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ORIGINAL RESEARCH

Sleep Quality in an Asthmatic Adult Population in Saudi Arabia: A Cross-Sectional Study

Tareq F Alotaibi[1,2], Saleh S Algarni[1,2], Mohammed M Alqahtani[1,2], Hassan Y Aljohani[1,2], Taha T Ismaeil[1,2], Mobarak K Alqahtani[1,2], Riyadh Abdullah Alotaibi[1,2], Abdullah H Alateeq[1,2], Fahad Saad Al-dawsari[1,2], Mansour M Alotaibi[3], Mohammed F Alshahrani[4], Turki M Alanazi[5,6], Abdullah M Alanazi[1,2]

[1]Department of Respiratory Therapy, College of Applied Medical Sciences, King Saud Bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia; [2]King Abdullah International Medical Research Center, Riyadh, Saudi Arabia; [3]Northern Border University, Department of Physical Therapy, Arar, Saudi Arabia; [4]Respiratory Department, Security Forces Hospital, Riyadh, Saudi Arabia; [5]Department of Respiratory Therapy, King Saud Bin Abdulaziz University for Health Sciences, Al Ahsa, Saudi Arabia; [6]King Abdullah International Medical Research Center, Al Ahsa, Saudi Arabia

Correspondence: Tareq F Alotaibi, Email alotaibita@ksau-hs.edu.sa

Background & Aims: Asthma is a chronic disorder affecting health-related quality of life. This study aimed to explore differences in sleep quality based on individual characteristics, such as smoking habits and asthma.

Methods: This cross-sectional study included Saudi citizens aged ≥18 years. A questionnaire was used to collect information regarding demographics, sleep quality, smoking history, and physical activity.

Results: We included 489 participants (male, 58%), divided into three main groups for analysis: (1) individuals with asthma (n=52), smokers (n=104), and controls (n=333). In total, 71.15% (n=37) of individuals with asthma and 64.4% (n=67) of the smokers had sleep difficulties. Furthermore, 61.5% (n=32) of individuals with asthma and 56.7% (n=59) of smokers were found to be insufficiently active. Additionally, 15.4% (n=8) of individuals with asthma and 15.4% of smokers (n=16) were moderately active. Finally, 23.1% (n=12) of individuals with asthma and 27.9% (n=29) of smokers were active. The questionnaire also revealed that 57.7% (n=282) of respondents had poor sleep quality, with a significantly higher rate among individuals with asthma (71.15%; n=37; mean ± SD: 10 ± 3.57) compared to that among non-asthmatics (50%; n=245; mean ± SD: 6.58 ± 3.61; *P*=0.027).

Conclusion: Asthma has a significant impact on sleep quality and physical activity levels. Poor sleep quality adversely affects the quality of life, suggesting that increased public awareness of these risk factors is crucial.

Keywords: asthma, smoking, adults, quality of life, sleep

Introduction

Asthma is a chronic inflammatory disease of the airways that causes wheezing, dyspnea, chest tightness, and coughing.[1] In 2018, 11–18% of individuals in Saudi Arabia had asthma.[2] The chronic nature of this disease, as well as the unpredictable character and severity of acute episodes, can significantly reduce health-related quality of life (QOL), including physical activity, sleep quality, and socioeconomic status and increase cardiovascular risk factors.[1]

Environmental factors, including air pollution and allergens, play a role in worsening and developing asthma.[3,4] A study in Saudi Arabia showed that the causes of increased asthma exacerbation are industrial activities, sandstorms, and vehicle exhaust fumes.[5] However, another study showed that common causes of asthma in the Kingdom of Saudi Arabia are allergens, such as dust mites, cockroaches, and animal dander.[6]

Additionally, factors such as body mass index (BMI) and comorbidities like severe persistent allergic rhinitis can significantly influence the outcomes of asthma. Obesity, often indicated by a high BMI, has been shown to negatively affect musculoskeletal health and inhibit physical function.[7] Moreover, severe persistent allergic rhinitis, a common comorbidity with asthma, can exacerbate asthma symptoms and complicate management.

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Physical activity has several health benefits, including a reduction in cardiovascular risk factors.[8,9] Individuals with asthma may avoid physical activity to avoid exacerbating symptoms.[8,9] According to the World Health Organization (WHO), regular physical activity can reduce the risk of developing chronic noncommunicable diseases, such as cardiovascular disease, stroke, and hypertension.[10] The WHO also recommends that adults perform moderate physical activity for at least 150–300 min, or 75–150 min of vigorous activity per week to obtain health benefits.

Sleep disturbances are common complaints in individuals with asthma and include late sleep onset, difficulty in sleep continuity, and early awakening, thereby affecting sleep quality.[11–13] Asthma symptoms, including variations in airflow and increased airway resistance at night, can disrupt sleep quality and energy consumption.[14–16] Asthma can affect the physical, mental, and financial resources of diagnosed individuals, thus negatively affecting their QOL.[1]

Socioeconomic status has long been attributed to differences in asthma outcomes.[17,18] Health literacy refers to the ability to receive, process, and understand health information leading to good health decisions.[19] Improving health literacy may help reduce health inequalities and address difficult socioeconomic obstacles.[20] This study aimed to describe differences in sleep quality and physical activity according to smoking status and/or asthma diagnosis.

Materials and Methods

This cross-sectional study included Saudi citizens aged ≥18 years. Between May 2022 and May 2023, an online self-report questionnaire was used to collect data on demographics, asthma symptoms, sleep quality, smoking habits, and physical activity. This study was approved by the Institutional Review Board of the King Abdullah International Medical Research Center (IRB number: IRB/1012/22). Informed consent was obtained from all participants.

Outcome Measures

The participants completed the Pittsburgh Sleep Quality Index (PSQI), an 18-item self-reported measurement tool used to evaluate sleep quality. The global score and seven components included: (1) sleep quality, (2) sleep latency, (3) sleep duration, (4) sleep efficiency, (5) sleep disturbance, (6) medication use, and (7) daytime dysfunction. These items were rated on a four-point Likert scale to examine the frequency or severity of the problem (eg, 0, not during the past month; 1, less than once a week; 2, once or twice a week; and 3, three or more times a week). These items are rated on a scale of 0–3, and the sum of the scores ranges from 0 to 21, with higher scores indicating poorer sleep quality.[21]

The Godin-Shephard Leisure-Time Physical Activity Questionnaire was used to measure physical activity.[22] Participants were asked three questions: How many times per week do you perform 15 minutes of (1) high-intensity physical activity (eg, running or yoga), (2) moderate-intensity physical activity (eg, fast walking or baseball), and (3) light physical activity (eg, yoga or archery)? Based on the participants' responses, a weekly leisure activity score was calculated as follows: ((9 × strenuous) + (5 × moderate) + (3 × light)=total leisure activity score). The cutoff points for the physical activity level were as follows: 24 units, more active; 14–23 units, moderately active; and <14 units, insufficiently active.

Statistical Analysis

Descriptive statistics were calculated and presented as frequencies (percentages) to determine the participants' demographic characteristics. Sleep quality was analyzed using an independent samples *t*-test for subgroup analysis (smokers were compared with non-smokers). Analysis of variance was used to compare physical activity between the groups. Statistical analyses were performed using the SPSS software (version 20). Statistical significance was set at $P<0.05$.

Results

Demographics

A total of 489 participants were included in this study, with a mean age of 24.27 ± 8.68 years; 58% (n=283) were male, 10.6% (n=52) were asthmatic, 12.7% had chronic diseases, and 21.3% (n=104) were smokers (Table 1). This study has several notable findings.

Table 1 Demographic Data of the Participants (n=489)

Characteristics	N (%)
Age in years (mean ± SD)	24.3 ± 8.6
Job status	
Employed Business	17 (3.4%)
Student	308(62.2%)
Employed	117 (23.6%)
Unemployed	53 (10.7%)
Monthly income in SAR	
<5000	350 (70.7%)
5000–10,000	62 (12.5%)
10,000–15,000	35 (7.1%)
15,000–20,000	30 (6.1%)
>20,000	18 (3.6%)
Education	
Bachelors	265 (53.5%)
General	142 (28.7%)
Diploma	62 (12.5%)
Masters	17 (3.4%)
PhD	5 (1.0%)
No education	4 (0.8%)
Social status	
Single	399 (80.6%)
Married	92 (18.6%)
Widowed	1 (0.2%)
Divorced	3 (0.6%)

Note: Data are presented as numbers (percentage), except age, which was presented as mean ± SD.

Sleep Quality with Asthmatics

In this study, 57.7% (n=282) of respondents had poor sleep quality, with significantly higher rates (71.15% [n=37]) and PSQI scores (mean ± SD, 10 ± 3.57) among individuals with asthma compared to those among non-asthmatic respondents (50%, n=245), who had lower PSQI scores (mean ± SD, 6.58 ± 3.61) (P=0.027), indicating a potential relationship between asthma and sleep difficulties.

Sleep Quality and Smoking

Of the 489 participants, 104 were smokers with an average PSQI score of 7.13 ± 3.74, trending toward poorer sleep quality compared to that in non-smokers (6.57 ± 3.71; P=0.389). This indicated that the difference in sleep quality rates between

smokers and nonsmokers was not statistically significant. However, out of the 104 smokers who participated, 64.4% (n=67) reported poor sleep quality, with a mean PSQI score of (mean ± SD) 9.16 ± 3.00 among those 67 individuals Figure 1.

Differences in Physical Activity Among Smokers, Asthmatics, and Health Conditions

This study also evaluated the levels of physical activity among participants using the Godin-Shephard Leisure-Time Physical Activity Questionnaire, which represents the physical activity status of individuals. Results showed that most of the participants (55.2%, n=270) were insufficiently active. Similarly, 61.5% (n=32) of the individuals with asthma, 56.7% (n=59) of the smokers, and 61.3% (n=38) of the individuals with chronic diseases were insufficiently active. However, the observed differences in physical activity levels compared with those exhibited by healthy individuals were not statistically significant (P>0.05) Figure 2.

Figure 1 Bar chart represents the prevalence of poor sleep quality among asthmatics and smokers.

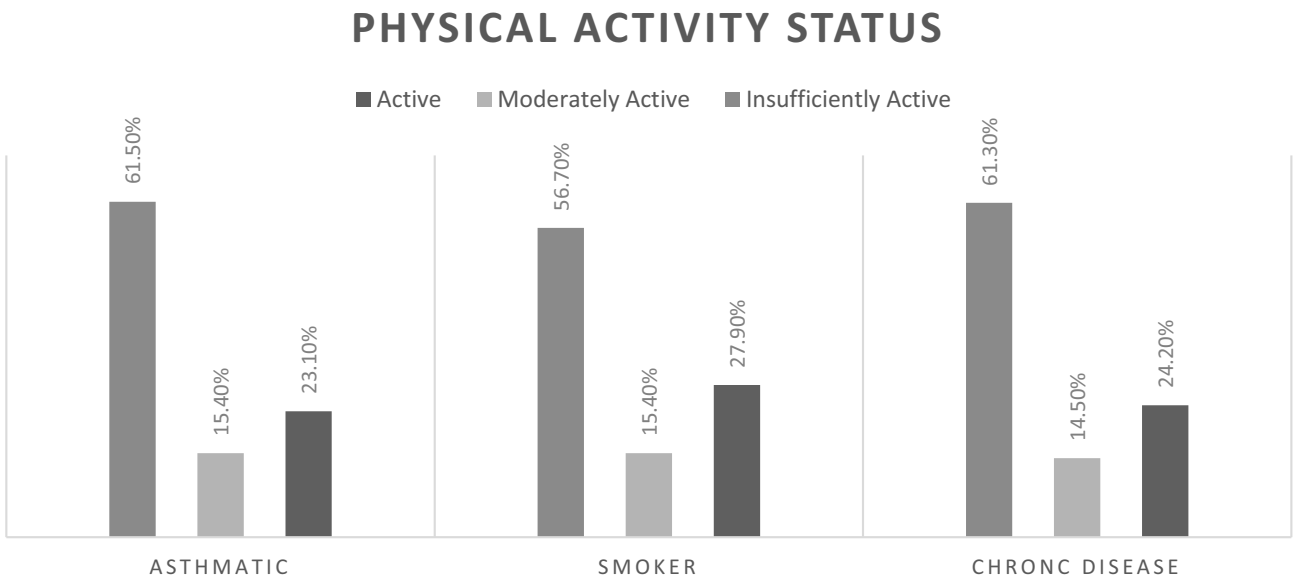

Figure 2 Bar chart represents physical activity level among three groups: Asthmatics, smokers and chronic diseases patients.

Discussion

In this study, over half of the respondents displayed poor sleep quality, with asthma significantly influencing sleep quality and smoking showing a trend towards negative effects, though not statistically significant. The impact of physical activity levels, smoking habits, chronic diseases, and asthma on sleep quality was examined.

More than two-thirds (71%) of individuals with asthma experienced sleep difficulties in the study, reinforcing findings from a previous study in Riyadh where 66% of asthma patients reported similar sleep issues. Improved asthma control has been linked to better sleep quality, with asthma symptoms and medication side effects contributing to disturbances in sleep patterns.[23]

Among smokers in the study, 64% reported poor sleep quality. Smoking's detrimental impact on sleep quality is well-documented, with nicotine acting as a stimulant that can impede falling asleep, particularly when smoked close to bedtime.[24]

The study revealed that over half of the participants (55.2%) were classified as insufficiently active, with 61.5% of individuals with asthma falling into this category. Individuals with severe asthma and smokers tend to engage less in moderate and vigorous activities, which can affect their overall physical activity levels.[25,26]

A portion of the participants (12.7%) reported having chronic diseases, with a majority (61.3%) of them being insufficiently active. Low physical activity levels among individuals with chronic diseases are well-documented, yet even minimal weekly physical activity can yield positive health benefits.[27]

It is crucial to consider the levels of asthma control, inflammation, and their implications for sleep quality. Studies have underscored the intricate relationship between sleep duration, inflammation, and asthma control. Understanding how these factors interplay can offer valuable insights into managing asthma symptoms and improving overall well-being furthermore, future research should emphasize objective measurements of sleep quality and physical activity, alongside verified asthma diagnoses and assessments of asthma severity, to enhance the reliability and applicability of findings.[28]

Asthma, smoking, sleep quality, and physical activity are interrelated in a very complex way, with many pathways. On one hand, smoking worsens asthma due to increased airway inflammation, bronchial hyperresponsiveness, and susceptibility to respiratory infections, while it impairs sleep quality because of the stimulating effect of nicotine and sleep-disordered breathing.[29] Poor sleep quality contributes to worse asthma symptoms and systemic inflammation, creating a vicious circle.[30] On one hand, exercise is superb for cardiovascular fitness and even to reduce inflammation, whereas on the other hand, it can induce bronchoconstriction in cases of exercise-induced bronchoconstriction. Poor sleeping decreases energy and motivation toward any physical activity. Also, smoking decreases exercise tolerance and overall fitness. It goes without saying that issues like smoking cessation, regular exercise, and sleep hygiene are terribly important for the optimal control of asthma and the well-being of the patient generally speaking.[31]

Limitations

This study had some limitations. Data were collected using a self-reported questionnaire to measure asthma, physical activity, health status, and sleep quality. This could have caused a bias in the overall results. Second, the study design was cross-sectional; therefore, we were unable to analyze the causal relationships between the variables. Third, the participants were relatively young. Therefore, these findings may not be generalizable.

Strengths

The recruitment for this study was powered by a power source. All participants were from different regions of the Kingdom of Saudi Arabia. Those who participated in the survey but did not complete the questionnaire were excluded. For future investigations, we highly recommend clinical studies that involve objective measurements of sleep quality and physical activity and a verified diagnosis of asthma, including asthma severity.

Conclusion

Poor sleep quality is a critical health issue reported in most adult populations. Asthma adversely affects sleep quality, which adversely affects QOL. Therefore, it is necessary to increase awareness of these health factors through programs, community services, events, and advertisements.

Institutional Review Board Statement

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. All participants provided informed consent prior to their inclusion in the study, and ethical approval was obtained from. This study was approved by the Institutional Review Board of the King Abdullah International Medical Research Center (IRB number: IRB/1012/22).

Data Sharing Statement

Data available on reasonable request.

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 no conflict of interest.

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