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The Effect of Internet Addiction on Asthma Control and Medication Adherence

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ABSTRACT

Objective: Internet addiction has recently become a prevalent health problem. Although many studies indicate a link between internet addiction and various diseases, no studies have examined its consequences on asthma control or medication adherence. The purpose of this study was to determine how internet addiction affects asthma control and medication adherence.

Materials and Methods: Study participants were grouped as asthmatics and healthy controls whom were aged between 18 and 77. Asthma control test (ACT) and medication adherence report scale (MARS-5) were fulfilled by asthma patients, whereas short version of Young Internet Addiction Test (s-IAT) was applied to all participants. Pulmonary function test was performed to all subjects.

Results: Forty-nine healthy volunteers and 54 asthmatic subjects were enrolled. Age and gender profiles within the study groups were similar. There was no significant difference in means of problematic and pathological (s-IAT ≥ 31) s-IAT scores between asthma and control groups (24.1% and 20.4%, p=0.41), as well as between asthma patients with controlled and uncontrolled ACT scores (24.1% and 24%, p=0.99), and those with and without medication adherence (16.7% and 27.8%, p=0.50). s-IAT scores were found to be linked to higher educational level (p=0.01, r=0.37), and better FEV_1 (p=0.04, r=0.27) in asthmatic patients. In addition, MARS-5 was correlated with older age (p=0.02, r=0.29), and low FEV_1 (p=0.01, r= -0.35).

Conclusion: Internet addiction did not seem to directly affect asthma control or medication adherence. However, it appeared to be associated with a high level of education and FEV_1.

Keywords: Medication adherence, addictive behavior, asthma, internet

INTRODUCTION

Asthma is a chronic inflammatory disorder of the airways, and it is estimated that 1-18% of the population is affected by asthma worldwide (1-3). The objective of asthma treatment is to maintain optimal disease control (4). Assessing patients' symptoms, treatment, and comorbidities are the other parts of control. Uncontrolled asthma can result in an increased risk of disease-related mortality and morbidity. Additionally, it has a detrimental effect on the patients' lives and their families and society, including missed school and workdays, frequent emergency visits, prolonged hospital stays, and significant medical expenses (5-7).

According to studies on asthma control, more than a third of asthmatics were uncontrolled (8,9). In a study that used the asthma control test, 64% of patients were found to be uncontrolled (10). Additionally, several studies have indicated that in practice, clinicians frequently underestimate uncontrolled or partially controlled asthma (11-13). Obesity, comorbidities, current smoking, frequent asthma flare-ups, usage of oral corticosteroids, medication adherence, low education, and lack of medical insurance are well-known factors that have been documented to affect asthma control (14). In addition, evaluating medication adherence is critical for assessing treatment issues. There are various methods available to assess medication adherence. Since questionnaires are helpful

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and cost-effective, we prefer to assess adherence using the Medication Adherence Report Scale (MARS-5), which is one of the most known scoring tests, particularly in chronic respiratory disorders (15).

Internet usage has increased dramatically during the last two decades, and widespread use of technological devices might be the main culprit for internet addiction (16). A vast amount of studies mention internet addiction in psychiatric disorders such as anxiety, depression, stress, personality traits, and life satisfaction (17-20). On the contrary, we couldn't find any research on the link between asthma and internet addiction. Therefore, we hypothesized that internet addiction could be an obstacle to asthma control. This study's primary purpose was to assess the effect of internet addiction on asthma control and medication adherence.

MATERIAL and METHODS

This cross-sectional study was conducted at the Kirikkale University Hospital in Turkey. The study was approved by the local ethics committee (decision number: 2021.02.04; date: 11.03.2021), and all participants gave written informed consent.

Participant Inclusion and Exclusion Criteria

Inclusion criteria for patients were having a documented diagnosis of asthma, being older than 18 years with access to an internet connection. Healthy controls aged between 18-77 years, were recruited from caregivers or friends of patients. Participants who had respiratory diseases other than asthma or new diagnosed asthma as in the last four weeks, and those who had no access to the internet connection were excluded.

Study Parameters

Sociodemographic characteristics and comorbidities of the participants were noted. Education level was evaluated as; low-moderate (≤12 years) and high (>12 years). Pulmonary function tests (PFTs) (Sensor Medics-2130 Corp.) were performed on all subjects.

Survey Questions

Internet addiction was evaluated by short version of Young's Internet Addiction Test (s-IAT), which had been validated in Turkish previously (21, 22). The s-IAT is a 12-item questionnaire with a five-point Likert scale (1=Never, 5=Very frequently). A score of between 31 and 35 was considered as problematic, whereas 36 and above was deemed to be pathologic in s-IAT (21).

The Turkish version of ACT was used for identifying those with poorly controlled asthma (23). ACT is a patient self-administered tool that assesses the frequency of shortness of breath and general asthma symptoms, use of rescue medications, the effect of asthma on daily functioning, and overall self-assessment of asthma control with 4-week recall. The scores range from 5 (poor control) to 25 (complete control), with an ACT score higher than 19 indicates well-controlled asthma (24).

The Turkish version of the MARS-5, which included five items ranging from 5 to 25, was used for treatment adherence (25,26). A total score of equal or higher than 23 means good adherence (27,28).

All participants were asked to fill out the s-IAT, whereas asthma patients answered both MARS-5 and ACT questionnaires.

Statistical Analysis

Statistical analysis was performed using SPSS software (version 21). The chi-square test was used to test for significant differences for categorical variables between asthma and control groups, as well as controlled and uncontrolled asthmatics. Depending on the normality of the distribution, continuous variables were compared using Student's t-test or Mann-Whitney U test. A p-value of less than 0.05 was considered significant.

RESULTS

A total of 103 participants (75 female, 28 male, mean age: 36.88 ± 12.66yr) were enrolled (Table I). About fifty-four (52.5%) of them were asthmatics, whereas forty-nine (47.6%) of them were in the control group. The two groups were similar by means of age and gender. Mean BMI was found to be higher in the asthma group than control (p=0.03). Control group had higher education degree and FEV_1 values than the asthma group. Smoking status was similar between the groups, mostly as non-smoker. Mean scores and ratio of problematic/pathologic (s-IAT ≥ 31) s-IAT were similar between the asthma and control group.

Almost half of the patients (53.7%) had well-controlled asthma (ACT ≥ 20) (Table II). Patients with controlled and uncontrolled asthma were similar by means of age, gender ratio, mean BMI, ratio of high educational degree, current smoker status, and FEV_1. There was no difference in means

of s-IAT and MARS-5 scores between controlled and uncontrolled asthmatics, as well as problematic vs. non-problematic and adherent vs. non-adherent. Almost three-fourths of the asthmatics had non-problematic/pathologic s-IAT scores, whereas only one-third of them had showed adherence in MARS-5 scores.

Differences between problematic/pathologic (s-IAT ≥ 31) and non-problematic (s-IAT<31) internet addiction were compared in each study group (Table III). There was no difference in means of age, gender, BMI, education degree, FEV_1 values, and smoking status in asthma group, whereas internet addicted ones were younger and thinner than non-addicted in healthy group.

The problematic or pathologic internet addiction rate was 20.4% in the control group, and 24.1% in the asthma group, with no difference between the controlled and uncontrolled asthmatics (p=0.41). Even tough mean MARS-5 scores were lower, and ratio of adherent ones were lower in internet addicted asthmatics, the differences were not statistically significant.

Table I: Demographic features and short version of Young Internet Addiction Test (s-IAT) questionnaire scores of the study groups.

Variables n (%)	Asthma Group (n=54)	Control Group (n=49)	p value
Age (year)*	37.24 ± 13.47	36.49 ± 11.82	0.76
Gender (F/M)	37 (68.5) / 17 (31.5)	38 (77.6) / 11 (22.4)	0.30
BMI (kg/m^2)*	26.39 ± 4.66	24.54 ± 3.91	0.03
High education degree	23 (42.6)	35 (71.4)	0.003
Current smoker	10 (18.5)	10 (20.4)	0.92
FEV_1 (L)*	2.50 ± 0.89	3.58 ± 0.56	< 0.001
s-IAT score*	24.12 ± 9.13	22.22 ± 7.85	0.41
Problematic	13 (24.1)	10 (20.4)	0.65
Non-problematic	41 (75.9)	39 (79.6)	

*: Mean ± standard deviation, **BMI:** Body mass index, **FEV_1:** Forced expiratory volume in the first second, **s-IAT:** Short version of Young Internet Addiction Test.

Table II: Comparison of baseline characteristics, internet addiction (s-IAT), and medication adherence (MARS-5) of patients with controlled vs. uncontrolled asthma.

Variables n (%)	Controlled Asthma (n=29)	Uncontrolled Asthma (n=25)	p value
Age (year)*	38.79 ± 15.36	35.44 ± 10.91	0.36
Female gender	18 (62.1)	19 (76)	0.28
BMI (kg/m^2)*	26.15 ± 4.62	26.68 ± 4.79	0.67
High education degree	12 (41.4)	11 (44)	0.84
Current smoker	5 (17.2)	5 (20)	0.25
FEV_1 (L)*	2.52 ± 1.02	2.45 ± 0.72	0.76
s-IAT score*	24.24 ± 9.72	24.00 ± 8.58	0.92
s-IAT score;			0.99
Problematic	7 (24.1)	6 (24.0)	
Non-problematic	22 (75.9)	19 (76)	
MARS-5 score*	20.69 ± 3.90	20.56 ± 3.70	0.90
MARS-5 score;			0.70
Adherent	9 (31.0)	9 (36.0)	
Non-adherent	20 (69.0)	16 (64.0)	

*: Mean ± standard deviation.

Table III: Differences between problematic/pathologic (s-IAT ≥ 31) and non-problematic (s-IAT<31) internet addiction in the study group.

Variables n (%)	Asthma Group		p	Control Group		p
	s-IAT ≥ 31	s-IAT<31		s-IAT ≥ 31	s-IAT<31	
Age (year)*	40.08 ± 15.61	36.34 ± 12.80	0.38	29.00 ± 9.60	38.41 ± 11.67	0.02
Female gender	8 (61.5)	29 (70.7)	0.73	7 (70)	31 (79.5)	0.67
BMI (kg/m^2)*	25.84 ± 5.27	26.57 ± 4.51	0.63	22.21±4.57	25.14±3.55	0.03
High education degree	7 (53.8)	16 (39.0)	0.34	8 (80)	27 (69.2)	0.70
FEV_1 (L)*	2.77 ± 1.08	2.41 ± 0.82	0.20			
Current smoker	2 (15.4)	8 (19.5)	0.89	2 (20)	8 (20.5)	0.76
MARS-5 score*	18.92 ± 4.05	21.17 ± 3.56	0.06			
MARS-5 score;			0.50			
Adherent	3 (23.1)	15 (36.6)				
Non-adherent	10 (76.9)	26 (63.4)				

*: Mean ± standard deviation.

Table IV: Correlation between internet addiction (s-IAT ≥ 31) and some variables in asthma/control groups.

Variables	Asthma Group		Control Group	
	r	p	r	p
Age	- 0.05	0.67	- 0.32	0.02
Education degree	0.37	0.01	0.24	0.09
FEV_1	0.27	0.04	0.197	0.17
BMI	- 0.25	0.07	- 0.189	0.19
Gender	0.18	0.18	- 0.047	0.75
ACT score	0.11	0.41		
MARS-5 score	- 0.17	0.22		

Correlation between internet addiction (s-IAT ≥ 31) and some variables in asthma/control groups were given in Table IV. Internet addiction was found to be positively correlated with educational degree (r= 0.37; p= 0.01) and FEV_1 (r= 0.27; p= 0.04) in patients with asthma, whereas it was negatively correlated with age (r= - 0.32; p= 0.02) in control group. However, age, BMI, gender, ACT and MARS-5 scores were not found to be correlated with internet addiction.

DISCUSSION

It has been known that internet addiction can cause hazardous effects on a person, both physically and emotionally. However, there have been no studies regarding links between internet addiction and asthma control. To our knowledge, this was the first study to compare internet addiction with disease control and medication adherence in adult patients with asthma. We hypothesized that emotional problems that might occur during internet addiction could lead to medication non-adherence and thus uncontrolled asthma. Despite numerous studies conducted on the link between internet addiction and mental health disorders such as depression, insomnia, and anxiety (16,18), in this study there was no effect of internet addiction on asthma control.

Previously, prevalence of problematic internet use among adolescents in Korea were 18.5% in asthma group and 15.2% in non-asthma group (29). They concluded that internet addiction was associated with an increased prevalence of asthma among adolescents. However, prevalence of problematic internet addiction was 24.1% in asthma group, like controls (%20.4) in our study.

In this study, s-IAT scores were not found to be associated with age, gender, BMI, education degree, FEV1, smoking status, and medication adherence in asthma group. On the other hand, healthy subjects with problematic internet addiction were younger and thinner than the ones with non-problematic s-IAT scores.

We used s-IAT, the most reliable and valid test to assess internet addiction (21, 22). Although some studies showed that internet addiction is more common in men, this was not confirmed in our study (30).

In contrast to previous research indicating an increase in internet addiction during adolescence, our study found no significant correlation between age and internet addiction in asthma group (31). Our study group's relatively older age may explain the results, as we included only four patients aged < 20 years.

Level of lack of internet addiction (s-IAT<31) was associated with high medication adherence, approaching significance (p = 0.06). In the literature, although MARS-5 overestimated patients' adherence and most of the participating patients were identified as adherent, most of the participants were found to be nonadherent in our study (15, 27, 28). This is because studies were primarily performed on COPD patients, and patients with asthma may not be taking their medications regularly due to variable airway limitations. We found a significant correlation between MARS-5 score with increased age and decreased FEV_1 values. Age-related changes in perception of disease control could account for this.

The limitation of this study was the limited number of participants. Another point was the lack adolescents, whom had a higher and more frequent internet addiction than adults. Furthermore, there was no psychiatric evaluation in this study, since there was no previous diagnosis of psychiatric disorders which show an association regarding internet addiction in the study participants.

However, in asthmatic patients, problematic/pathologic internet addiction was unexpectedly related to higher education but not medication adherence.

In conclusion, this study showed that prevalence of internet addiction in asthmatics was similar as in healthy individuals, as less than 25%. Internet addiction in asthma patients was not related with asthma control or medication adherence. Questionnaire of s-IAT was a useful, practical, and reliable tool to assess internet addiction in outpatient clinic. Studies should be repeated to get more valid data on this subject.

Conflicts of Interest

The authors declares that there aren't any conflicts of interest.

Authorship Contributions

Concept: **Ayşe Baççıoğlu,** Design: **Ayşe Füsun Kalpaklıoğlu, Ayşe Baççıoğlu,** Data collection or processing: **Betül Dumanoğlu, Merve Poyraz, Sümeyra Alan Yalım, Gülistan Alpağat,** Analysis or Interpretation: **Ayşe Füsun Kalpaklıoğlu, Ayşe Baççıoğlu, Betül Dumanoğlu,** Literature search: **Betül Dumanoğlu, Merve Poyraz, Sümeyra Alan Yalım, Gülistan Alpağat,** Writing: **Ayşe Füsun Kalpaklıoğlu, Ayşe Baççıoğlu, Betül Dumanoğlu,** Approval: **Ayşe Füsun Kalpaklıoğlu.**

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