

Asthma control, coronaphobia and physical activity levels of children with asthma in social isolation during the COVID-19 pandemic

Physical activity of children with asthma during pandemic

SEYMA NUR ONAL^{1*}, GIZEM MERMERKAYA¹, EBRU CALIK KUTUKCU², MELDA SAGLAM², HASAN HUSEYIN MERMERKAYA³

¹ Bartın University, Vocational School of Health Services, Department of Therapy and Rehabilitation, Physiotherapy Program, Bartın, Turkey

² Department of Cardiorespiratory Physiotherapy and Rehabilitation, Faculty of Physical Therapy and Rehabilitation, Hacettepe University, Ankara, Turkey

³ Department of Family Medicine, Faculty of Medicine, Karabuk University, Karabuk, Turkey

* Corresponding author

Summary

Objective: We aimed to evaluate children and adolescents with asthma in terms of asthma control, social isolation, coronaphobia, and physical activity (PA) level during the pandemic.

Methods: In this cross-sectional, prospective study, 45 patients with childhood asthma and 49 healthy peers aged 6-18 years were included. The Asthma Control Test (Child: C-ACT/Adolescent: ACT), Physical Activity Questionnaire (Child: PAQ-C/Adolescent: PAQ-A), and the social isolation (days/month) and coronaphobia questions created by the researchers were applied via the Google Forms link address.

Results: ACT scores were found to be 22.1 ± 0.7 for C-ACT and 22.2 ± 0.6 for ACT. The mean PAQ-C scores were 2.4 ± 0.8 , 2.6 ± 0.7 in asthmatic and healthy children respectively, the mean PAQ-A scores were 2.1 ± 0.6 , 2.4 ± 0.7 in asthmatic and healthy adolescents respectively. Whereas 15 (71.4%) of children with asthma were inactive, 19 (79.2%) of adolescents with asthma were inactive during the pandemic. Fear of hospitalization due to COVID-19 infection was higher in the asthmatic adolescent group than healthy peers ($p < 0.001$). The families of adolescents with asthma went outside the home to open and closed areas for more days during the pandemic ($p = 0.004$ for outdoors, $p < 0.001$ for indoors).

Conclusions: During COVID-19, adolescents with asthma had a greater fear of hospitalization, and their families adhered less to social isolation and stay-at-home precautions. PA was similarly low in both asthmatic and healthy children/adolescents. The interventions for the negatively affected PA both in asthmatic and healthy children/adolescents and concerns related to COVID-19 infection should be considered by health professionals during and after the pandemic.

Key words: asthma, child, physical activity, social isolation, coronaphobia

© *Alergia Astma Immunologia* 2023,28(4) 115-123

www.alergia-astma-immunologia.pl



Adres do korespondencji / Address for correspondence

Seyma Nur ONAL, PT, MS

Bartın University, Health Services Vocational School, Department of Therapy and Rehabilitation, 74100, Bartın, Turkey.
e-mail: seymanurelskma@gmail.com

1. Introduction

COVID-19 spread rapidly worldwide from the Chinese city of Wuhan in December 2019. The World Health Organization (WHO) declared this outbreak a pandemic in March 2020. Beta Coronavirus family member SARS-CoV-2 can cause respiratory tract infection, pneumonia, and acute respiratory distress syndrome in severe cases [1]. According to the Centers for Disease Control and Prevention (CDC) 2016 report, the prevalence of asthma in children aged 5-11 years is 9.6%, and in children aged 12-17 years is 10.5%, respectively [2]. At the beginning of the pandemic The American Academy of Asthma Allergy and Immunology

(AAAAI) has reported that asthma is a risk factor for hospitalization [3, 4].

The effect of measures implemented to prevent transmission of COVID-19 on asthma control is uncertain in children with asthma [5]. Based on available evidence, increased medication adherence and decreased exposure to triggers were seen in children with asthma during quarantine. Thus, although there are positive developments in asthma control, there are variable results in the use rate of preventive drug therapy [6, 7]. At the same time, with the decrease in respiratory viral infection load due to social distancing and face mask use during the pandemic period, there has been a significant decline in outpatient (87%) and emergency admissions

(84%) and asthma-related steroid use in pediatric asthma patients [7, 8]. During the pandemic period, within the scope of the call to stay at home, an increase in screen exposure and a significant decrease in the amount of physical activity (PA) and sleep duration, were observed mainly children aged > 5 years with respiratory disease [7, 9, 10]. It has been determined that caregivers of children with asthma have deep concerns about the impact of COVID-19 infection on their children's health and the limited PA level of children [11].

Specifically, it has been observed that emotional responses to COVID-19, such as stress, anxiety, and fear may have health consequences in children and adolescents [12]. To the best of our knowledge, despite limited studies regarding the mental status and anxiety levels of children with asthma [13], the coronaphobia level of patients was not determined during the pandemic. There is limited evidence in the literature on the impact of restrictions due to the COVID-19 pandemic on PA and sedentary behavior in children with asthma. The aim of our study was to evaluate the asthma control of children and adolescents with asthma during the COVID-19 pandemic, to compare the levels of PA, coronaphobia, and families' attention to social isolation with their healthy peers.

2. Material and method

2.1. Study Design

The study was conducted between May 2021 and October 2021 in Karabuk Provincial Health Directorate, Primary Health Center Safranbolu/Karabuk. The Hacettepe University Ethics Committee approved the study committee (on May 4, 2021, with approval number GO 21/444) and was registered in the National Institutes of Health Clinical Trial Institute, Identifier: NCT05220488). A written consent form was presented to the children participating in the study and their parents at the beginning of the questionnaire, and they were asked to tick the "I have read-understood-I accept" and "I am a volunteer for the research" options.

2.2. Participants

In this prospective cross-sectional study, asthmatic children/adolescents and healthy children/adolescents with routine follow-up who volunteered to participate were included in the primary care center of the Ministry of Health, Karabuk Provincial Health Directorate, Safranbolu. Inclusion criteria for asthmatic participants: being 6-18 years of age, diagnosed with childhood asthma based on Global Initiative for Asthma (GINA) guideline diagnostic criteria [14], volunteers for participating in the study and not having mental, neurological, orthopedic, cardiovascular or pulmonary problems that would prevent physical abilities. Children with a medical indication requiring restriction of PA, cooperation and communication problems, and had COVID-19 infection in the last month were excluded from the study. Inclusion criteria for healthy participants: being 6 to 18 years old, without any chronic diseases, and volunteers to participate in the study; children with cooperation and communication problems and had COVID-19 in the last month were excluded from the study. The participants were grouped as asthmatic and healthy children aged 6-11 years and adolescents aged 12-18 years according to their status.

A power analysis program (G*Power, ver. 3.1., Universität Düsseldorf, Düsseldorf, Germany) was used to determine and calculate the sample size based on two

calculations. Based on 5% type 1 error and 90% power to detect least an effect size of 0.5, each group's required number of participants was 20. The PA scores of asthmatic and healthy children in terms of MET-min (6.985 ± 1.261 MET-hours for asthmatic children, 8.878 ± 0.924 MET-hours for healthy peers) in the study by Lam et al. were used for sample size calculation [15].

2.3. Outcome Measures

Individuals were called by phone to be informed about the study and invited. The online questionnaire was created on the Google Forms and transmitted by link. Volunteers were asked to fill in the questionnaire form. Their parents completed questionnaires for children aged 6-11 years with asthma. Adolescents with asthma aged 12-18 years filled in the questionnaires themselves. The forms sent to individuals who agreed to participate in the study included qualitative questions asking physical characteristics such as age, height and body weight, sociodemographic variables, clinical characteristics of the disease, asthma control status, PA assessment, coronaphobia and isolation status.

Asthma control: The asthma control level of adolescents/children with asthma was assessed with the Asthma Control Test (ACT) and Childhood Asthma Control Test (C-ACT). ACT is administered to children over 12 years of age. It consists of five questions that evaluate the last four weeks (limitation of activities, shortness of breath, awakenings at night, use of reliever medication, and patient's perception of asthma control). Questions are scored between 1-5. The total score ranges from a minimum 5 to a maximum 25. On the ACT, a total score of 20 to 25 is considered as having good control, 16 to 19, insufficient control, and 5 to 15, uncontrolled [16]. The C-ACT (for children aged 4-11 years) is divided into two section and consists of seven questions covering the previous four weeks. One section is designed to be answered by the child and consists of four questions (asthma control, activity restrictions, coughing, and nighttime awakenings) with three-point scale. The second section is designed to be answered by the parent or caregiver and consists of three questions (daytime complaints, daytime wheezing, and night waking) with five-point scale. The total score of C-ACT ranges from 0-27, and a higher score indicates better asthma control [17]. A total C-ACT score is divided into three asthma control levels: well-controlled (≥ 20), partly controlled [13-19], and uncontrolled asthma (≤ 12) [18].

Physical activity: Physical Activity Questionnaire for Older Children (PAQ-C) and Physical Activity Questionnaire-Adolescent (PAQ-A) were used to determine PA levels [19, 20]. In our study, PAQ-C was used for children under 12 years of age and PAQ-A was used for children over 12 years of age. It is a self-administered, 7-day recall questionnaire that assesses activities in physical education class, lunchtime, recess (PAQ-C only), after school, evenings, and weekends, as well as physical activities. Each of the eight (PAQ-A) or nine (PAQ-C) questionnaire items is scored between 1 (low) and 5 (high PA), and a mean score of all items constitutes the overall PAQ score. The questionnaire items nine (PAQ-A) or 10 (PAQ-C) asks participants whether they were sick last week, or whether anything prevented them from doing normal physical activities. The minimum score that can be obtained from the scale is 8-9, the maximum score is 40-45, and higher scores indicate a high PA level. The total score was divided by

the number of questions and classified as active according to the cut-off points for PAQ-C score (>2.75) and PAQ-A score (>2.73) [21].

Coronaphobia level and social isolation: Coronaphobia and social isolation were questioned with qualitative questions created by the researchers (Table 1). Concerns about COVID-19, such as being unable to sleep, being in the hospital, and dying due to COVID-19 infection, were questioned. Questions about coronaphobia were recorded using the "Face Pain Scale-6". It consists of six facial expressions. It progresses in even numbers from '0-10' and (higher points indicate greater coronaphobia level) [22]. The social isolation status of children and adolescents was also questioned in the last month. These were questions such as going out for himself or a family member, accepting guests at home, and going to indoor/outdoor places. The response was Likert type as 'never, 1-3 days, 4-7 days, 7-15 days, 16-22 days, 23-30 days.

Table 1. Questions about Coronaphobia and Social Isolation

Koronaphobia (COVID-19) Qualitative Questions	Social Isolation Qualitative Questions
I'm so afraid of COVID-19.	How many days have you been out of the house in an open area in the last 4 weeks? (park, nature, field, garden, etc.)
I'am afraid of dying due to COVID-19.	How many days in the last 4 weeks have you been out of the house in a closed area? (shopping mall, workplace, market, etc.)
I can't sleep for fear of COVID-19.	How many days in the last 4 weeks has someone from outside come to your home? (Guest, relative, etc.)
I'am afraid of going to the hospital because of COVID-19.	How many days in the last 4 weeks has anyone other than you been out of the house for open spaces? (park, nature, field, garden, etc.)
	How many days in the last 4 weeks has anyone other than you been out of the house for closed areas? (shopping mall, workplace, market, home visit etc.)

2.4. Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics version 28.0 (IBM Corp., Armonk, NY, USA). The normal distribution of the variables was evaluated using visual (histograms/probability graphs) and analytical methods (Shapiro–Wilk test). Descriptive data were presented as mean and standard deviation (SD), median and interquartile range or number and frequency. Comparisons of quantitative variables between the groups were made with the Independent Samples t-test for normally distributed variables and the Mann–Whitney U test for non-normally distributed variables. In addition, the Fisher chi-square test was used to evaluate whether categorical variables such as gender and COVID-19 history were homogeneous in the groups. Statistical significance was accepted at $p < 0.05$.

3. Results

Considering the participants, 94 out of 140 eligible children and adolescents participated in the study. Participants in the study were divided into four groups as asthmatic children, healthy children, asthmatic adolescents, and healthy adolescents. The flow chart of the study is given in Figure 1. The demographic and

physical characteristics of the groups are shown in Table 2. The characteristics of the groups, such as age, height, weight, and gender were similar.

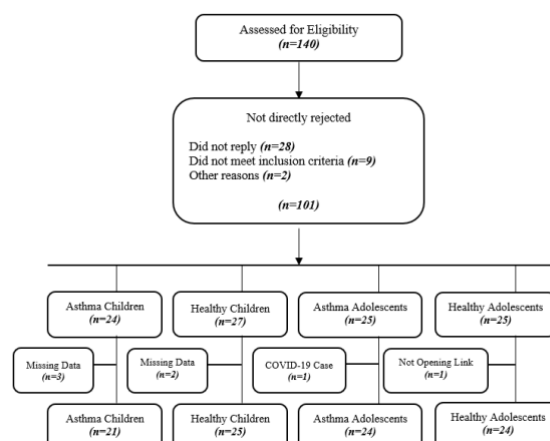


Figure 1. Flowchart.

Children and adolescents' asthma symptoms were generally under control. The effect of season on asthma in children and adolescents with asthma was present in the majority of the group (Table 2).

The fear of hospitalization was significantly higher in adolescents with asthma than in healthy peers ($p < 0.001$, Table 3).

Questions about social isolation are explained in table 1. Looking at questions about family members other than children and adolescents 'How many days in the last four weeks has anyone other than you been out of the house for open areas?' and 'How many days in the last four weeks has anyone other than you been out of the house for closed areas?' questions were statistically different between the asthmatic adolescents and healthy peers ($p = 0.004$ for the outdoors, $p < 0.001$ for indoors, respectively).

When the questions asking family members other than children and adolescents are examined, no difference between families of children with asthma and healthy peers, families of healthy adolescents stayed home for more days than those of asthmatic adolescents ($p < 0.05$, Table 4). There were also statistically significant differences in 'How many days have you been out of the house in an open area in the last four weeks?', 'How many days did guests come to the house in the last four weeks?' and 'How many days has anyone other than you been out of the house for open spaces in the last four weeks?' questions between the asthmatic children and asthmatic adolescent groups ($p = 0.015$, $p = 0.036$ and $p = 0.014$, respectively, Table 4).

PAQ-C results are shared in table 3. PA levels of asthmatic and healthy children and asthmatic and healthy adolescents were similar during the COVID-19 pandemic ($p > 0.05$, Table 3). According to PAQ-C/PAQ-A cut-off values, 15 (71.4%) of children with asthma and 12 (48.0%) of healthy peers were inactive ($p = 0.108$). Otherwise, 19 (79.2%) of adolescents with asthma and 18 (75.0%) of healthy peers were inactive ($p = 0.731$) (Figure 2).

Table 2. Physical and clinical characteristics of asthmatic and healthy children/adolescents

		Asthmatic Children X±SD	Healthy Children X±SD	p ^a	Asthmatic Adolescents X±SD	Healthy Adolescents X±SD	p ^b
Age (year)		9.0±2.1	8.3±2.2	0.599	14.3±2.3	17.0±0.8	0.095
Body weight (kg)		29.9±8.6	29.2±6.2	0.249	55.8±16.6	60.2±11.2	0.914
Height (cm)		128.3±16.6	128.2±13.1	0.056	164.2±10.1	166.9±6.6	0.099
Asthma control test score		22.1±0.7	-	-	22.2±0.6	-	-
		n (%)	n (%)		n (%)	n (%)	
Asthma control level							
Well controlled		17 (81.0)			20 (83.3)		
Partly controlled		4 (19.0)			1 (4.2)		
Uncontrolled		0 (0)			3 (12.5)		
Gender	Girl	10 (47.6)	12 (48.0)	0.979	11 (45.8)	13 (54.2)	0.771
	Boy	11 (52.4)	13 (52.0)		13 (54.2)	11 (45.8)	
COVID-19 history	No	15 (71.4)	17 (68.0)	0.801	16 (66.7)	18 (75.0)	0.525
	Yes	6 (28.6)	8 (32.0)		8 (33.3)	6 (25.0)	
Regular drug use	No	6 (28.6)	13 (52.0)	0.108	4 (16.7)	24 (100.0)	0.057
	Yes	15 (71.4)	12 (48.0)		20 (83.3)	0 (0.0)	
Seasonal effect on asthma	No	6 (28.6)	N/A	N/A	7 (29.2)	N/A	0.965 ^c
	Yes	15 (71.4)	N/A		17 (70.8)	N/A	
Shortness of breath during sleep	No	11 (52.4)	N/A	N/A	19 (79.2)	N/A	0.057 ^c
	Yes	10 (47.6)	N/A		5 (20.8)	N/A	

All data is reported as mean (standard deviation) or n (%). ^aIndependent samples t test: (Asthmatic children group versus healthy children group), ^bIndependent samples t test: (Asthmatic adolescent group versus healthy adolescent group). ^cFisher x2 test: (Asthmatic adolescent group versus asthmatic children group). Abbreviations: X: mean, SD: standard deviation, N/A: Non-applicable.

Table 3. Comparison of physical activity and coronaphobia levels of asthmatic and healthy children/adolescents

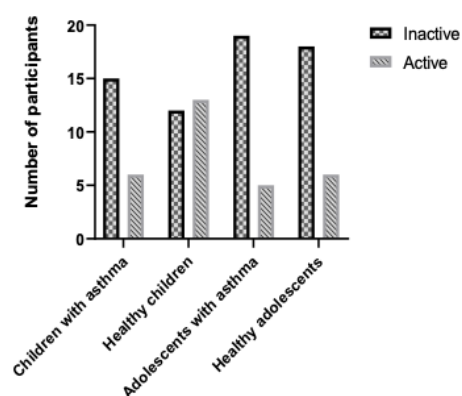
	Grup	X±SD	p ^a	Grup	X±SD	p ^b
PAQ	Asthmatic Children	2.4±0.8	0.516	Asthmatic Adolescent	2.1±0.6	0.926
	Healthy Children	2.6±0.7		Healthy Adolescent	2.4±0.7	
I'm so afraid of COVID-19.	Asthmatic Children	7.1±2.0	0.884	Asthmatic Adolescent	4.4±2.1	0.098
	Healthy Children	5.8±2.2		Healthy Adolescent	3.0± 2.9	
I'am afraid of dying due to COVID-19.	Asthmatic Children	4.6±3.5	0.577	Asthmatic Adolescent	3.5±2.5	0.059
	Healthy Children	4.3± 3.4		Healthy Adolescent	2.8±3.2	
I can't sleep for fear of COVID-19.	Asthmatic Children	1.3± 2.6	0.799	Asthmatic Adolescent	1.0 ±2.4	0.149
	Healthy Children	1.6± 2.8		Healthy Adolescent	0.7±1.5	
I'am afraid of going to the hospital because of COVID-19.	Asthmatic Children	2.4± 2.8	0.390	Asthmatic Adolescent	5.6±1.7	<0.001*
	Healthy Children	2.9± 3.1		Healthy Adolescent	3.4±3.5	

All data is reported as mean (standart deviation) ^aIndependent samples t test was performed to compare normally distributed variables between groups (Asthmatic children group versus healthy children group). ^bIndependent samples t test was performed to compare normally distributed variables between tests (Asthmatic adolescent group versus healthy adolescent group). *Statistical significance is set at p<0.05. Abbreviations: X: mean, SD: standard deviation, PAQ: physical activity questionnaire

Table 4. Social isolation questions and answers of children/adolescents with asthma and healthy peers

		Asthmatic Children n (%)	Healthy Children n (%)	p ^a	Asthmatic Adolescents n (%)	Healthy Adolescents n (%)	p ^b	p ^c
How many days have you been out of the house in an open area in the last 4 weeks? (park, nature, field, garden, etc.)	Never 1-3 days 4-7 days 7-15 days 16-22 days 23-30 days	0 (0) 1 (4.8) 6 (28.6) 6 (28.6) 6 (28.6) 2 (9.5)	1 (4.0) 6 (24.0) 8 (32.0) 4 (16.0) 2 (8.0) 4 (16.0)	0.178	0 (0) 6 (25.0) 6 (25.0) 0 (0) 5 (20.8) 7 (29.2)	1 (4.2) 2 (8.3) 5 (20.8) 5 (20.8) 4 (16.7) 7 (29.2)	0.185	0.015*
How many days in the last 4 weeks have you been out of the house in a closed area? (shopping mall, workplace, market, etc.)	Never 1-3 days 4-7 days 7-15 days 16-22 days 23-30 days	4 (19.0) 4 (19.0) 3 (14.3) 7 (33.3) 3 (14.3) 0 (0)	6 (24.0) 9 (36.0) 3 (12.0) 3 (12.0) 4 (16.0) 0 (0.0)	0.441	0 (0) 7 (29.2) 6 (25.0) 7 (29.2) 4 (16.7) 0 (0)	4 (16.7) 2 (8.3) 7 (29.2) 7 (29.2) 1 (4.2) 3 (12.5)	0.292	0.216
How many days in the last 4 weeks has someone from outside come to your home? (Guest, relative, etc.)	Never 1-3 days 4-7 days 7-15 days 16-22 days 23-30 days	6 (28.6) 8 (38.1) 5 (23.8) 1 (4.8) 1 (4.8) 0 (0)	9 (36.0) 15 (60.0) 0 (0.0) 1 (4.0) 0 (0.0) 0 (0.0)	0.077	0 (0) 10 (41.7) 12 (50.0) 2 (8.3) 0 (0) 0 (0)	6 (25.0) 7 (29.2) 5 (20.8) 4 (16.7) 1 (4.2) 1 (4.2)	0.174	0.036*
How many days in the last 4 weeks has anyone other than you been out of the house for open spaces? (park, nature, field, garden, etc.)	Never 1-3 days 4-7 days 7-15 days 16-22 days 23-30 days	1 (4.8) 1 (4.8) 1 (4.8) 7 (33.3) 2 (9.5) 9 (42.9)	2 (8.0) 11 (44.0) 3 (12.0) 6 (24.0) 2 (8.0) 1 (4.0)	0.07	0 (0) 6 (25.0) 0 (0) 0 (0) 4 (16.7) 14 (58.3)	2 (8.3) 4 (16.7) 8 (33.3) 2 (8.3) 4 (16.7) 4 (16.7)	0.004*	0.014*
How many days in the last 4 weeks has anyone other than you been out of the house for closed areas? (shopping mall, workplace, market, home visit etc.)	Never 1-3 days 4-7 days 7-15 days 16-22 days 23-30 days	1 (4.8) 6 (28.6) 1 (4.8) 3 (14.3) 2 (9.5) 8 (38.1)	4 (16.0) 7 (28.0) 11 (44.0) 1 (4.0) 1 (4.0) 1 (4.0)	0.05	0 (0) 1 (4.2) 0 (0) 3 (12.5) 9 (37.5) 11 (45.8)	3 (12.5) 3 (12.5) 8 (33.3) 5 (20.8) 2 (8.3) 3 (12.5)	<0.001	0.066

All data is reported as n (%). ^aFisher χ^2 test: (Asthmatic children group versus healthy children group), ^bFisher χ^2 test: (Asthmatic adolescent group versus healthy adolescent group), ^cFisher χ^2 test: (Asthmatic adolescent group versus asthmatic children group) *Statistical significance is set at $p < 0.05$.

**Figure 2.** Physical activity levels of children/adolescents with asthma and healthy peers

4. Discussion

The main findings of our study were first that adolescents with asthma had a higher fear of hospitalization than their healthy peers during the COVID-19 pandemic. Secondly, it was determined that asthmatic adolescents and their families paid less attention to social isolation. Finally, all of the asthmatic children, adolescents, and their healthy peers had low physical activity levels during the COVID-19 pandemic.

Uncertainty exists regarding the impact of higher compliance or lower exposure to COVID-19 prevention strategies on asthma control in asthmatic children [5]. During the pandemic, there was a 71-78% decrease in childhood asthma hospital admissions and a 51-68%

decrease in admissions for acute respiratory attacks compared to the periods in the last three years [23]. It has been determined that thematic topics such as a decrease in the desire to seek medical care due to fear of COVID-19 infection, improved compliance due to increased awareness of asthma control, strategies to cope with the changes caused by the COVID-19 pandemic, and managing new difficulties were effective for asthma control. Children with asthma were advised to continue good asthma management, take prescription asthma medications usually, and follow hygiene rules during this period [24]. Better or unchanged asthma control was reported for children with asthma between 4–18 years in a multi-national large-sample study [25]. Reported asthma exacerbation frequency in children reduced nearly by 55% in 2020 compared to the previous five years, and this was closely related to face mask use [26]. Accordingly, asthma control improved during the COVID-19 pandemic due to the pandemic's precautions and prevention. In the present study, children and adolescents had mainly controlled asthma (81% of asthmatic children and 83.3% of asthmatic adolescents) during the COVID-19 pandemic period. This is likely related to the decrease in exposure to viral infections and indoor/outdoor allergens due to restrictions, increased use of masks, and adherence to treatment during the pandemic.

Children with asthma have more sleep problems than healthy peers. These problems are difficulty in initiating sleep, restless sleep, and breathing disorders during sleep. Asthma and sleep apnea are closely related in children and adolescents with asthma. As asthma severity increases, symptoms increase during sleep [27, 28]. The prevalence of sleep disturbances was reported

to be 54% during the pandemic [29]. However, sleep difficulties were not reported in children and adolescents due to anxiety or coronaphobia.

The only data in pediatric patients with asthma (mean age=14±4 years), 72% of patients reported sleep disturbances. The most problematic impairments were sleeping respiratory disorder (52%) and initiation and maintenance of sleep (40%) [29]. In line with this finding, we determined that dyspnea during sleep was observed in 47.6% of asthmatic children and 20.8% of asthmatic adolescents. The level of inability to sleep with fear of COVID-19 was similar and low between children/adolescents with asthma compared to healthy peers. The reason why our patients reported relatively lower percentage of sleep disturbances compared to Garriga-Baraut et al. [29] was that most of the cases were not symptomatic due to controlled asthma during pandemic.

The social isolation and quarantine implemented to prevent transmission of COVID-19 infection had severe effects on children and adolescents [13]. Social isolation measures taken during the COVID-19 pandemic have significantly controlled the seasonality of childhood respiratory diseases. This is reflected in the unexpected decrease in the number of hospitalizations in the pediatric population [30]. In our study, we demonstrated that the seasonal impact affected most children and adolescents with asthma during the pandemic. We attribute this to 38.1% of asthmatic children and 50% of asthmatic adolescents being outdoors for ≥ 15 days during this period.

Children's fear of death from COVID-19 may be related to parents' concerns about the disease, children's age, and children's general fears [31]. The COVID-19 pandemic has also been associated with other mental health problems, such as somatic symptoms, psychological distress, and increased behavioral problems. Specifically, emotional responses to COVID-19, such as stress, fear, and anxiety can have health consequences in children and adolescents [12]. Despite parents' increased anxiety and worry levels related to COVID-19 infection shown in the literature [9, 11, 32], there is limited data associated with attitudes and perceptions towards infection in children with asthma. Hepkaya et al. reported that children with asthma >8 years had increased depression levels at 8%. As the exposure to media resources increased, the anxiety level was more negatively affected during the pandemic [32]. In our study, the fear of hospitalization increased in asthmatic adolescents compared to their healthy peers. However, asthmatic children and adolescents were less likely to suffer from insomnia due to fear of contracting COVID-19. We think this may be related to the fact that COVID-19 infection is asymptomatic, has a lower complication rate, or has a good prognosis under 18 years [12].

Infectious diseases such as COVID-19 can negatively affect children's mental health, as can other traumatic experiences [33]. It has been reported that asthmatic children are more concerned about contagion than their healthy peers, but there is no difference in psychological exposure compared to healthy peers. Because of their children's activities, parents reported the fear and anxiety related to COVID-19 infection. It was also stated that their psychological health generally deteriorated during the quarantine and mothers with asthmatic children are more likely to experience psychological fatigue in a pandemic scenario [34]. It is

observed that compliance with the precautions in the early period of social isolation is high in asthmatic children and their families, and hygiene behaviors also increase. There were conflicting findings in studies, and it was stated that the anxiety levels of mothers in asthma and control groups may be similar or increased [35, 36]. In our study, children with asthma and healthy peers were found to pay attention to social isolation alike. However, it was determined that the family of asthmatic adolescents paid less attention to social isolation than healthy peers. The asthmatic adolescent group's good asthma control and regular medication use may have created confidence in the family against contagion. We also think that the increased fear of hospitalization in adolescents with asthma may be related to their families paying less attention to social isolation. It shows that COVID-19 has a negative effect on mental health and is associated with depression and anxiety, particularly in adolescents [37]. Health professionals have suggested increasing communication with their parents, interactive games, PA, and music therapy to reduce fear and anxiety in children and adolescents affected by the psychological aspect of the COVID-19 epidemic [38].

Previous studies have shown that PA levels are associated with asthma control. More active school children were found to be more likely to get asthma under control [39, 40]. Within the scope of the call to stay at home during the pandemic, an increase in sedentary behavior and screen time and decreased exercise and PA behaviors were observed in children with chronic respiratory diseases [41]. In children and adolescents with asthma, symptoms may reduce the perception of PA participation, leading to a sedentary lifestyle [42]. Most parents limited their children's activity to prevent symptoms during the pandemic [11]. Especially male gender, Hispanic race, low socioeconomic level, and not attending school were related to physical inactivity in children with asthma during the pandemic [10]. The literature is contradictory about whether the PA levels of children and adolescents with asthma differ from their healthy peers. There is limited data on how PA changed during the pandemic period [7, 10]. Disease status of patients with asthma ≥ 5 years old increased screen time and diminished PA worsened during the pandemic [9]. According to our findings, children/adolescents with asthma comparably reduced their PA levels during the COVID-19 pandemic. Therefore, approaches are needed to decrease the risk of an unhealthy lifestyle and promote regular physical activity behaviors in children and adolescents with asthma.

The main limitations of our study were the inability to use devices that provide objective data (e.g., pedometer, accelerometer, etc.) due to the necessity of online evaluation, the small sample size due to the pandemic process and the assessment of coronaphobia with some qualitative questions instead of a standard scale. We didn't have information about the asthma control status of the patients before the COVID-19 pandemic. Therefore, we couldn't have assessed their current status compared to the pre-pandemic period as another limitation.

In conclusion, adolescents with asthma had a higher fear of hospitalization than their healthy peers during the COVID-19 pandemic. Otherwise, asthmatic adolescents and their families pay less attention to social isolation. In case of another possible pandemic, more precautionary information can be given to asthmatic adolescents and their families to prevent transmission. All of the asthmatic

children, adolescents, and their healthy peers participating in our study had low physical activity levels during the COVID-19 pandemic. Considering the general health benefits, prompt recommendations and interventions are required to enhance the physical activity levels of children and adolescents with asthma by government and rehabilitation professionals.

5. Informed consent

The study was approved by Hacettepe University Non-Interventional Clinical Research Ethics Committee approved the study on 04.05.2021, with the registration number, GO 21/444.

6. Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Bibliography:

1. Mohamed AA, Alawna M. Role of increasing the aerobic capacity on improving the function of immune and respiratory systems in patients with coronavirus (COVID-19): A review. *Diabetes Metab Syndr*. 2020;14(4):489-96.
2. Zahran HS, Bailey CM, Damon SA, Garbe PL, Breyse PN. Vital Signs: Asthma in Children - United States, 2001-2016. *MMWR Morb Mortal Wkly Rep*. 2018;67(5):149-55.
3. The American Academy of Asthma Allergy and Immunology Website (<https://www.aaaai.org/Tools-for-the-Public/Conditions-Library/Asthma/covid-prevent>) Last Access Date: May 2022
4. Williamson EJ, Walker AJ, Bhaskaran K, et al. Factors associated with COVID-19-related death using OpenSAFELY. *Nature*. 2020;584(7821):430-436.
5. Oreskovic NM, Kinane TB, Aryee E, Kuhlthau KA, Perrin JM. The Unexpected Risks of COVID-19 on Asthma Control in Children. *J Allergy Clin Immunol Pract*. 2020;8(8):2489-91.
6. Papadopoulos NG, Custovic A, Deschildre A, Mathioudakis AG, Phipatanakul W, Wong G, et al. Impact of COVID-19 on Pediatric Asthma: Practice Adjustments and Disease Burden. *J Allergy Clin Immunol Pract*. 2020;8(8):2592-9 e3.
7. Ferrante G, Mollicone D, Cazzato S, Lombardi E, Pifferi M, Turchetta A, et al. COVID-19 Pandemic and Reduced Physical Activity: Is There an Impact on Healthy and Asthmatic Children? *Front Pediatr*. 2021;9:695703.
8. Taquechel K, Diwadkar AR, Sayed S, Dudley JW, Grundmeier RW, Kenyon CC, et al. Pediatric Asthma Health Care Utilization, Viral Testing, and Air Pollution Changes During the COVID-19 Pandemic. *J Allergy Clin Immunol Pract*. 2020;8(10):3378-87 e11.
9. Cahal M, Amirav I, Diamant N, Be'er M, Besor O, Lavie M. Real-time effects of COVID-19 pandemic lockdown on pediatric respiratory patients. *Pediatr Pulmonol*. 2021;56(6):1401-8.
10. Lee S, Zhang A, Liu L, Salvo D, Wang L. Changes in physical activity and sedentary time among children with asthma during the COVID-19 pandemic and influencing factors. *J Asthma*. 2022:1-9.
11. Caveney B, Halterman JS, Fagnano M, Stern J, Frey SM. Caregiver Experiences Managing Persistent Childhood Asthma During the COVID-19 Pandemic. *Clin Pediatr (Phila)*. 2022;61(4):313-9.
12. Nearchou F, Flinn C, Niland R, Subramaniam SS, Hennessy E. Exploring the Impact of COVID-19 on Mental Health Outcomes in Children and Adolescents: A Systematic Review. *International journal of environmental research and public health*. 2020;17(22):8479.
13. Luijten MAJ, van Muilekom MM, Teela L, Polderman TJC, Terwee CB, Zijlmans J, et al. The impact of lockdown during the COVID-19 pandemic on mental and social health of children and adolescents. *Quality of life research : an international journal of quality of life aspects of treatment, care and rehabilitation*. 2021;30(10):2795-804.
14. Global Initiative for Asthma (GINA) (2020) Global Strategy for Asthma Management and Prevention (2020 Update). https://ginasthma.org/wp-content/uploads/2020/06/GINA-2020-report_20_06_04-1-wms.pdf Last Access Date: February 2023
15. Lam KM, Yang YH, Wang LC, Chen SY, Gau BS, Chiang BL. Physical Activity in School-Aged Children with Asthma in an Urban City of Taiwan. *Pediatrics and neonatology*. 2016;57(4):333-7.
16. Schatz M, Sorkness CA, Li JT, Marcus P, Murray JJ, Nathan RA, et al. Asthma Control Test: reliability, validity, and responsiveness in patients not previously followed by asthma specialists. *J Allergy Clin Immunol*. 2006;117(3):549-56.
17. Liu AH, Zeiger R, Sorkness C, Mahr T, Ostrom N, Burgess S, et al. Development and cross-sectional validation of the Childhood Asthma Control Test. *J Allergy Clin Immunol*. 2007;119(4):817-25.
18. Liu AH, Zeiger RS, Sorkness CA, Ostrom NK, Chipps BE, Rosa K, et al. The Childhood Asthma Control Test: retrospective determination and clinical validation of a cut point to identify children with very poorly controlled asthma. *J Allergy Clin Immunol*. 2010;126(2):267-73, 73 e1.
19. Kowalski KC, Crocker PR, Faulkner RA. Validation of the physical activity questionnaire for older children. *Pediatr Exerc Sci*. 1997;9:174-86.
20. Kowalski KC, Crocker PR, Donen RM. The physical activity questionnaire for older children (PAQ-C) and adolescents (PAQ-A) manual. College of Kinesiology, University of Saskatchewan. 2004;87(1):1-38.
21. Benítez-Porres J, Alvero-Cruz JR, Sardinha LB, López-Fernández I, Carnero EA. Cut-off values for classifying active children and adolescents using the Physical Activity Questionnaire: PAQ-C and PAQ-A Cut-off values for classifying active children and adolescents using the Physical Activity Questionnaire: PAQ-C and PAQ-A. *Nutr Hosp*. 2016;33(5):564.
22. Hicks CL, von Baeyer CL, Spafford PA, van Korlaar I, Goodenough B. The Faces Pain Scale-Revised: toward a common metric in pediatric pain measurement. *Pain*. 2001;93(2):173-83.
23. Krivec U, Seliger AK, Tursic J. COVID-19 lockdown dropped the rate of paediatric asthma admissions. *Archives of disease in childhood*. 2020;105(8):809-10.
24. Jia Y, Bao J, Yi M, Zhang Z, Wang J, Wang H, et al. Impact of the COVID-19 pandemic on asthma control among children: a qualitative study from caregivers' perspectives and experiences. *BMJ Open*. 2021;11(5):e046525.
25. Papadopoulos NG, Mathioudakis AG, Custovic A, Deschildre A, Phipatanakul W, Wong G, et al. Childhood asthma outcomes during the COVID-19 pandemic: Findings from the PeARL multi-national cohort. *Allergy*. 2021;76(6):1765-75.
26. Chan KF, Kwok WC, Ma TF, Hui CH, Tam TC, Wang JK, et al. Territory-Wide Study on Hospital Admissions for Asthma Exacerbations in the COVID-19 Pandemic. *Ann Am Thorac Soc*. 2021;18(10):1624-33.
27. Meltzer LJ, Pugliese CE. Sleep in young children with asthma and their parents. *Journal of child health care : for professionals working with children in the hospital and community*. 2017;21(3):301-11.
28. Goldstein NA, Aronin C, Kantrowitz B, Herschopf R, Fishkin S, Lee H, et al. The prevalence of sleep-disordered breathing in children with asthma and its behavioral effects. *Pediatr Pulmonol*. 2015;50(11):1128-36.

29. Garriga-Baraut, T. COVID-19 pandemic and sleep disorders among pediatric and adolescent asthmatic patients. *Am J Respir Crit Care Med.* 2021;203:A3344.
30. Nascimento MS, Baggio DM, Fascina LP, do Prado C. Impact of social isolation due to COVID-19 on the seasonality of pediatric respiratory diseases. *PLoS One.* 2020;15(12):e0243694.
31. Radanović A, Micić I, Pavlović S, Krstić K. Don't Think That Kids Aren't Noticing: Indirect Pathways to Children's Fear of COVID-19. *Frontiers in psychology.* 2021;12:635952-.
32. Hepkaya E, Kilinc AA, Cebi MN, Koyuncu Z, Cokugras H. General health status of children with asthma during the COVID-19 pandemic. *Pediatr Int.* 2021;63(3):331-7.
33. Xie X, Xue Q, Zhou Y, Zhu K, Liu Q, Zhang J, et al. Mental Health Status Among Children in Home Confinement During the Coronavirus Disease 2019 Outbreak in Hubei Province, China. *JAMA Pediatr.* 2020;174(9):898-900.
34. Di Riso D, Spaggiari S, Cambrisi E, Ferraro V, Carraro S, Zanconato S. Psychosocial impact of Covid-19 outbreak on Italian asthmatic children and their mothers in a post lockdown scenario. *Sci Rep.* 2021;11(1):9152.
35. Sancakli O, Tuncel T, Eren Akarcan S, Kanik A, Özyurt G, Ozdogru EE. Anxiety Levels and Changes in Health and Hygiene Behaviors in Mothers of Children with Asthma in Early COVID-19 Lockdown in Turkey. *Pediatr Allergy Immunol Pulmonol.* 2022;35(1):27-35.
36. Patrick SW, Henkhaus LE, Zickafoose JS, Lovell K, Halvorson A, Loch S, et al. Well-being of parents and children during the COVID-19 pandemic: a national survey. *Pediatrics.* 2020;146(4).
37. Nearchou F, Flinn C, Niland R, Subramaniam SS, Hennessy E. Exploring the Impact of COVID-19 on Mental Health Outcomes in Children and Adolescents: A Systematic Review. *Int J Environ Res Public Health.* 2020;17(22).
38. Jiao WY, Wang LN, Liu J, Fang SF, Jiao FY, Pettoello-Mantovani M, et al. Behavioral and Emotional Disorders in Children during the COVID-19 Epidemic. *The Journal of pediatrics.* 2020;221:264-6.e1.
39. Santos APD, Strassburger MJ, Roncada C, Stein RT, Pitrez PM, Strassburger SZ. Effect of physical activity on asthma control in schoolchildren. *Einstein (Sao Paulo).* 2020;18:eAO4936.
40. Abdo M, Waschki B, Kirsten AM, Trinkmann F, Biller H, Herzmann C, et al. Persistent Uncontrolled Asthma: Long-Term Impact on Physical Activity and Body Composition. *J Asthma Allergy.* 2021;14:229-40.
41. Cheval B, Sivaramakrishnan H, Maltagliati S, Fessler L, Forestier C, Sarrazin P, et al. Relationships Between Changes in Self-reported Physical Activity and Sedentary Behaviours and Health During the Coronavirus (COVID-19) Pandemic in France and Switzerland. 2020.
42. Vasconcello-Castillo L, Torres-Castro R, Sepúlveda-Cáceres N, Acosta-Dighero R, Miranda-Aguilera S, Puppo H, et al. Levels of physical activity in children and adolescents with asthma: A systematic review and meta-analysis. *Pediatr Pulmonol.* 2021;56(6):1307-23.