

Effect of adult attention deficit hyperactivity symptoms on smoking cessation

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ABSTRACT

Objective: Nicotine addiction is the most prevalent addiction type all over the world and attention deficit hyperactivity disorder (ADHD) is an important factor associated with nicotine addiction. Primary aim of this study was to evaluate the effect of ADHD symptoms on smoking cessation. **Methods:** Smokers who had admitted to the smoking cessation center were evaluated with using Wender Utah and Fagerstorm Scales at the beginning of study and for the success of smoking cessation at the end of 6 months. **Results:** Of the 353 smokers enrolled to the study, 99 individuals had a score of 36 or higher on Wender Utah scale (ADHD symptoms group). Of these 99 patients with ADHD symptoms, 11 (11.1%) and of the 254 non-ADHD symptoms group, 68 (26.8%) had quitted smoking after a period of six months. Logistic regression analysis revealed that having ADHD symptoms predicted failure of smoking cessation (adjusted odds ratios 2.12, 95% confidence interval 1.02-4.40) after controlling for sociodemographic and smoking-related variables. **Conclusions:** ADHD symptoms may be an important factor affecting smoking cessation. Examining these symptoms in problematic nicotine addicts might help treatment outcome. (*Anatolian Journal of Psychiatry* 2016; 17(2):104-110)

Key words: smoking, nicotine addiction, attention deficit hyperactivity disorder

Erişkin dikkat eksikliği hiperaktivite bozukluğu belirtilerinin sigara bırakma üzerine etkisi

ÖZET

Amaç: Nikotin bağımlılığı dünyada en sık görülen bağımlılık tiplerinden biridir ve dikkat eksikliği hiperaktivite bozukluğu (DEHB) nikotin bağımlılığı ile ilişkili olan önemli bir etkidir. Bu çalışmanın temel amacı, DEHB belirtilerinin sigara bırakma üzerine olan etkisini değerlendirmektir. **Yöntem:** Sigara bırakma merkezine başvuran sigara kullanıcıları, çalışmanın başında ve altı ay sonunda sigara bırakma başarısı için Wender Utah ve Fagerstorm Ölçekleri kullanılarak değerlendirildi. **Sonuçlar:** Çalışmaya alınan 353 sigara kullanıcısından 99'unun Wender Utah Ölçeğinde 36 veya daha yüksek bir puanı vardı (DEHB belirtileri grubu). DEHB belirtileri olan 99 hastadan 11'i (%11.1) ve DEHB belirtileri olmayan 254 kişilik grubun 68'i (%26.8) altı aylık süre sonrasında sigarayı bırakmıştır. Lojistik regresyon analizi, sosyodemografik ve sigarayla ilişkili değişkenler kontrol edildikten sonra DEHB belirtileri olanların sigarayı bırakma (düzeltilmiş tahmini görel risk 2.12, %95 GA 1.02-4.40) konusunda başarısız olabileceğini göstermiştir. **Tartışma:** DEHB belirtileri sigara bırakmayı etkileyen önemli bir etken olabilir. Nikotin bağımlılığı olanlarda bu belirtilerin incelenmesi tedavi sonucuna yardım edebilir. (*Anadolu Psikiyatri Derg* 2016; 17(2):104-110)

Anahtar sözcükler: Sigara içmek, nikotin bağımlılığı, dikkat eksikliği hiperaktivite bozukluğu

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INTRODUCTION

Nicotine dependence is caused by chronic and repetitive use of the products that contains nicotine and is characterized by withdrawal symptoms following cessation of use (e.g., depressive mood, irritability, headache, lack of attention, and restlessness), and difficulty to quit despite knowing the health risks associated with the use of these products.¹ Many mental disorders were associated with smoking and nicotine addiction.² Attention-deficit/hyperactivity disorder (ADHD) is a genetically heritable and biologically driven disorder and is characterized by developmentally inappropriate levels of inattention, hyperactivity, and impulsivity.^{3,4} ADHD leads to difficulties in the work, school and family lives and in social relationships. There are several studies showing that ADHD may be a significant risk factor for the onset and development of an addiction.³⁻⁵ Tobacco use has been suggested to be more common and smoking cessation is more difficult among individuals with ADHD compared to the general population.^{3,4,6} Despite the relationships between ADHD and cigarette smoking have been demonstrated for a long time, the mechanisms underlying the high rates of comorbidity between ADHD and smoking remains to be clarified.⁶ Since nicotine has neuropharmacological, cognitive and behavioral effects many authors have suggested that cigarette smoking may act as a 'self-medication' among individuals with ADHD.^{3,6,7} Due to fact that ADHD and nicotine addiction are complex and heterogeneous disorders, ADHD-related symptoms may influence different stages of the smoking (i.e., initiation, progression and relapse) in diverse and complex ways.

The identification of characteristics associated with the failure of smoking cessation may be beneficial to develop new therapeutic strategies. Although the smoking behavior of individuals with ADHD has been examined in both cross-sectional and longitudinal studies, the effect of ADHD symptoms on smoking cessation has rarely been examined. Humfleet and colleagues⁸ reported in a 1 year follow up study that ADHD symptoms were associated with treatment failure. The purpose of this prospective study was to evaluate the effect of ADHD symptoms on smoking cessation and other smoking related characteristics.

METHODS

This study was carried out at the smoking cessation center between March 2011 and March 2013. The smokers admitting to the center are evaluated by the attendant physician and a smoking cessation day is co-determined by the physician and patient. Then, patients were taken under a standard treatment program consisting of motivational interviewing and bupropion. Patients were evaluated in first 72 hours after smoking cessation. Follow up visits were assessed at weeks 2, 4, 8, 12, 16 and 24.

The individuals who had admitted for smoking cessation and meeting to the diagnostic criteria for nicotine dependence according to the DSM-IV criteria were invited to participate in the study. Participants provided written informed consent before enrollment. At the initial visit to the Smoking Cessation Centre, participants completed a brief medical history and underwent physical and psychiatric examination. Participants between 18-65 years of age were included in the study. Exclusion criteria were pregnancy, a current diagnosis of bipolar disorder, major depression or psychotic disorder, current treatment for or recent diagnosis of cancer, and current treatment for alcohol or drug abuse. All participants were individually administered: (a) the Sociodemographic Questionnaire; (b) the Wender Utah Rating Scale (WURS) for Attention Deficit Hyperactivity Disorder in adults; and (c) Fagerstrom Tolerance Test for Nicotine Dependency (FTND) at baseline. Six months after the commencement of the treatment program, participants were questioned about their current smoking status by face-to-face interview.

Measures

The Sociodemographic Questionnaire: The questionnaire was developed by the researchers and consists of data on the gender, age, education level, marital status, socioeconomic status, age of onset of smoking and number of cigarettes smoked per day.

Wender Utah Rating Scale for Attention Deficit and Hyperactivity Disorders in adults (WURS): The scale measures the presence and severity of childhood ADHD symptoms in adult patients. According to the DSM-IV diagnostic criteria, there are some difficulties in the diagnosis of ADHD in adulthood. One of these difficulties is the fact that some of the current

criteria include the features of childhood and are not eligible for use in adults. Several studies have found that WURS can discriminate the patients with ADHD from the control patients and also can evaluate the outcome of the psychopharmacological treatment in ADHD patients. The scale has been developed by Ward and Wender in 1993. Each item is scored from 0 to 4. The cut-off score was determined to be 36 points.⁹

Fagerstrom Tolerance Test for Nicotine Dependency (FTND): The scale was developed in 1989 by Fagerstrom and Schneider in order to determine the nicotine dependency induced by cigarette smoking. The scale determines the amount of cigarette consumption and evaluates the compulsive use of the cigarette and the dependency status. It is considered as a useful screening test for nicotine dependence and the information obtained from the scale can be used to make decisions about the treatment and to predict the course of the disease.¹⁰

Statistical analysis

All data were analyzed using SPSS 17.0 (Statistical package for social sciences for windows). Continuous variables were presented as mean \pm SD or median with interquartile range (IQR) and categorical variables were described as numbers and percentages. The chi-square test was used to analyze the distributions of categorical variables. All continuous variables were tested for normality and homogeneity of variance. Owing to violations of homogeneity of variances for age and non-normality for the other continuous variables, Mann-Whitney U test was utilized for comparisons. Logistic regression was used to examine the independent effect of potential predictor variables on quit status at six-month follow-up. The p value <0.05 was considered as statistically significant.

RESULTS

During the study period, of the total of 2554 individuals admitting to the smoking cessation center, 393 individuals agreed to participate in the study. Of these 393 individuals, 353 (89.8%) completed the six-month follow-up.

The mean age of the 353 individuals forming the study group was 42.63 \pm 11.95 years (range, 19-77 years). Within this sample, 231 (65.4%) were male and 122 (34.6%) were female. With regard to the marital status of the participants, 248 (70.3%) were married, 77 (21.8%) were single

and 28 (7.9%) were widowed or divorced. Of the individuals with nicotine dependence, two (0.6%) were literate, while 115 (32.6%), 42 (11.9%), 110 (31.2%) and 84 (23.8%) were graduated from primary school, secondary school, high school and university, respectively. The mean age of onset of smoking was 19.88 \pm 4.79 (range: 11-35), mean years of regular smoking was 22.56 \pm 11.88 (range: 1-54) and mean number of cigarettes smoked per day was 14.26 \pm 8.78 (range: 5-40).

At the beginning of the study, all individuals with nicotine dependence were evaluated by Fagerstrom and Wender Utah scales. For the 353 participants, mean FTND score was 5.28 \pm 2.07 (2-10) and mean WURS score was 25.98 \pm 19.30 (0-87). When the cut-off score on WURS was established as 36, of the individuals with nicotine dependence, 99 (28.0%) had a score over the cut-off level (ADHD symptoms group, ADHDSG) and 254 (72.0%) had a score under the cut-off level (non-ADHD symptoms group, Non-ADHDSG). Two groups were compared in terms of sociodemographic and smoking-related characteristics. Statistically significant differences were found between two groups for sex, age, age of onset of smoking, number of cigarettes smoked per day and FTND scores. The sociodemographic and smoking-related characteristics of two study groups are shown in Table 1.

After six months, of the individuals who had been reached, 79 (22.4%) quit the smoking and 274 (77.6%) continued smoking. Of the 99 individuals with a score of 36 or over on WURS, only 11 (11.1%) quit the smoking and the remaining 88 (88.9%) continued smoking. On the other hand, of those with a score under 36 on WURS, 68 of 254 participants (26.8%) quit the smoking and 186 (73.2%) continued to smoke. In the comparison of both groups in terms of smoking cessation there was a statistically significant difference in chi-square test (odds ratio [OR]=2.30, p=0.02).

Logistic regression analysis were conducted to determine how demographics (sex, age, marital status, education level and socioeconomic status), smoking related parameters (age of onset of smoking, years of regular smoking, number of cigarettes smoked per day and FTND scores) and ADHD symptoms were associated with failure of smoking cessation. Patients who have ADHD symptoms showed a more than 2-fold increased risk of failure of smoking cessation controlling for sociodemographic and smoking-

Table 1. The sociodemographic and smoking-related characteristics of ADHDSG and non-ADHDSG

	Full sample (n=353)		ADHDSG (n=99)		Non-ADHDSG (n=254)		p
	n	%	n	%	n	%	
Gender							0.007
Male	231	65.4	75	75.8	156	61.4	
Female	122	34.6	24	24.2	98	38.6	
Marital status							0.390
Married	248	70.3	68	68.7	180	70.9	
Single/divorced	105	29.7	31	31.3	74	29.1	
Education							0.231
>8 years	194	55.0	58	58.6	136	53.5	
≤8 years	159	45.0	41	41.4	118	46.5	
Socioeconomic status							0.515
Low	119	33.7	33	33.3	86	33.9	
Middle/high	234	66.3	66	66.7	168	66.1	
	Median	(IQR)	Median	(IQR)	Median	(IQR)	
Age	41	(34-52)	40	(30-50)	42	(35-53)	0.043
Age of onset	19	(16.5-22)	18	(15-20)	20	(17-23)	<0.001
Years of smoking	20	(13-30)	22	(12-32)	20	(14-30)	0.924
FTND score	5	(4-7)	7	(6-8)	5	(3-6)	<0.001
Cigarettes per day	12	(6-20)	15	(9-20)	10	(6-20)	0.011

Table 2. Predictors of failure of smoking cessation*

Variable	AOR	95% CI	p
Marital status			0.043
Married	1.00		
Single/divorced	1.94	1.02-3.72	
Socioeconomic status			0.013
Middle/high	1.00		
Low	2.25	1.19-4.27	
ADHD symptoms			0.042
No	1.00		
Yes	2.12	1.02-4.40	
FTND score	0.80	0.69-0.93	0.003

* Adjusted for gender, education level, age, age of onset of smoking, years of regular smoking and number of cigarettes smoked per day.

related variables. Results of logistic regression analysis were summarized in Table 2.

DISCUSSION

The present study is one of the few follow up study to examine the relationship of ADHD symptoms to smoking cessation. The primary aim of the present study was to evaluate the effect of ADHD symptoms on smoking cessation

over a period of six months and it was found that smoking cessation rate after six months was significantly lower in the participants with ADHD symptoms group compared to non-ADHD symptoms group. Patients who have ADHD symptoms exhibited a more than 2-fold increased risk of failure of smoking cessation.

The first finding of the present study is the significant difference between the individuals with

and without ADHD symptoms in terms of smoking patterns. As mentioned in previous studies^{3,11-13} the median age of onset of smoking was two years earlier in individuals with ADHD symptoms. There was also a significant difference in the average number of cigarettes smoked per day and nicotine dependence level (FTND score) between the ADHD symptoms and non-ADHD groups. Although several authors have reported similar results, there are also some studies showing no relationship between these parameters.^{3,14,15} It should be noted that among the individuals admitting to the smoking cessation center, those with ADHD symptoms were significantly younger than those without. This might be resulted from the younger age at the onset of smoking, smoking more cigarettes, more severe nicotine dependence and thus seeking help to quit the smoking at an earlier age. To our knowledge, there are no findings in the literature about this issue.

Cigarette smoking is the largest preventable cause of death and disease. Although most smokers intend to quit, the long-term quit rates remain low. According to CDC, 52.4% of smokers had made a quit attempt for more than 1 day in the year before, but the overall prevalence of recent cessation was only 6.2%.¹⁶ To identify the factors associated with smoking cessation failure would be beneficial to ascertain more effective treatment strategies. Previous studies have shown a large number of significant factors associated with success in quitting smoking. Age, gender, educational and social status, presence of a smoking partner, heaviness of smoking, level of nicotine dependence, quit intentions and prior quit attempts are among these related factors.¹⁷⁻²⁰ Similarly, our results indicated that to be single or divorced, low socioeconomic status and a high level of nicotine dependence were independent predictors of smoking cessation failure. Additionally, ADHD symptoms were associated with 2.18 fold risk for failure of smoking cessation.

The group with ADHD symptoms was 28% of who admitted to the smoking cessation center, agreed to participate the study and completed the six-month follow-up. (ADHDSG [n=99] / Full sample [n=353]). In adults, ADHD prevalence is approximately 4% of the population and the ADHD rate was higher than the general population in this study. It may be associated with the higher rates of smoking in individuals with ADHD. Previous studies have shown that ADHD smoke at rates that are significantly higher than those of the general population and/or no diag-

nosed controls among adults.^{6,21} Our results are consistent with these previous studies.

There are several previous studies investigating the association between ADHD symptoms and smoking cessation. In a study on 71 adults with ADHD symptoms (55 male and 16 female patients), 'smoking cessation' has been defined as those patients who had smoked in their previous life but had quit smoking during the study period and the rate of smoking cessation has been reported to be 29% in patients with ADHD and 48.5% in general population.²² In a prospective 8-week study, Covey et al.²³ have found that self-reported smoking cessation rates are lower in patients with hyperactivity/impulsivity symptoms than those without ADHD after the treatment with NRT and bupropion. Humfleet et al.⁸ have reported that psychological and pharmacological treatments resulted in a smoking cessation rate of 2% in individuals with a history of childhood ADHD and of 18% in those without after follow up 52 weeks. In our study, 22.4% of non-ADHDSG and 11.1% ADHDSG quit the smoking. Our smoking cessation rates were higher than those reported by Humfleet et al.⁸ It has been also reported that smoking cessation rates were higher in 6 months compared to 1 year.²⁴⁻²⁶ The relatively higher smoking cessation rates which we identified might be due to our shorter study period.

There are also some other studies reporting that increased hyperactivity and impulsivity in the early period would lead to susceptibility to the relapse of smoking addiction and that treatment directed to these symptoms may increase the success of smoking success.²⁷ Even it was not mentioned in our study, some authors have also investigated the effects of psychostimulant treatment on smoking cessation and reported that psychostimulant treatment facilitates smoking cessation and individuals under the treatment quit smoking easier. However, there also some other studies reporting no difference in smoking cessation rates after psychostimulant treatment.²⁸⁻³¹ Similarly, Huizink et al.³² have hypothesized that a decrease in ADHD symptoms may reduce the rate of early onset of smoking and have concluded that taking the ADHD symptoms under control may reduce the rate of early onset of smoking. Considering all these findings, it may be suggested that there is a complex relationship between ADHD symptoms and smoking habit and controlling the ADHD symptoms may influence both onset and cessation of smoking.

Our results suggest that individuals with and

without ADHD symptoms may have differences in the rate of smoking cessation and in the ability to maintain smoking abstinence. The mechanisms underlying negative effects of ADHD symptoms on smoking cessation remains to be elucidated. The present study did not include 'measure self-efficacy', 'severity of withdrawal symptoms' may differ between the smokers with and without ADHD since we were not able to examine the hypothesis, it may be possible that individuals with ADHD symptoms use the nicotine as a self-medication because of its cognitive and behavioral effects.

Limitations of the present study should be acknowledged. First, we used a retrospective self-report measure to assess ADHD symptoms. Not with standing, several studies have shown that the scale is valid in distinguishing ADHD from non-ADHD both in patient and community samples.^{9,33,34} Bupropion can be used in the treatment of ADHD and useful in reducing the ADHD symptoms.³⁵ However it is not the first line option and this was a limitation of our study. In the present study, instead of smoking cessation, ADHD symptoms could have been changed due to use of bupropion and this could have affected the outcome of the study and this was another

limitation. The other important limitation was, cessation of smoking was assessed via self-report without measuring the cotinine or carbon monoxide levels.

In conclusion, despite limitations, our findings provide preliminary evidence for an association between ADHD symptoms and smoking addiction. The primary finding of the present study is that presence of ADHD symptoms reduces the success rate of smoking cessation. The other important findings of the present study are that individuals with ADHD symptoms start smoking at an earlier age, smoke more cigarettes per day, have a more severe addiction potential and seek help to quit smoking at an earlier age. According to the results of the present study, an individual with ADHD symptoms starts smoking two years earlier and smokes five more cigarettes per day, which is equal to 2x5x365 more cigarettes to be smoked. As demonstrated in many studies, understanding the relationship between ADHD symptoms and nicotine dependency as well as early recognition and treatment of ADHD symptoms may reduce rate of starting to smoke. Moreover, taking into account the presence of ADHD symptoms in the smokers intending to quit would increase the success of the treatment.

Authors' contributions

C.B.Ş.: Study design, writing the manuscript; **C.Ş.:** Study design, writing the manuscript; **G.Ü.:** Study design, statistical analysis, writing the manuscript; **A.B.:** Drafting the manuscript, writing the manuscript; **K.K.:** Collecting the data; **H.H.:** Study design.

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