and use of sleep aid medication consequently.

Table 2: Mean scores of quality of sleep in asthma and Control group

Domain	Asthmatic patients Mean (SD)	Control Mean (SD)	P value
Mean PSQIModified PSQI /	9.3 (4.4) / 8.2 (3.8)	4.8 (2.8)/4.0 (2.5)	<0.001/<0.001
subjective sleep quality	1.5 (0.7)	0.9 (0.6)	0.001>
Delay in falling asleep	1.7 (0.9)	0.8 (0.9)	0.001>
Sleep duration	1.2 (1.0)	0.7 (0.9)	0.001>
Sleep efficiency	0.8 (1.1)	0.4 (0.8)	0.001>
Sleep disorders	1.7 (0.7)	1.1 (0.6)	0.001>
Use of sleep aid medications	0.7 (1.2)	0.1 (0.3)	0.001>
Daytime dysfunction	1.7 (1.5)	0.7 (0.9)	0.001>

Table 3 represents the odds ratio of poor sleep quality based on increasing age in different gender. By increasing one year in age in female group, the chance of poor sleep quality increased by 9.6%. In male group, this test result was not statistically significant.

Table 3: Binary Logistic regression analysis PSQI (good≤5&poor≥6) based on age in different sex

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Age	0.024	0.02	1.431	1	0.232	1.024	0.985	1.065
constant	-0.894	0.958	0.871	1	0.351	0.409		
Age	0.091	0.024	14.349	1	0	1.095	1.045	1.148
constant	-3.405	1.023	11.082	1	0.001	0.033		

Sex= male, Sex =female

Discussion

The results of this study presented a high prevalence of poor sleep quality in asthma patients compared to the age and sex-matched controls. The double burden of sleep impairments on overall health requires proper interventions against it. Gender-based interferences may need to be considered with an overview, more than 50,000 articles were published with the keywords "asthma prevention & management" and "asthma & sleep" in the last 5 years. If we take into account the considerable amount of unpublished studies, we realize that there are missing links related to the current knowledge of this disease.

Poor sleep quality rate in our study was in accordance to surveys from different countries¹²⁻¹⁶. Distinction of these finding with our study results could be explained by different design, existence of comorbidities and level of control of the diseases, and also higher overall sleep

disturbances in our country⁷ and region^{13,30} and continent^{15,24,31}.

Adverse health consequences of sleep disturbances could be explained by different mechanisms in chronic diseases²³⁻²⁵. Poor sleep quality negatively affects quality of life^{7,23-25,27}, especially in females^{25,31} and elderly⁷. Increasing age was a risk factor for poor sleep quality, especially in female asthma patients as shown in other research^{4,6,11,12}.

However, higher PSQI score in asthma in contrast to other chronic diseases²⁰⁻²⁵, represented even in mild and well-controlled cases¹⁴ without nocturnal attacks¹⁷ could be interpreted as impaired mental health of subjects²⁷ in concurrent anxiety-depression. Depressive symptoms were higher in asthma than in patients with other chronic diseases^{12,26}. After adjustment for other comorbidities that affect sleep quality in asthmatic, the rate of bad sleepers remained high¹⁴.

In this study, among PSQI domains, sleep latency has the highest and use of sleep aid medication the least discrimination scores the same as the results described by a survey about validity of PSQI in Iranian population³². Namely sleep latency is the best parameter to discriminate low sleep quality subjects from normal sleep quality group even in hypertensive patients²¹. In contrast to Braidó et al findings that presented sleep disturbances and sleep efficiency as the most and least effectors of sleep quality respectively¹⁶. In another study the highest differentiation reported for subjective sleep quality⁷ and sleep disturbances¹³. Although we check all the domains to calculate the sleep quality score, the discrimination power of these domains could specify the management plan.

Common manifestation of asthma such as intermittent attacks of shortness of breath, wheezing, and cough cause some limitations in daily activities and disturbed sleep pattern³³. Short sleep duration also impairs the quality of life and increases the probability of depression and anxiety. On the other hand, depression, anxiety and mood instability increase the probability of asthma attacks. It seems that investigating the history of depression and anxiety is one of the important considerations in management of the disease. However,

distinguishing the precedence of these two diseases is not always straightforward.

Sleep health screening is not only an indissociable part of health promotion programs but also care plans of chronic diseases in different age groups especially with respiratory manifestation such as asthma.

Indirect risk of inadequate sleep is shown in drivers sleepiness and car accidents, bad academic scores and carrier mistakes as a result of loss of concentration^{25,34}. Sleep problems led to double burden and higher morbidity and mortality in general population⁹. Research results have shown that about half of the subjects with sleep disturbances take no step-in diagnosis and classification of their problem^{6,8} even they have less opportunity to receive health care services³⁵.

There is a need to concentrate on sleep disorders as prevalent problems with numerous bad health consequences. Though they have received less attention from community and health system. It is necessary to increase the awareness about lifestyles that aggravate sleep problems and try to change them and prevent serious comorbidities. Poor sleep quality in chronic diseases is significantly correlated with depression and increased remarkably by number of comorbidities^{12,26}.

Mean score of PSQI in our study was greater than research results in Italy¹⁶, Saudi Arabia³⁰ Pakistan³⁶ and China¹⁵. Besides, the role of mental health in prevalence of sleep problems²⁷ and reciprocal relationship between anxiety and depression in chronic respiratory diseases should be more precisely defined. Up to half of the cases were classified as depression³⁰. Accordingly, the role of depression in deterioration of sleep quality scores is confirmed and should be considered in every case.

Nocturnal awakening in asthmatic is a key feature of disease control level and possible need for adjustment of treatment plan¹. Night attacks of asthma are recorded in up to 66% of cases³⁷ even in mild and under-controlled subjects^{13,16,38}. Underreporting of patients and failure to approach nocturnal asthma in management of the disease is a common sense^{2,12,16-18}. Several epidemiologic studies have illustrated a bidirectional relationship between sleep breathing disorders and asthma not only in

diagnosis but also in prognosis and management of the disease^{18,38,39}. Sleep apnea was confirmed to be higher in asthmatic females¹⁹. Therefore, sleep quality assessment is highly recommended as an indissociable part of screening and management plan of patients.

Limitation: The case-control design of the study led to recall bias among participants. Besides, prospective multi-center studies need to survey on cause-and-effect hypothesis and the generalization of the results to the community.

Conclusion

According to the results of the present study, sleep quality of the majority of asthma patients was not desirable. It is necessary for policymakers and health managers as well as physicians to focus on this aspect of the patients' health as well. It is recommended to have sleep health consultation in pulmonary clinic.

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