

# Physical activity, sleep, and quality of life of patients with asthma during the COVID-19 pandemic

Kübra Ayşe Daşdemir & Sinem Suner-Keklik

To cite this article: Kübra Ayşe Daşdemir & Sinem Suner-Keklik (2021): Physical activity, sleep, and quality of life of patients with asthma during the COVID-19 pandemic, Journal of Asthma, DOI: [10.1080/02770903.2021.1931303](https://doi.org/10.1080/02770903.2021.1931303)

To link to this article: <https://doi.org/10.1080/02770903.2021.1931303>



Published online: 02 Jun 2021.



Submit your article to this journal [↗](#)



Article views: 78





View related articles [↗](#)



View Crossmark data [↗](#)

# Physical activity, sleep, and quality of life of patients with asthma during the COVID-19 pandemic

Kübra Ayşe Daşdemir, PT  and Sinem Suner-Keklik, PT, PhD 

Department of Physiotherapy and Rehabilitation, Faculty of Health Sciences, Sivas Cumhuriyet University, Sivas, Turkey

## ABSTRACT

**Objective:** There is limited information in literature on how coronavirus disease-2019 (COVID-19) pandemic period affects people with asthma. This study aimed to compare levels of physical activity, stress, and fear and quality of life and sleep quality between patients with asthma and healthy individuals during the pandemic.

**Methods:** Twenty-two patients with asthma and 22 healthy individuals aged between 18 and 65 years were included. Physical activity level using "International Physical Activity Questionnaire"; stress level, using "Perceived Stress Scale-14"; fear level, using "Fear of COVID-19 Scale"; sleep quality, using "Pittsburgh Sleep Quality Index"; and quality of life, using "World Health Organization Quality of Life" were evaluated.

**Results:** Total physical activity level, vigorous physical activity level, and walking score of patients with asthma were lower than healthy individuals ( $p < .05$ ). Sitting time of patients with asthma was higher than healthy individuals ( $p < .05$ ). Subjective sleep quality, latency, duration, efficiency, sleeping medication use, and daytime dysfunction of both were similar ( $p > .05$ ). Only sleep disturbance score of patients with asthma were higher than healthy individuals ( $p < .05$ ). Quality of life, stress, and fear levels of both were similar ( $p > .05$ ).

**Conclusion:** During pandemic, patients with asthma are more inactive than healthy individuals regardless of the presence of a chronic disease; pandemic negatively affected stress, fear levels, sleep, and quality of life. To minimize the effects of restrictions and psychological burden caused by pandemic and to encourage patients with asthma to perform physical activities, conducting studies to control stress levels and increasing quality of life and sleep of all individuals are important.

## ARTICLE HISTORY

Received 23 January 2021

Revised 11 May 2021

Accepted 12 May 2021

## KEYWORDS



COVID-19;  
asthma;  
physical activity;  
quality of life;  
sleep

## Introduction

The novel coronavirus disease 2019 (COVID-19) (caused by severe acute respiratory syndrome coronavirus 2), which had emerged in Wuhan, China, toward the end of December 2019 and has currently affected the entire world within a short span, was declared as a pandemic by the World Health Organization (WHO) (1). Different quarantine policies have been implemented in different countries for preventing the spread of the virus worldwide. In particular, individuals with chronic diseases were advised to stay home and maintain social distancing (2). Reportedly, staying home for a long duration owing to mandatory restrictions may cause inactivity, anxiety, and depression. Prolonged immobility is an important risk factor for mortality and morbidity (3).

Asthma is a chronic lung disease that manifests with symptoms including chest tightness, dyspnea, wheezing, and cough and is characterized by airway hypersensitivity to direct or indirect stimuli. It is a common disease that occurs in over 339 million individuals worldwide (4). There are approximately 4 million patients with asthma in Turkey (5).

It is considered that patients with asthma have a higher susceptibility to COVID-19 compared with normal individuals owing to decreased antiviral immune response and high virus-induced exacerbation risk (6). According to data from the Chinese Center for Disease Control (CDC), 2.4% of 44,672 patients with COVID-19 experienced chronic respiratory diseases, including asthma (7). In the United States, data from New York alone reported that 9% of patients with COVID-19 experienced asthma (8).

**CONTACT** Kübra Ayşe Daşdemir  kubradasdemir46@gmail.com  Department of Physiotherapy and Rehabilitation, Faculty of Health Sciences, Sivas Cumhuriyet University, Sivas, Turkey.

© 2021 Taylor & Francis Group, LLC

Ambiguity regarding the disease status in patients with asthma may cause stress, anxiety, and other psychological disorders owing to the acute and infectious nature of the pandemic (9). Increased stress and fear levels negatively affect asthma control, sleep quality, and quality of life (10). Patients with asthma tend to avoid physical activity because of the concern that their symptoms will worsen with physical activity, and this trend is believed to have increased during the pandemic. Withdrawing from a sedentary lifestyle and performing regular physical activity can help in asthma control and increase quality of life by reducing stress and anxiety (11). Moreover, moderate regular physical activity reportedly has a positive impact on the immune system (12).

Considering this information, it is vital to evaluate the physical activity level, psychological state, sleep quality, and quality of life of patients with asthma in the risk group for COVID-19. Information regarding the effect of the pandemic on patients with asthma is insufficient. The present study aimed to compare the levels of physical activity, stress, and fear and quality of life and sleep quality of patients with asthma with healthy individuals during the COVID-19 pandemic. The hypothesis of our study is that individuals with asthma will have worse physical activity, stress, and fear levels during the pandemic, and this will negatively affect the quality of life and sleep quality.

## Methods

A total of 22 patients with asthma and 22 healthy individuals aged between 18 and 65 years were included in the study. Patients with asthma who experienced no orthopedic issues that could prevent them from performing physical activity, were able to walk, were cooperative, and had no other chronic diseases besides asthma (cancer, chronic obstructive pulmonary disease, coronary artery disease, etc.) were included. The control group comprising healthy individuals included those with no diagnosed disease that could prevent them from performing any physical activity.

The study was approved by the university ethics committee (decision number 2020-11/18, dated November 18, 2020). Healthy individuals and patients with asthma were informed about the purpose and content of the study, and their consent was obtained online. Demographic characteristics (age, height, body weight, background, and family history) and smoking habits of both groups were examined. Physical activity level, perceived stress level,

COVID-19 fear level, quality of life, and sleep quality of the participants were evaluated using an online questionnaire method.

The physical activity level of the participants was evaluated using the International Physical Activity Questionnaire (IPAQ) short form. The IPAQ short form consists of seven questions, including those about physical activities performed in the last 7 days, divided into four sections. This questionnaire questions the number of days physical activities including vigorous physical activity [8 metabolic equivalents (METs)], moderate physical activity (4 METs), and walking (3.3 METs) were performed in the previous week and the duration for which they were performed on each day. The total amount of MET spent during these three different physical activities was calculated by determining the number of days and the duration for which an individual performs walking, moderate activity, and vigorous activity per week. The time spent being sedentary is questioned but is not included in the scoring. Based on the total amount of MET, the physical activity level is divided into three categories as inactive, minimally active, and very active (13).

Stress level was evaluated using the Perceived Stress Scale-14 (PSS-14). The scale measures an individual's perception of life situations in terms of stress associated with the situation. The scale consists of 14 items and includes the sub-dimensions of perception of insufficient self-efficacy and perception of stress/discomfort. Each item is evaluated using a 5-point Likert scoring system as follows: "Never: 0," "Almost never: 1," "Sometimes: 2," "Quite often: 3," and "Very often: 4." The lowest score of the scale is 0, and the highest score is 56. High scores from the scale indicate that the individual has a high stress level (14).

COVID-19 fear level was assessed using the Fear of COVID-19 Scale. The scale is one-dimensional and comprises seven items. The 5-point Likert scoring of the Fear of COVID-19 Scale and the total score calculation are presented in Table 1. A high score on the scale indicates a high COVID-19 fear level, whereas a low score indicates a low COVID-19 fear level (15).

Quality of life was assessed using the WHO Quality of Life Short Form (WHOQOL-BREF). WHOQOL-BREF consists of 26 questions on physical, psychological, social, and environmental domains. With the addition of a national question to the Turkish version of the questionnaire (WHOQOL-BREF-TR), the total number of questions became 27. The first two questions and the last were not included in scale scoring (16).

**Table 1.** Scoring of Fear of COVID-19 Scale and Pittsburgh Sleep Quality Index.

Fear of COVID-19 Scale	Strongly Disagree:1
	Disagree:2
	Neutral:3
	Agree:4
	Strongly Agree:5
Total score	Q1 + Q2 + Q3 + Q4 + Q5 + Q6 + Q7 (min score: 5, max score:35)
PSQI	
Component 1 (Subjective sleep quality)	Q9 score; 0, 1, 2, 3
Component 2 (Sleep latency)	Q2 score; <15 min:0, 16–30 min:1, 31–60 min:2, >60 min:3 Q5a score; 0, 1, 2, 3
Component 3 (Sleep duration)	Q2 + Q5a score; 0:0, 1–2:1, 3–4:2, 5–6:3
Component 4 (Habitual sleep efficiency)	Q4; >7 h:0, 6–7 h:1, 5–6 h:2, <5 h:3 Hours slept – Q4 Hours in bed – Q1 and Q3 (Hours slept/Hours in bed) × 100% score; >85%:0, 75–84%:1, 65–74%:2, <65%:3
Component 5 (Sleep disturbance)	Q5b–5j score; 0, 1, 2, 3 Q5b + Q5c + Q5d + Q5e + Q5f + Q5g + Q5h + Q5i + Q5j score; 0:0, 1–9:1, 10–18:2, 19–27:3
Component 6 (Use of sleeping medication)	Q6 score; 0, 1, 2, 3
Component 7 (Daytime dysfunction)	Q7 score; 0, 1, 2, 3, Q8 score; 0, 1, 2, 3 Q7 + Q8 score; 0:0, 1–2:1, 3–4:2, 5–6:3
Total Score	C1 + C2 + C3 + C4 + C5 + C6 + C7 (min score:0, max score:21)

PSQI, Pittsburgh Sleep Quality Index; Q, Question; C, Component

Sleep quality was evaluated using the Pittsburgh Sleep Quality Index (PSQI). PSQI is a 19-item self-report scale that evaluates sleep quality and sleep disorder over the past month. In this scale that consists of 24 questions in total, the first 19 are self-report questions, whereas the last 5 are questions to be answered by the spouse or a roommate. PSQI components and scoring system are presented in Table 1. If the total score on the scale is  $\leq 5$ , sleep quality is considered “good,” and if it is  $> 5$ , it is considered “poor” (17).

### Data analysis

SPSS for Windows 22 package program was used for statistical analysis. Normal distribution of the data was analyzed using Shapiro–Wilk test and histograms. Continuous variables were presented as means and standard deviation (SD) for normally distributed data or median and interquartile range (IQR) for non-normally distributed data. Categorical variables were presented as frequencies and percentages. Continuous variables were compared between asthma patients and

healthy controls by independent *t* test or the Mann–Whitney *U* test. Categorical variables were compared between the two groups by the chi-square test or Fisher’s exact test. A *p* values of  $< .05$  was considered as statistical significance.

### Results

The comparison of the demographic characteristics of patients with asthma and healthy individuals is presented in Table 2. Among the patients with asthma, 72.7% were women and 27.3% were men and among the healthy individuals, 68.2% were women and 31.8% were men. Sex distribution of patients with asthma and healthy individuals was similar ( $p > .05$ , Table 2). Furthermore, 22.7% and 20.5% of the patients with asthma and healthy individuals, respectively, were smokers. No significant difference was observed in age, height, body weight, body mass index, and smoking exposure between both groups ( $p > .05$ , Table 2).

Among patients with asthma, 59.1% were inactive, 36.4% were minimally active, and 4.5% were active

**Table 2.** Comparison of the demographic characteristics of patients with asthma and healthy controls.

	Asthma (n=22)	Healthy controls (n=22)	<i>p</i> value
Gender, n (%)			.74
Female	16 (72.7)	15 (68.2)	
Male	6 (27.3)	7 (31.8)	
Age (years)	34.32 ± 10.52	34.18 ± 11.14	.96
Height (cm)	166.18 ± 7.926	167.82 ± 9.91	.54
Weight (kg)	71.91 ± 14.86	68.36 ± 14	.42
BMI (kg/m <sup>2</sup> )	26.05 ± 5.37	24.14 ± 3.77	.17
Smoking (package-year)	0 [1]	0 [0]	.84

BMI, body mass index.

Data are presented as means ± SD, median [IQR] or *n* (%).

at a level to promote health. Among healthy individuals, 31.8% were inactive, 50% were minimally active, and 18.2% were active at a level to promote health. No significant difference was observed in overall physical activity levels between both groups ( $p > .05$ , Table 3). No significant difference was noted in moderate physical activity levels between patients with asthma and healthy individuals ( $p > .05$ , Table 3). It was found that vigorous physical activity levels, total physical activity levels, and walking scores were significantly higher in healthy individuals than in patients with asthma ( $p < .05$ , Table 3). Time spent being sedentary was significantly higher in patients with asthma than in healthy individuals ( $p < .05$ , Table 3).

No significant difference was observed in terms of the perception of insufficient self-efficacy, perception of stress/discomfort, and general stress levels between patients with asthma and healthy individuals ( $p > .05$ , Table 3). Specifically, the stress levels of participants in both groups were similar. Furthermore, there was no significant difference between the COVID-19 fear levels of patients with asthma and healthy individuals ( $p > .05$ , Table 3). The pandemic fear levels were similar for all participants in the study.

No significant difference was observed in terms of subjective sleep quality, sleep latency, sleep duration, sleep efficiency, use of sleeping medication, and daytime dysfunction between patients with asthma and healthy individuals ( $p > .05$ , Table 3). Sleep disorder scores of patients with asthma were significantly higher than those of healthy individuals ( $p < .05$ , Table 3). Sleep quality was poor in 59.1% and good in 40.9% of the patients with asthma, whereas it was poor in 36.4% and good in 63.6% of the healthy individuals; sleep quality of both groups was similar ( $p > .05$ , Table 3).

Furthermore, there was no significant difference in the quality of life in terms of the physical health, psychological, social relationships, and environmental domains of the WHOQOL-BREF-TR scale between patients with asthma and healthy individuals ( $p > .05$ , Table 3). The impact on the quality of life was found to be similar during the pandemic.

## Discussion

In the present study, the physical activity level of patients with asthma was lower than that of the healthy individuals, and perceived stress level,

**Table 3.** Comparison of patients with asthma and healthy controls.

	Asthma (n=22)	Healthy controls (n=22)	p value
<b>IPAQ</b>			
Total PA (MET-min/week)	623.50 ± 725.162	1548.27 ± 1426.491	.025*
Vigorous PA (MET-min/week)	0 [0]	0 [390]	.025*
Moderate PA (MET-min/week)	0 [180]	0 [480]	.23
Walking (MET-min/week)	403.50 ± 355.84	830.23 ± 831.995	.035*
Sitting down (min)	608.18 ± 123.23	485.45 ± 101.26	.001*
Overall PA level			.14
Inactive	13 (59.1)	7 (31.8)	
Minimally active	8 (36.4)	11 (50)	
HEPA	1 (4.5)	4 (18.2)	
<b>PSS-14</b>			
Perception of insufficient self-efficacy	1.75 ± 0.77	2 ± 0.54	.21
Perception of stress/discomfort	2.15 ± 0.76	1.98 ± 0.82	.48
Stress (General)	27.36 ± 9.62	27.95 ± 7.54	.82
Fear of COVID-19 Scale	21.27 ± 6.66	18.50 ± 6.28	.16
<b>WHOQOL-BREF</b>			
Physical health	14.75 ± 2.40	14.45 ± 2.93	.71
Psychological	14.02 ± 2.18	13.35 ± 3.17	.42
Social relationships	14.05 ± 2.59	13.87 ± 2.16	.79
Environmental	13.68 ± 1.86	13.47 ± 2.22	.73
<b>PSQI</b>			
Subjective sleep quality	1 [1]	1 [0]	.08
Sleep latency	2 [1]	1 [1]	.43
Sleep duration	0 [1]	0 [1]	.68
Habitual sleep efficiency	0 [1]	0 [1]	.37
Sleep disturbance	2 [1]	1 [0]	.028*
Use of sleeping medication	0 [0]	0 [0]	.67
Daytime dysfunction	1 [1]	0 [1]	.05
PSQI-Total score	6.68 ± 3.45	5.72 ± 3.02	.33
Sleep quality, n (%)			.13
Good	9 (40.9)	14 (63.6)	
Poor	13 (59.1)	8 (36.4)	

\* $p < 0.05$ .

IPAQ, International Physical Activity Questionnaire; PA, Physical activity; HEPA, Health-enhancing physically active; PSS-14, Perceived Stress Scale-14; WHOQOL-BREF, WHO Quality of Life Short Form; PSQI, Pittsburgh Sleep Quality Index.

Data are presented as means ± SD, median [IQR] or n (%).

COVID-19 fear level, sleep quality, and quality of life were similar between both groups.

Patients with asthma avoid physical activity and adopt a sedentary lifestyle because exercise and vigorous physical activity lead to bronchoconstriction (18). However, studies have shown that bronchodilation also occurs owing to the decrease in vagal tone in the smooth muscles of the airway owing to the immediate effect of physical activity (19). Regular physical activity reportedly improves cardiopulmonary fitness, asthma symptoms, and quality of life in patients with asthma (20). In a study that evaluated the physical activity level in 20 patients with asthma and 15 healthy individuals using the IPAQ short form, the physical activity level was lower in patients with asthma than in the healthy individuals (21). Another study reported that compared with the control group, patients with asthma showed a higher degree of inactivity and engaged in less intense physical activity (22). Furthermore, in a study that compared the physical activity level of patients with asthma and healthy individuals using the IPAQ short form, both groups showed similar intensive physical activity levels, moderate physical activity levels, walking scores, and sedentary time (23). In the present study, similar to most previous studies, the total physical activity level of patients with asthma was lower than that of healthy individuals. However, in this study, unlike previous studies, healthy individuals showed higher physical activity levels and walking scores than patients with asthma; patients with asthma exhibited longer sedentary time compared with healthy individuals. Furthermore, 59.1% of patients with asthma were inactive, and only 4.5% were active at a level to promote health. In the present study, the proportion of inactive individuals was higher in the patients with asthma group compared with previous studies. These findings may be attributed to patients with asthma staying home for a longer duration under quarantine conditions during the pandemic and avoiding physical activity owing to the concern that asthma symptoms will increase even at home.

Mood disorders, such as stress and anxiety, are more common in patients with asthma (24). Stress increases shortness of breath, leading to exacerbated asthma symptoms and impaired sleep and quality of life (25). Moreover, it negatively affects the perception and management of asthma, which provides asthma control (26). Stress may lead to adverse health behaviors that increase smoking exposure, which is an asthma trigger (27). To the best of our knowledge, no study has compared the perceived stress levels of patients with asthma with those of a healthy control group. In our study, the perceived stress levels of patients with asthma and healthy individuals were

similar. Because the mean score of PSS-14 was in the range of “Sometimes” in both groups, the stress level of both groups was determined to be moderate. This similarity can be attributed to the fact that the current pandemic causes the stress response regardless of the presence of chronic disease.

Although COVID-19 has profound psychological effects on all individuals worldwide, it has increased fear, stress, and depression levels, particularly in individuals with chronic illnesses who are considered in the risk group (28). In the literature, the quarantine period, fear of infection, and insufficient information have been reported as the main factors that increase stress during the pandemic (29). It has been determined that patients with chronic lung disease have high fear and anxiety levels with regard to the impact of the COVID-19 pandemic (30). However, no study has compared the COVID-19 fear level in patients with asthma and healthy individuals. In the present study, no significant difference was observed between the mean scores of patients with asthma and healthy individuals in the Fear of COVID-19 Scale. Based on the mean scores of both groups in the scale, which is scored between 7 and 35 points, the fear level was determined to be moderate. Our study showed that owing to the COVID-19 pandemic, patients with asthma as well as healthy individuals without any chronic diseases experience similar fear and stress levels.

Sleep disturbances, such as difficulty falling asleep, waking up at night, and daytime sleepiness, are common in patients with asthma (31). In a study that evaluated sleep quality based on PSQI, patients with asthma were found to have a mean overall sleep quality score of  $5.68 \pm 3.4$  and 58.3% of the patients exhibited poor sleep quality (32). Another study reported that 79% of 487 patients with asthma exhibited poor sleep quality and that the overall sleep quality score was  $7.78 \pm 3.76$  points (33). In the present study, the mean score of general sleep quality in patients with asthma was  $6.68 \pm 3.45$  and 59.1% of these patients exhibited poor sleep quality. Although the mean score of overall sleep quality was similar to that observed in previous studies, no significant difference was observed between patients with asthma and healthy individuals. We believe that owing to the psychological effects of the pandemic and the lifestyle changes of individuals spending more time at home than normal, the sleep quality of healthy individuals may also be impaired during this pandemic. Therefore, sleep quality of healthy individuals and patients with asthma may be similar.

The quality of life of patients with asthma decreases owing to the physical, psychological, and social

limitations in daily life caused by factors such as asthma symptoms and stress (34). Studies comparing the quality of life of patients with asthma and a control group are scarce. In a study that compared the quality of life of 51 patients with asthma and 51 healthy individuals, the quality of life in patients with asthma was found to be lower (35). In the present study, unlike the aforementioned studies, the quality of life of patients with asthma and healthy individuals was similar. The COVID-19 pandemic has resulted in restrictions and additional stress to the lives of each healthy individual and patient with asthma, which may have led to similar effects on the quality of life in both groups.

If information regarding the pre-pandemic physical activity and stress level, sleep quality, and quality of life of patients with asthma and healthy individuals who participated in our study was available, the effects of the pandemic could have been demonstrated and further clarified. This may be a limitation of our study.

## Conclusions

Compared with healthy individuals, patients with asthma have adopted a more inactive lifestyle during the pandemic. We believe that to minimize the negative effects of inactivity on the disease, particularly in the future, it is important to inform patients with asthma about the benefits of regular physical activity and encourage them to stay active and perform home-based physical activities to the maximum extent. In addition, the COVID-19 pandemic as well as the restrictions and psychological burden associated with it have increased the stress levels of individuals regardless of the presence of chronic diseases, negatively affecting their sleep quality and quality of life. Therefore, we believe that each individual requires support to control their stress levels and improve their sleep quality and quality of life.

In the literature, studies that compare the physical activity levels, sleep quality, COVID-19 fear levels, quality of life, and stress levels in adult patients with asthma during the pandemic with a control group are limited. Therefore, we believe that additional studies are required to further elucidate the effects of the COVID-19 pandemic on patients with asthma.

## Declaration of interests

The authors report no conflicts of interest.

## ORCID

Kübra Ayşe Daşdemir  <https://orcid.org/0000-0003-4128-1382>  
Sinem Suner-Keklik  <https://orcid.org/0000-0002-9506-3172>

## References

1. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *J Autoimmun.* 2020;109:102433. doi:10.1016/j.jaut.2020.102433.
2. Ha BTT, Ngoc QL, Mirzoev T, Tai NT, Thai PQ, Dinh PC. Combating the COVID-19 epidemic: experiences from Vietnam. *Int J Environ Res Public Health.* 2020;17(9):3125. doi:10.3390/ijerph17093125.
3. Chen P, Mao L, Nassis GP, Harmer P, Ainsworth BE, Li F. Coronavirus disease (COVID-19): the need to maintain regular physical activity while taking precautions. *J Sport Health Sci.* 2020;9(2):103–104. doi:10.1016/j.jshs.2020.02.001.
4. Global Initiative for Asthma (GINA). Global strategy for asthma management and prevention. Available from: [https://ginasthma.org/wp-content/uploads/2020/06/GINA-2020-report\\_20\\_06\\_04-1-wms.pdf](https://ginasthma.org/wp-content/uploads/2020/06/GINA-2020-report_20_06_04-1-wms.pdf) [last accessed December 2020].
5. Ünal BE, Horasan GD, Kalaça S, Sözmen K. Türkiye kronik hastalıklar ve risk faktörleri sıklığı çalışması. Ankara: TC Sağlık Bakanlığı; 2013. Available from: <https://sbu.saglik.gov.tr/ekutuphane/kitaplar/khrfat.pdf>. [last accessed December 2020]
6. Wang Y, Di Y, Ye J, Wei W. Study on the public psychological states and its related factors during the outbreak of coronavirus disease 2019 (COVID-19) in some regions of China. *Psychol Health Med.* 2021;26(1):13–22. doi:10.1080/13548506.2020.1746817.
7. The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) in China. *Zhonghua Liu Xing Bing Xue Za Zhi.* 2020;41(2):145–151. doi:10.3760/cma.j.issn.0254-6450.2020.02.003.
8. Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson KW, Barnaby DP, Becker LB, Chelico JD, Cohen SL, et al.; the Northwell COVID-19 Research Consortium, Presenting characteristics, comorbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the New York City area. *JAMA.* 2020;323(20):2052–2059. doi:10.1001/jama.2020.6775.
9. Liu S, Zhi Y, Ying S. COVID-19 and asthma: reflection during the pandemic. *Clin Rev Allergy Immunol.* 2020;59(1):78–88. doi:10.1007/s12016-020-08797-3.
10. Rosenberg SL, Miller GE, Brehm JM, Celedón JC. Stress and asthma: novel insights on genetic, epigenetic, and immunologic mechanisms. *J Allergy Clin Immunol.* 2014;134(5):1009–1015. doi:10.1016/j.jaci.2014.07.005.
11. Hiles SA, Lamers F, Milaneschi Y, Penninx B. Sit, step, sweat: longitudinal associations between physical activity patterns, anxiety and depression. *Psychol Med.* 2017;47(8):1466–1477. doi:10.1017/s0033291716003548.
12. Klentrou P, Cieslak T, MacNeil M, Vintinner A, Plyley M. Effect of moderate exercise on salivary immunoglobulin A and infection risk in humans. *Eur J Appl Physiol.* 2002;87(2):153–158. doi:10.1007/s00421-002-0609-1.
13. Sağlam M, Arikan H, Savci S, Inal-Ince D, Bosnak-Guclu M, Karabulut E, Tokgozoglu L. International physical activity questionnaire: reliability and validity of the

- Turkish version. *Percept Mot Skills*. 2010;111(1):278–284. doi:10.2466/06.08.Pms.111.4.278-284.
14. Eskin M, Harlak H, Demirkıran F, Dereboy Ç. Algılanan stres ölçeğinin Türkçeye uyarlanması: güvenilirlik ve geçerlik analizi. *New/Yeni Symp J*. 2013;51(3):132–140.
  15. Satici B, Gocet-Tekin E, Deniz ME, Satici SA. Adaptation of the fear of COVID-19 scale: its association with psychological distress and life satisfaction in Turkey. *Int J Ment Health Addict*. 2020. doi:10.1007/s11469-020-00294-0.
  16. Eser E, Fidaner H, Fidaner C, Eser SY, Elbi H, Göker E. WHOQOL-100 ve WHOQOL-BREF'in psikometrik özellikleri. *Psikiyatri Psikoloji Psikofarmakoloji (3P) Dergisi*. 1999;7(Suppl 2):23–40.
  17. Agargun MY, Kara H, Anlar O. Pittsburgh uyku kalitesi indeksinin geçerliliği ve güvenilirliği. *Türk Psikiyatri Dergisi*. 1996;7:107–115.
  18. Winn CON, Mackintosh KA, Eddolls WTB, Stratton G, Wilson AM, Rance JY, Doull IJM, McNarry MA, Davies GA. Perceptions of asthma and exercise in adolescents with and without asthma. *J Asthma*. 2018;55(8):868–876. doi:10.1080/02770903.2017.1369992.
  19. Dempsey JA, Adams L, Ainsworth DM, Fregosi RF, Gallagher CG, Guz A, Johnson BD, Powers SK. Airway, lung, and respiratory muscle function during exercise. *Comp Physiol*. 2010;448–514. doi:10.1002/cphy.cp120111.
  20. Nyenhuis SM, Dixon AE, Ma J. Impact of lifestyle interventions targeting healthy diet, physical activity, and weight loss on asthma in adults: what is the evidence? *J Allergy Clin Immunol Pract*. 2018;6(3):751–763. doi:10.1016/j.jaip.2017.10.026.
  21. Ramos E, de Oliveira LV, Silva AB, Costa IP, Corrêa JC, Costa D, Alves VL, Donner CF, Stırbulov R, Arena R, et al. Peripheral muscle strength and functional capacity in patients with moderate to severe asthma. *Multidiscip Respir Med*. 2015;10(1):3. doi:10.1186/2049-6958-10-3.
  22. Ford ES, Heath GW, Mannino DM, Redd SC. Leisure-time physical activity patterns among US adults with asthma. *Chest*. 2003;124(2):432–437. doi:10.1378/chest.124.2.432.
  23. Sonbahar H. Astımlı Hastalarda Ve Sağlıklı Kişilerde Yorgunluk Düzeyinin Karşılaştırılması (tez). Ankara: Hacettepe Üniversitesi; 2015.
  24. Alonso J, de Jonge P, Lim CC, Aguilar-Gaxiola S, Bruffaerts R, Caldas-de-Almeida JM, Liu Z, O'Neill S, Stein DJ, Viana MC, et al. Association between mental disorders and subsequent adult onset asthma. *J Psychiatr Res*. 2014;59:179–188. doi:10.1016/j.jpsy-chires.2014.09.007.
  25. Rand CS, Wright RJ, Cabana MD, Foggs MB, Halterman JS, Olson L, Vollmer WM, Wilson SR, Taggart V. Mediators of asthma outcomes. *J Allergy Clin Immunol*. 2012;129(3 Suppl):S136–S141. doi:10.1016/j.jaci.2011.12.987.
  26. Peters TE, Fritz GK. Psychological considerations of the child with asthma. *Pediatr Clin North Am*. 2011;58(4):921–935, xi. doi:10.1016/j.pcl.2011.06.006.
  27. McKee SA, Sinha R, Weinberger AH, Sofuoğlu M, Harrison EL, Lavery M, Wanzer J. Stress decreases the ability to resist smoking and potentiates smoking intensity and reward. *J Psychopharmacol*. 2011;25(4):490–502. doi:10.1177/0269881110376694.
  28. Sayeed A, Kundu S, Al Banna MH, Christopher E, Hasan MT, Begum MR, Chowdhury S, Khan MSI. Mental health outcomes of adults with comorbidity and chronic diseases during the COVID-19 pandemic: a matched case-control study. *Psychiatr Danub*. 2020;32(3–4):491–498. doi:10.24869/psyd.2020.491.
  29. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, Rubin GJ. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet*. 2020;395(10227):912–920. doi:10.1016/s0140-6736(20)30460-8.
  30. Philip KEJ, Lonergan B, Cumella A, Farrington-Douglas J, Laffan M, Hopkinson NS. COVID-19 related concerns of people with long-term respiratory conditions: a qualitative study. *BMC Pulm Med*. 2020;20(1):319. doi:10.1186/s12890-020-01363-9.
  31. Kavanagh J, Jackson DJ, Kent BD. Sleep and asthma. *Curr Opin Pulm Med*. 2018;24(6):569–573. doi:10.1097/mcp.0000000000000526.
  32. Braidı F, Baiardini I, Ferrando M, Scichilone N, Santus P, Petrone A, Di MF, Corsico AG, Zanforlin A, Milanese M, et al. The prevalence of sleep impairments and predictors of sleep quality among patients with asthma. *J Asthma*. 2021;58(4):481–487. doi:10.1080/02770903.2019.1711391.
  33. Mastronarde JG, Wise RA, Shade DM, Olopade CO, Scharf SM, American Lung Association Asthma Clinical Research Centers. Sleep quality in asthma: results of a large prospective clinical trial. *J Asthma*. 2008;45(3):183–189. doi:10.1080/02770900801890224.
  34. Peters JB, Rijssenbeek-Nouwens LH, Bron AO, Fieten KB, Weersink EJ, Bel EH, Vercoulen JH. Health status measurement in patients with severe asthma. *Respir Med*. 2014;108(2):278–286. doi:10.1016/j.rmed.2013.11.012.
  35. Geraldo José Cunha Â, Zbonik Mendes A, Dias Wanderley de Carvalho F, Aparecida Ribeiro de Paula M, Gonçalves Brasil T. The impact of asthma on quality of life and anxiety: a pilot study. *J Asthma*. 2019;56(6):680–685. doi:10.1080/02770903.2018.1486854.