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The effects of cognitive and emotional status on smoking cessation

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Abstract. – OBJECTIVE: Smoking cessation is affected by multiple factors including cognitive status of the patients. In this study, we aimed to investigate the effects of demographic, emotional and cognitive functions of 39 male and 42 female patients who applied to the smoking cessation outpatient clinic on smoking cessation.

PATIENTS AND METHODS: This study recruited 81 healthy volunteers of equal age, gender, and educational level. Total Montreal Cognitive Assessment (MoCA) scores were compared according to age, gender, cessation methods, and Beck Depression Inventory and Beck Anxiety Inventory (BAI) scores in smoking cessation settings.

RESULTS: In our study, there were 39 (48.1%) male patients and 42 (51.9%) female patients. While 36 patients were able to quit smoking, the remaining 38 were unable to do so. During follow-up, 7 patients had yet to be reached. Age, years of smoking, number of cigarettes smoked per day, education level, first reason for starting smoking, reasons for quitting smoking, quitting method, and medical drugs used were found to have no effect on smoking cessation; however, the MoCA total score, Beck depression scale, Beck anxiety scale, and smoking cessation scale score were found to have significant effects on smoking cessation.

CONCLUSIONS: Various cognitive processes, particularly visuospatial and attention skills, have been found to be useful in quitting smoking. Furthermore, emotional states, such as depression and anxiety have a negative impact on quitting smoking. We believe that if it is provided to the patients in the smoking cessation outpatient clinic to boost cognitive capabilities and treat mood problems, the success of smoking cessation will increase.

Key Words:
Anxiety, Cognitive functions, Depression, Smoking.

Introduction

Smoking/Nicotine addiction is an important public health problem that constitutes a risk factor for many diseases that cause death all over the world. China is the world's largest tobacco producer and consumer. According to World Health Organization (WHO) report on the global tobacco epidemic 2021 data[1], China has approximately 300 million smokers (about one-quarter of the global total). Every year, more than one million Chinese people die as a result of tobacco-related diseases. According to WHO preventive organizations, while smoking prevalence is decreasing globally, the total population is increasing in most parts of the world, and the total number of people who smoke remains high. Turkey ranks among the top countries in terms of preventive organizations and WHO compliance[1].

The WHO defines substance addiction as "a behavior that values a used psychoactive substance significantly higher than other activities and objects formerly valued by the person". Nicotine addiction develops as a result of consuming increasing amounts of nicotine to alleviate withdrawal symptoms and social dysfunction.

Nicotine withdrawal symptoms peak in the first few days after quitting smoking and last for three to four weeks. It can cause mood disorders, such as increased appetite, weight gain, dysphoria or depression, insomnia, irritability, anxiety, difficulty concentrating, and cognition disorders[2].

It also implies that nicotine's cognitive-enhancing benefits may contribute to the difficulty of quitting smoking, particularly in people with psychiatric disorders[3].

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When compared to people without psychiatric comorbidities, people with psychiatric comorbidities start smoking at a younger age, consume more cigarettes, are more reliant on tobacco, and are less likely to quit smoking[4,5].

There is research that suggest smoking has a long-term deleterious impact on cognition, as well as studies that imply cognitive issues have a negative impact on smoking cessation[6,7].

The goal of this study was to see how the emotional and cognitive functions of patients who went to a smoking cessation outpatient clinic affected their ability to quit smoking.

Patients and Methods

The study was conducted in Istanbul Training and Research Hospital, a tertiary referral and education hospital between March 2019-January 2022. The effects of demographic, emotional, and cognitive functions on smoking cessation in 39 male and 42 female patients who applied to the smoking cessation outpatient clinic were explored. The study's participants were followed for two years. Every six months, the patients were called up for control. In the presence of expert psychologists and neurologists, questionnaires were filled out.

All the adult patients who applied to the smoking cessation clinics and pulmonology outpatient clinics were included. Exclusion criteria were as follows: history of cerebrovascular disease, cardiovascular disease, diabetes mellitus, arterial hypertension, or hyperlipidemia; somatic or psychiatric disorders (e.g., major depression or psychosis according to DSM-5 criteria).

The study was approved by the Ethics Committee of Istanbul Training and Research Hospital. A detailed written informed consent form was obtained by patients before the study.

This prospective case-control study comprised 81 participants who applied to quit smoking and were of similar age, gender, and educational level. The educational levels of patients who applied to the smoking cessation outpatient clinic, the methods they used to quit, the drugs they used, the smoking cessation indicator scales, the reason they wanted to quit smoking, the reasons they started smoking, their mood and cognition status were all determined.

Total Montreal Cognitive Assessment (MoCA) scores were compared in smoking cessation circumstances based on age, gender, stopping strategies, and Beck Depression Inventory and Beck Anxiety Inventory (BAI) scores.

Cognitive Assessment

The Montreal Cognitive Assessment (MoCA)[8] was used for evaluating the cognitive function of the migraine patients and healthy controls. The MoCA is a 30-point assessment of many cognitive domains that takes 10-15 minutes to complete. A total score of 15.5 on the subscales of visuospatial/executive functioning, identification, memory, attention, language, abstraction, and orientation indicates mild CI[9].

The Mini-Mental Status Examination (MMSE) was performed to assess cognitive abilities. The MMSE is the most well-known and widely used short-duration rating scale for assessing cognitive impairment in clinical and research settings. This scale assesses spatial and temporal orientation, attention, registration, computation, repetition, language, and visual building through 12 chapters and 30 questions. The test is worth 30 points, with 1 point given for each correct answer[10].

Assessment of Depression and Anxiety

The BDI and BAI scores were used to assess depression and anxiety symptoms, respectively. The Beck depression and anxiety inventories consist of 21 items with a score ranging from 0 to 63. The depression and anxiety cut-off values were set at 10 points on the BDI and 17 points on the BAI, respectively[11,12].

Statistical Analysis

The data were processed into IBM SPSS Statistics 23 (IBM Corp., Armonk, NY, USA) and the analyses were done. When categorical variables were reported using descriptive statistics (N, percent), numerical variables were reported using descriptive statistics (mean, standard deviation). The difference between categorical variables with two groups was investigated using the independent *t*-test, whereas the difference between categorical variables with more than two groups was investigated using the one-way ANOVA test (one way analysis of variance). The Pearson Correlation Coefficients were used to examine the association between the two numerical variables, while the chi-square test was performed to examine the correlation between the two categorical variables. Multiple linear regressions were utilized to evaluate the effect of the independent variables on this dependent variable. The type I error rate was taken as 0.05 in

Table I. Evaluation of demographic, cognition, emotional status and smoking data of patients who applied to the smoking cessation outpatient clinic.

Feature	Mean ± SD
Age	42.2±11.2
Smoking initiation age	17.01±4.02
Smoking duration (years)	23.8±10.4
Daily cigarette quantity	27.3±12.6
MMSE score	28.2±1.4
MOCA score	23.9±3.42
BAI	15.6±11.1
BDI	16.01±8.9
Smoking cessation rating scale	14.3±7.1
Gender (Male/Female)	39(48.1%)/42(51.9%)
Educational Status	33 (40.7%) primary, 13 (16%) elementary, 23 (28.4%) high school, 12 (14.8%) university
Reason of smoking	Curiosity: 23 (28.4%)
	Stress: 16 (19.8%)
	Admirance: 29 (35.8%)
	Other: 13 (16%)
Reason of quitting smoking	Comorbid disease: 14 (17.3%)
	Fear of an illness: 3 (3.7%)
	Economic reasons: 30 (37%)
	Environmental pollution: 2 (2.5%)
	Family pressure: 8 (9.9%)
	All: 24 (30%)
Previous attemps of quitting	Yes: 62 (76.5%)
	No: 19 (23.5%)
Medications used	Bupropion: 55 (67.9%)
	Varenicline: 22 (27.2%)
	Nicotine patch: 4 (4.9%)
Quitted at 6th month	Yes: 36 (44%)
	No: 38 (46.9%)
	Unknown: 7 (8.2%)

Abbreviations: BAI: Beck anxiety inventory, BDI: Beck depression inventory, MMSE: Mini-Mental Status Examination, MOCA: Montreal Cognitive Assessment.

the study and *p*-values less than 0.05 were considered to be significant.

Results

Demographic, cognition, emotional status and smoking data of patients who applied to the smoking cessation outpatient clinic are summarized in Table I. In our study, there were 39 (48.1%) male patients and 42 (51.9%) female patients. While 36 patients were able to quit smoking, the remaining 38 were unable to do so. During follow-up, 7 patients had yet to be reached. Age, years of smoking, number of cigarettes smoked per day, education level, first reason for starting smoking, reasons for quitting smoking, quitting method, and medical drugs used were found to have no effect on smoking cessation; however, the MoCA total score, Beck depression scale, Beck anxiety scale, and smoking cessation scale score were found to have significant effects on smoking cessation.

While the MoCA total score, depression, anxiety, and smoking cessation scale score all had a significant effect on smoking cessation, age, smoking year, and daily quantity of cigarettes were found to have no association (Table II).

Education level, first reason for smoking, reasons for quitting smoking, smoking cessation strategy, and types of pharmaceutical medications used in smoking cessation were found to have no significant association ($p>0.05$) (Table III).

While 12 (33.3%) of the patients who quit smoking went to primary school, 5 (13.9%) went to elementary school, 11 (30.6%) went to high school, and 8 (22.2%) attended university, 17 (33.3%) of those who couldn't quit smoking were to primary school, 7 (18.4%) elementary school, 10 (26.3%)

Table II. Evaluation of cognition, emotional status, smoking cessation scales and smoking amount in smoking cessation.

	Quitters (n:36)	Nonquitters (n:38)	p
MMSE score	28.4±1.55	27.8±1.6	0.123
MOCA score	26.25±3.4	23.5±3.6	**0.01**
Smoking cessation rating scale	12.9±7.02	16.3±7.02	**0.043**
BAI	12.7±9.6	18.9±9.7	**0.017**
BDI	13.3±7.2	18.1±9.7	**0.019**
Age	40.4±11.8	43.7±10.6	0.208
Smoking duration (years)	21.8±11.1	25.3±9.8	0.165
Cigarette quantity	25.6±12.2	29.2±13.8	0.251
Visuospacial	4.4±0.7	3.7±1.1	**0.004**
Naming	2.6±0.4	2.5±0.5	0.91
Memory	3.3±1.06	2.8±0.9	0.081
Attention	4.8±1.1	3.2±1.1	0.001
Language	2.2±0.7	2.2±0.7	1
Abstraction	1.7±0.48	1.7±0.41	0.911
Orientation	5.8±0.6	4.7±1.6	**0.001**

Abbreviations: BAI: Beck anxiety inventory, BDI: Beck depression inventory, MMSE: Mini-Mental Status Examination, MOCA: Montreal Cognitive Assessment.

high school, and 4 (10.5%) university graduates.

While 24 patients using bupropion, 11 patients used varenicline, and 1 patient used a nicotine patch, drugs used in medical treatment of patients who could quit smoking. On the other hand, 25 patients used bupropion, 11 patients used varenicline, and 2 patients used nicotine patches in the group who could not quit.

There was no statistically significant difference in the mini-mental test scores in the neurocognitive evaluation of the group who quit smoking *vs.* the group who did not quit; however, the total score of the MoCA test, which evaluated various cognitive functions in detail, as well as visuospatial and attention skill scores, was significantly higher.

Discussion

Differences in age, years of smoking, number of cigarettes smoked per day, education level, first reason for starting smoking, reasons for quitting smoking, smoking cessation method, and medical drugs used were not found to be related in this study; however, the MoCA total score, Beck depression scale, Beck anxiety scale, and smoking cessation scale score were found to have significant effects on smoking cessation.

Learning, memory, attention, reasoning, and impulse control are just a few of the basic cognitive abilities that are affected by addiction. By altering normal brain structure and function, the addictive chemicals cause cognitive changes that encourage continued drug use and impede adaptive behavior that supports cessation. Depending on the individual's genetic background, an addictive drug, such as cigarettes may impact the degree to which the individual's cognitive processes change[13]. A new brain-behavior mechanism was discovered in a study by Louhead et al[14] (2009), who found that the COMT Val allele could promote smoking relapse. While greater cognitive test scores were linked to improved smoking cessation in our study, there was no evidence of relapse in the first six months. Patient follow-up continues.

There is few research that look at the link between nicotine withdrawal-related cognitive impairment and smoking relapse in the literature. It has been discovered that when a person quits smoking, withdrawal symptoms become more severe as a result of triggering withdrawal, which might lead to resuming smoking. In the first week, these symptoms are the most intense[2]. Fatigue and increased tension were reported in all of our patients throughout the first week.

Table III. Effects of education level, first reason for starting smoking, reasons for quitting smoking, smoking cessation method, and types of pharmaceutical medications used in smoking cessation.

	Quitting status (p)
Educational status	0.148
Reason to start smoking	0.160
Reason to quit smoking	0.836
Quitting method	0.669
Medications	0.800

It suggests that nicotine's cognitive-enhancing properties may add to the difficulty of quitting smoking, particularly in people with psychiatric disorders[3].

When compared to people without psychiatric comorbidities, people with psychiatric comorbidities start smoking at a younger age, consume more cigarettes, are more reliant on tobacco, and are less likely to quit smoking[4,5]. Anxiety and depression scores were higher in our patients who were unable to quit smoking.

Negatively effective cognitive processes (anxiety, depressive disorder) are involved in the continuation of smoking[3]. Anxiety sensitivity is defined as the dread of experiencing anxiety symptoms, and it is exacerbated in emotionally weak people. It is defined by three components: social phobia, physical symptom (such as palpitations), and mental lack of control. It has been demonstrated that during a quitting attempt, those with high anxiety sensitivity have a tendency to restart smoking due to withdrawal symptoms from nicotine and the desire to smoke[15,16].

Furthermore, because to the anxiety and low mood experienced after quitting, these individuals may have a greater nicotine addiction when they re-start smoking than they had before stopping[17]. This condition creates a negative motivation, leading to the person's failure to quit smoking on multiple occasions. The high level of anxiety and depression supports the idea that individuals have a direct impact on quitting smoking.

Cognitive impairment, particularly in visuospatial and attention skills, as well as Beck Anxiety Inventory (BAI) and Beck Depression Inventory (BDI) scores, were significantly higher in the quit group in this study.

Cognitive function may be a significant indicator of smoking cessation in smokers who are trying to quit. Poor performance in a working memory task, decreased response inhibition, and motor impulsivity has all been linked to relapse to smoking in human laboratory studies[18,19].

These data show that cognitive enhancing measures could help with smoking cessation programs. A 12-week computer-based cognitive exercise training program in smokers seeking to quit was recently tested in a randomized clinical trial. Despite the small increases in cognitive performance, these findings suggest the efficacy of computerized cognitive training as a smoking cessation adjunctive therapy[20].

The 2-year follow-up of the patients who participated in the study is a limitation of our study. A longer period of smoking cessation must be evaluated in further studies.

Conclusions

Various cognitive dysfunctions in smoking cessation have been found to have a negative influence on quitting smoking. Moreover, emotional states, such as depression and anxiety, have a negative impact on quitting smoking. Based on these findings, we believe that adding cognitive enhancement to the smoking cessation outpatient clinic and incorporating it into the treatment of mood disorders will increase the effectiveness of smoking cessation.

Conflict of Interest

The authors declare that they have no conflict of interests.

Ethics Committee Approval

Ethics Committee Approval was obtained from the Ethics Committee of Istanbul Education and Research Hospital.

Informed Consent

The patients signed the written informed consent.

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Authors' Contribution

Literature search: ACG, AT, ASK
Data collection: ACG, AT, BDG, AT, AY, IM
Study design: ACG, BDG, AT, AY
Analysis of data: AT, ASK, AY
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Data Availability

All patient records, questionnaires, informed consents, and statistical evaluation documents are saved and archived in Istanbul Education and Research Hospital Pulmonology Department.

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