



## Original Article


# Sleep Quality in Asthmatic Patients with Obstructive Sleep Apnea Syndrome; A Descriptive Case Series

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### ABSTRACT

**Background:** Asthma is known as a chronic lung disease that results in airway blockages. Asthma includes the symptoms of dyspnea, wheezing and cough which worsen in the morning and at night and result in the production of excess mucus which results in the reduction of expiratory airflow. Various studies have shown a strong association of asthma being a risk factor for the onset of obstructive sleep apnea. **Objective:** To assess and evaluate the sleep quality in asthmatic patients with obstructive sleep apnea syndrome. **Methods:** This is a descriptive case series that was conducted in Gulab Devi Hospital, Sheikh Zayed Hospital and Ghurki Teaching Hospital, Lahore, Pakistan. A non-probability convenient sampling technique was employed. The sample size was calculated by using World Health Organization software. Patients who were diagnosed with asthma and obstructive sleep apnea, both males and females ages between 18 and 55 were recruited in this study. Pittsburgh sleep quality index was employed to assess the patients. Patients were subjectively rated regarding their sleep quality and were inquired about their usual sleeping habits and their scores were recorded using a Likert scale ranging from zero to three. Data was analyzed by using Statistical Package for Social Sciences version 23. The variable of the study was represented in the form of descriptive statistics using graphs, percentages and graphs. **Results:** The results of this study show us that moderate difficulty of sleep apnea lies between 57.6% and severe difficulty of sleep apnea lies between 42.4%. The results of this study also show us that age affects the global Pittsburgh sleep quality index score. Results show that middle-aged adults reported suffering more from moderate and severe sleeping difficulty due to sleep apnea as compared to young and older adults. **Conclusion:** This study concludes that patients who have asthma with obstructive sleep apnea have a disturbed sleep cycle, especially in middle age. It concludes that asthmatic patients with obstructive sleep apnea have moderate to severe difficulty in their sleep cycle.

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## INTRODUCTION

Asthma is known as a chronic disorder of the lungs which results in the blocking of airways. The airways become constricted, red and bronchial tubes in the lungs get swollen. Consequently, this results in inflammation of the lungs which might damage the lungs. An association has been observed to exist between blockage of the airway, oversensitivity the reversible limitation of the expiratory flow rate.<sup>1</sup> As the blockage of the airway increases, the shortness of breath, the whistling sounds while breathing out and coughing mostly worsen in the morning or at night. This results in the production of excessive mucus which ultimately results in the lessened expiratory rate of airflow.<sup>2</sup> There are three major concerns considering this issue but wheezing has been observed to be the most common complaint as gathered by the asthmatic patients and it makes breathing difficult for them. Wheezing has also been observed to trigger coughing resulting in the production of excessive sputum.

Asthma has been known to attack almost all age groups but it often has been seen to begin the early life and it has been observed to vary in frequency and severity. As time passes by, its symptoms and the rate of airflow obstruction alter however it lasts forever.<sup>3</sup> On the other side, there is an inflammation of the airways going on actively which has been known to cause deleterious effects in life later on. The eosinophils are known to be the major protein that is responsible for the damage to the airways.<sup>4</sup> Chronic obstructive pulmonary disease and asthma have been observed to overlay with each other because of the co-existence of limitation of the airway in both and both of them could be evaluated and assessed by pulmonary function testing.<sup>5</sup> The early onset of episodic asthma has been known to be mediated by type I hypersensitivity reaction. Further attacks are proceeded by dust allergens and pollen. They

are triggered by environmental antigens. The late chronic asthmatics are observed to have evidence of sensitization to allergens which includes respiratory infections.<sup>6</sup> Sleep apnea has been defined as a transitory interruption in the airflow. It is defined as a sleep disorder in which the flow of the air starts and stops repeatedly lasting for about ten seconds or more. Sleep apnea has been observed to have three major types central, obstructive and mixed. The most prevailing type in asthmatic patients is obstructive sleep apnea. Obstructive sleep apnea is known to have inadequate closure of the upper airways because of swelling and thickening of the airways. Resulting is causing sudden distortion in sleeping and waking up from sleep.<sup>7</sup> All these consequences results in the decreased tone of the dilator muscle of the upper trachea. This happened while sleeping as a consequence to site specific collapse in the oropharynx.

While awake, patients with obstructive sleep apnea are capable of preventing the collapse of the upper trachea by activating the upper airway dilators sufficiently.<sup>8</sup> In asthmatic patients the chances of occurrence of obstructive sleep apnea are very high. There are various factors present in asthmatic patients that overlap because of the blockage in the airflow in which the pattern of sleeping is disturbed, causing trouble during sleep because of the breathing difficulty which ultimately leads to the likelihood of obstructive sleep apnea. In asthmatic patients the chances of sleepiness during the daytime, snoring and being overweight are common. The probability of occurrence of obstructive sleep apnea is manifestly preminent in asthma.<sup>9</sup> Development of snoring in children because of mild and moderate blockage of the upper airway while they sleep and the development of sleeping disorders in children are the impacts of asthma which have been identified in children with asthma. The

physiological signs and symptoms of these diseases are associated with each other because of the complex interaction between these respiratory disorders.<sup>10,11</sup> The obstructive sleep apnea Syndrome and the impacts it has on the overall sleeping quality of patients with asthma has remained a neglected factor while treating and managing asthmatic patients. Research in this field was scarce considering the asthmatic Pakistani patients. Our current study will add to the literature considering the asthmatic Pakistani population regarding obstructive sleep apnea as a major factor that hinders the normal sleep cycle of patients with asthma. This knowledge with add more information thereby leaving an asthmatic patient less compliant with the treatment plan. Hence, to make asthmatic patients engage in more ineffective treatment strategies and improve their quality of sleep, this problem of obstructive sleep apnea has to be addressed using physical therapy as well. Obstructive sleep apnea in asthmatic patients has been recognized to hinder the sleep of the sufferer and might cause hypertension with the risks of developing cardiovascular disease, hence the quality of sleep needs to be evaluated in asthmatic patients with obstructive sleep apnea.<sup>12</sup> Considering Pakistani setups, no such on larger levels have been previously conducted and literature lacks the information on how obstructive sleep apnea in asthmatic patients might affect their sleep quality hence decreasing their compliance towards their treatment and risk of developing other comorbidities as well.

## METHODS

This study is a descriptive case series study. This study was approved by the institutional review board committee of Lahore Medical and Dental College, Lahore, Pakistan. The data for this study was collected from Gulab Devi Hospital, Ghurki Teaching Hospital and Sheikh Zayed Hospital, Lahore, Pakistan. The sampling technique employed was the non-

probability convenient sampling technique. The sample size for this study was calculated by utilizing the World Health Organization software using the following formula.<sup>13</sup> Sample size determination in health studies version 2.0.21 World Health Organization was employed. The sample size was calculated to be 33. The following formula was employed to calculate the sample size<sup>14</sup> 
$$n = \frac{z_{1-\alpha/2}^2 P(1-P)}{d^2}$$

Males and females ages 10 to 55 years who were diagnosed with asthma were recruited in this study. Patients with active infection, non-cooperation patients, patients with acute exacerbation of asthma and COVID-positive patients were excluded from this study. Data was collected from all the patients who had asthma. Outdoor patients from the above-mentioned hospitals were recruited in this study. Patients who fulfilled the inclusion criteria were screened. Recruited patients were assessed using the Pittsburgh Sleep Quality Index scale.<sup>15,16</sup> Consent of patients before data collection was taken. Written consent forms in both Urdu and English were signed by all the participants recruited in this study.

Patients were rated subjectively regarding their quality of sleep and were inquired about their sleeping habits. Scoring was done with a scale ranging from zero to three followed by good to very bad sleep. Data was analyzed by utilizing a statistical package for social sciences version 23. The variable of the study was represented in the form of descriptive statistics using graphs, percentages and graphs. Permission to conduct this study was taken from the ethical committee of Lahore College of Physical Therapy and Lahore Medical and Dental College, Lahore, Pakistan. The questionnaire employed in this study was accompanied by a sheet containing information regarding the nature and purpose of this study in detail. Every detail of this study was explained to every participant of this study before their recruitment in this

study. All the participants were guaranteed that their responses would remain confidential.

**RESULTS**

The results of this study showed us that 19 (57.6%) asthmatic patients reported suffering from moderate difficulty while they sleep and 14 (42.2%) asthmatic patients reported that they suffer from severe difficulty while they sleep. Table I and II showed a comparison of how age affects the global Pittsburgh sleep quality index scale score in different age groups. Figure I showed that most of the asthmatic patients suffered from moderate difficulty in sleep quality.

**Table I: Percentage of Sleep Apnea**

Status	Frequency	Percentage
Moderate Difficulty	19	57.6%
Severe Difficulty	14	42.4%
Total	33	100.0%

**DISCUSSION**

The occurrence of obstructive sleep apnea is relatively high in patients with asthma when compared to its rate of occurrence in the general population. These two also have been observed to share a bidirectional bond in which both these conditions have adversely influenced each other. This has ultimately been reported to result in an additional burden of interrupted, disturbed and poor sleep, high blood pressure and other comorbidities accompanied by other conventional clinical signs and symptoms of asthma.<sup>17</sup> Our current study and study conducted by Dixit, R and coworkers both agree with these findings. The most conspicuous characteristic observed in this study was snoring which was seen commonly in patients with mild and moderate asthmatic patients. Obesity has also been

observed as a risk factor for the development of obstructive sleep apnea<sup>18</sup>, more work is needed to be done considering obesity as a risk factor, especially in the Pakistani asthmatic population. Various studies show that populations who have occupations that are more exposed to airborne pollutants are at a higher risk of suffering from asthma as compared to populations with occupations that are less exposed to environmental pollution.<sup>19</sup> Numerous previously conducted studies show that potential risk factors for asthma are inefficiently controlled. Most studies report obstructive sleep apnea, sinus diseases, gastroesophageal reflux disease, smoking, exposure to allergens and psychological dysfunction as risk factors.<sup>20</sup> This study employed the Pittsburgh Sleep Quality Index Scale to score the sleep quality of asthmatic patients with obstructive sleep apnea. This scale has been recognized to be easy to use scale in clinical settings. This scale can be used in every class of patients. Everyone can comprehend and respond to this scale and everyone is also able to mark their habitual quality of sleep on their own.<sup>21</sup> Our study is consistent with the studies that prove the Pittsburgh sleep quality index scale is valuable and reliable for both illiterate and literate asthma patients,<sup>15</sup> especially considering the population of Pakistan. This scale is subjectively rated by the patient himself or herself so the patient must be encouraged to talk as talking will justify the score about his or her habitual efficiency of sleep.<sup>22</sup> It has also been observed that the patient sometimes tries to exaggerate his or her severity when inquired about their condition. They might want to seek attention by exaggerating their symptoms.<sup>23</sup> It was also observed that some patients were not able to recall or remember their sleep duration and their sleep latency. So, to compensate for this, we had to inquire about their roommate and inform them to note the timings of their sleep routine. Asthmatic patients mostly report with the chief complaint

**Table II: Global Pittsburgh Sleep Quality Index Scale Score**

Age (Years)	Global Pittsburgh Sleep Quality Index Scale Score		Total
	Moderate Difficulty	Severe Difficulty	
Younger adults (18-35)	5	0	5
Middle adults (36-55)	12	9	21
Older adults (>55)	2	5	7
Total	19	14	33

of wheezing<sup>24</sup> and obstructive sleep apnea has been employed as a factor to evaluate the extent of the severity of the disease.

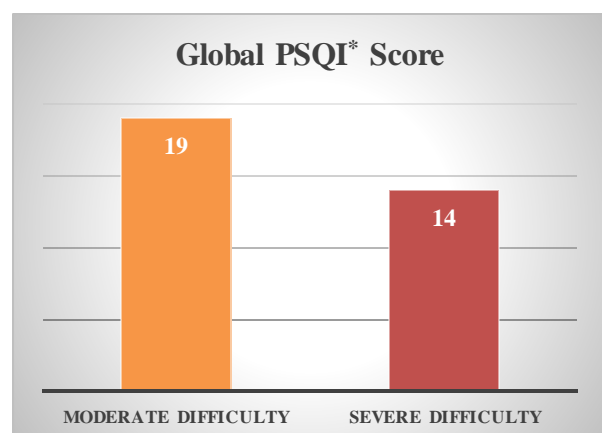
This study aimed to observe the disturbed pattern of sleeping in patients with asthma. The results of this study show us that asthmatic patients with obstructive sleep apnea are found to have worse sleep quality than patients with no asthma however, middle-aged adults are at a higher risk of disease as compared to others. The results and observations of our study coincide with the results and observations made by Ran Wang and his co-workers. Their study was an up-to-date review of asthma and obstructive sleep apnea in adults and children. Their review summarized that evidence confirms that there is a bidirectional association between asthma and obstructive sleep apnea.<sup>25</sup> This is in agreement with our study. Our study and their study recommend that future researchers focus on therapeutic challenges considering these problems and both studies highlight the need for further research. This study should have been carried out in multiple clinical settings so that results could have been more generalized all over the population. For more generalizability, future researchers are recommended to conduct this study on a larger

scale. Future researchers are recommended to conduct studies focusing on the effects of physical therapy interventions on preventing and treating the worsened symptoms of asthma and obstructive sleep apnea. For more literature and to guide physical therapists in customizing more physical therapy interventions obstructive sleep apnea should also be evaluated in other pulmonary conditions. Our study would add more to the current literature and would aid health professionals in streamlining more authentic and reliable preventive, precautionary and interventional strategies for asthma and obstructive sleep apnea focusing on the Pakistani population.

**CONCLUSION**

This study concludes that patients who have asthma who are also accompanied by obstructive sleep apnea have a disrupted sleep cycle especially middle-aged asthmatic patients who reported to have moderate sleeping difficulty. Pittsburgh sleep quality index was used to document sleep quality which showed us that obstructive sleep apnea is among the top most associated predictors for poor sleep quality in asthmatic patients. The results of this study conclude that patients with asthma who have obstructive sleep apnea face moderate difficulty while sleeping.

**Figure I: Frequency of Obstructive Sleep Apnea Among Asthmatic Patients**



## DECLARATIONS

**Consent to participate:** Written consent had been taken from patients. All methods were performed following the relevant guidelines and regulations.

**Availability of data and materials:** Data will be available on request. The corresponding author will submit all dataset files.

**Competing interests:** None

**Funding:** No funding source was involved.

**Authors' contributions:** All authors read and approved the final manuscript.

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