RESEARCH ARTICLE

Selcuk Mistik[1]
Cemalinur Uzun[1]
Inci Gulmez[2]

[1]Erciyes University Medical Faculty, Department of Family Medicine, Kayseri, Türkiye
[2]Erciyes University Medical Faculty, Department of Chest Diseases, Kayseri, Türkiye

Corresponding Author:
Selcuk Mistik
mail:selcukmistik@erciyes.edu.tr

Received: 28.01.2022
Acceptance: 12.05.2022
DOI: 10.18521/ktd.1064357

This study has been presented as an oral presentation at the 21. International Eastern Mediterranean Family Medicine Congress held between 12-15 May 2022 in Adana, Turkey.

Konuralp Medical Journal
e-ISSN1309–3878
konuralptipdergi@duzce.edu.tr
konuralptipdergisi@gmail.com
www.konuralptipdergi.duzce.edu.tr

The Effect of a Mobile Phone Application on Smoking Cessation

ABSTRACT

Objective: The aim of this study was to investigate whether these applications are effective in quitting smoking by using one of the smartphone applications in addition to motivational interviewing in patients who applied for giving up smoking.

Methods: A randomized controlled intervention study was between January and July 2020. Adults aged 18-65 years who smoke at least one cigarette a day were included in the study. In the prospective study, the patients were followed for 6 months and a total of ten interviews were made. A phone application was installed on the intervention group. Afterwards, the smoking status of the patients was evaluated by telephone or face-to-face.

Results: Sixty-three smokers participated in the study. Fifty patients completed the study, 25 controls and 25 interventions. Long-term smoking cessation findings at the first, third and sixth months were evaluated for both groups. Of the patients, 64% in the intervention group and 32% of the patients in the control group quit smoking at the end of the first month. The success of quitting at the end of the first month was found to be statistically more significant in the intervention group than in the control group (p=0.024). Patients who did not continue smoking at the end of the sixth month were 44% in the intervention group and 24% in the control group, and there was no statistically significant difference between the two groups. Of the 50 patients, 16 had never smoked for six months.

Conclusions: The smartphone mobile-application showed a positive effect in promoting the increase in the smoking quitting rate. The intervention was found to be effective in 30-day smoking cessation success. Despite higher smoking quitting rates at 3 and 6 months, the application was not effective.

Keywords: Smoking Cessation, Motivational Interview, Phone Application.

Cep Telefonu Uygulamasının Sigara Bırakmaya Etkisi

ÖZET

Amaç: Bu çalışmanın amacı, sigarayı bırakmak için başvuran hastalarda motivasyonel görüşmeye ek olarak akıllı telefon uygulamalarından birini kullanarak bu uygulamaların sigarayı bırakmada etkili olup olmadığını araştırmaktır.

Gereç ve Yöntem: Ocak ve Temmuz 2020 arasında randomize kontrollü bir müdahale çalışması yapıldı. Çalışmaya günde en az bir sigara içen 18-65 yaş arası yetişkinler dahil edildi. Prospektif çalışmada hastalar 6 ay takip edilmiş ve toplam on görüşme yapılmıştır. Müdahale grubuna telefon uygulaması yüklendi. Daha sonra hastaların sigara içme durumları telefonla veya yüz yüze değerlendirildi.

Bulgular: Çalışmaya 63 sigara içicisi katıldı. Çalışmayı elli hasta, 25 kontrol ve 25 müdahale grubu olarak tamamladı. Her iki grup için de birinci, üçüncü ve altıncı aydaki uzun dönem sigara bırakma bulguları değerlendirildi. Müdahale grubundaki hastaların %64'ü, kontrol grubundaki hastaların %32'si birinci ay sonunda sigarayı bırakmıştır. Birinci ay sonundaki bırakma başarısı müdahale grubunda kontrol grubuna göre istatistiksel olarak daha anlamlı bulunmuştur(p=0,024). Altıncı ay sonunda sigaraya devam etmeyen hastalar müdahale grubunda %44, kontrol grubunda %24'dür ve her iki grup arasında istatistiksel olarak anlamlılık yoktur. Toplam 50 hastanın 16'si altı ay boyunca hiç sigara içmemiştir.

Sonuç: Akıllı telefon mobil uygulaması, sigara bırakma oranındaki artışı teşvik etmede olumlu bir etki göstermiştir. Müdahalenin 30 günlük sigara bırakma başarısında etkili olduğu bulundu. 3. ve 6. aylarda daha yüksek sigara bırakma oranlarına rağmen uygulama etkili olmadı.

Anahtar Kelimeler: Sigara Bırakma, Motivasyonel Görüşme, Telefon Uygulaması.

INTRODUCTION

Smoking is one of the most important preventable causes of death in politics and in the world. One of the biggest problems today is nicotine dependence. Tobacco is one of the world's largest public health risks. Tobacco use and the various diseases it causes, cause the death of more than 8 million people in the world annually. While more than 7 million of these deaths are due to tobacco use, approximately 1.2 million are the result of exposure to second-hand smoke by non-smokers (1).

Compared to non-smokers, the relative death rate of smokers was tripled for men aged 45-64 and doubled for men aged 65-84 (2). Looking at the 2019 data of the Turkish Statistical Institute (TUIK), the rate of individuals aged 15 and over who smoke every day has increased from 26.5% in 2016 to 28% in 2019. This rate was determined as 41.3% for men and 14.9% for women. Every year, approximately 110 thousand people die due to smoking (3). Nicotine is the primary psychoactive stimulant, addictive substance in cigarettes. The tar contained in cigarettes increases the risk of lung cancer, each cigarette shortens human life by 11 minutes (4).

It is known that even when physicians ask patients about their smoking status and warn them not to smoke during their routine treatment services, it leads them to think about quitting smoking, and at a rate of 1-3% (5). It has been determined that physicians' advice and support in quitting smoking motivates many smokers and encourages them to try to quit. Physicians working in primary care have a great role in this regard (6).

The use of communication and mobile phone applications in health promotion is becoming more and more widespread. Since most relapses occur in the first weeks after a quit attempt, such interventions have the potential to provide support when it is most needed (7). Due to the high prevalence of smartphone use, providing health promotion interventions using smartphone apps is a promising approach, especially because of proximity to users, cost-effectiveness, location independence, possibility of adaptation, and immediate interactive support (8, 9).

The aim of this study was to investigate whether these applications are effective in smoking cessation by using one of the smartphone applications in addition to motivational interviewing.

MATERIAL AND METHODS

Patients between the ages of 18-65 who smoked at least one cigarette a day and wanted to quit smoking between January and July 2020 in the Erciyes University Faculty of Medicine Family Medicine Department polyclinic were included in the study. Patients who agreed to participate in the study signed the consent form. The study was approved by an Ethical Committee. The patients were followed for six months and the study ended in January 2021. The research is a randomized controlled intervention study. Randomization was performed according to admission sequence, one by one, first to study group than to control group. The intervention was carried out with the program called Beat Smoking, which was developed as a mobile phone application, and its effectiveness on smoking cessation was investigated.

Tools: In the study, informed consent form, personal information form, Fagerström Test for Nicotine Dependence and the form that was distributed to the patients including the motivational interview and behavioral changes used for the first interview were used. A questionnaire form including socio-demographic data such as name-surname, age, gender, education level, monthly income levels, marital status, and the number of cigarettes consumed per day, how many years have been smoked, whether they have been given smoking cessation advice, and the reason for wanting to quit if they are considering quitting smoking was used.

Fagerström Test for Nicotine Dependence (FTND): Fagerström first proposed the Fagerström Tolerance Test in 1978 to measure physical dependence on nicotine. This test was revived by Fagerström, Heatherton and Kazlowki in 1992 and the Fagerström Test for Nicotine Dependence emerged. This test consists of six questions and each question is given a different score. According to the total scores obtained, nicotine addiction was divided into five groups as very low (0-2 points), low (3-4 points), medium (5 points), high (6-7 points), and very high (8-10 points). It was adapted into Turkish by Uysal et al. in 2004 and a reliability study was conducted. In the study of Uysal et al., the reliability coefficient of the scale was reported as 0.56 (10, 11).

Properties of the Mobile Phone Application: The phone application we used in our study is the application called Beat Smoking. The interface of this program is beautifully designed, it is free for everyone to use, the login-registration to the application is quite simple and the application is useful. Many users find it difficult to maintain quitting during and after treatment. The most important reason for this is the loss of motivation. It is aimed that this application will increase the motivation needed and provide continuous support to the patient in quitting smoking.

In this program, the person first registers with their e-mail address. Then the person answers questions about the degree of addiction. According to these questions, the program measures the degree of addiction of the person and determines how long the desire to smoke will be. The person can track how often they need nicotine, thanks to the application. When the person wants to smoke, by clicking on the I want to smoke button, she is directed to the page containing the activities and suggestions (hiking, watching movies, etc.) that she can do instead of smoking. In addition, various scientific articles and articles about the harms of

smoking can be accessed in practice. It informs the patient about the changes that occur in the body from the moment the patient quits smoking. There are motivating notifications about how long he has not smoked during the day. If the patient does not quit smoking, he warns about what problems he will encounter in his life.

Inclusion Criteria:

• Those who smoke at least one cigarette every day for at least one year and who want to quit smoking
• Those between the ages of 18-65
• Those who read, accepted and signed the informed consent form
• Having completed the questionnaire and the Fagerström test completely
• Will not receive any other treatment for smoking cessation during the study
• Accepting 6-month follow-up
• Patients with Android phone users were included in the study.

Exclusion Criteria

• Those younger than 18 or older than 65
• Not accepting 6-month checks
• Those who quit smoking before applying to the outpatient clinic
• Not using an Android phone
• Patients taking active drug therapy to quit smoking were excluded from the study.

Study Design: This study was carried out in Erciyes University Faculty of Medicine Family Medicine Polyclinic. A randomized controlled trial was conducted. Sixty-three patients (over 18 years) who applied to quit smoking were divided into 2 groups. Patients were randomly assigned to an intervention group and a control group, respectively. Thirty-three patients were included in the control group and 30 patients were included in the intervention group.

Eight patients in the control group and five patients in the intervention group who could not be reached during the controls were excluded from the study. The patients who accepted the study signed the consent forms and filled the questionnaire form and FNAT. The control group was formed by interviewing the patients about motivational, behavioral and life changes, which lasted for about 30 minutes. In addition to motivational interview therapy, the other 25 patients were given a smart phone application called "Beat Smoking", and the intervention group was created, and the intervention group used the smart phone application every time they wanted to smoke during the day.

During the interviews, a quit date was determined to be within two weeks. If there is a special day in the recent history, it is recommended that patients choose that day in terms of motivation. In the interview, the reasons for change that are important for the patients were discussed. The interview is about their private reasons and the personal benefits of changing their behavior that are not judgmental and non-confrontational. Reminding the harms of cigarette consumption, speeches were made about obstacles. Behavioral and lifestyle changes were also recommended to patients.

After determining the quit date for each patient, smoking cessation status was evaluated by telephone or face-to-face interviews. The patients were informed at each interview, they were encouraged to quit smoking, and the importance of this issue was repeatedly explained to the patients. Patients were interviewed once a week for the first month. In the second month, smoking cessation status was followed for 6 months by interviewing every 2 weeks and then monthly. A total of 10 interviews were conducted with the patients and the number of cigarettes smoked was recorded.

Statistical Analysis: SPSS (Statistical Package for the Social Sciences) 23.0 package program was used for statistical analysis of the data. Categorical measurements were summarized as numbers and percentages, and continuous measurements as mean and standard deviation (median and minimum-maximum where appropriate). Chi-square and Fisher's exact tests were used to analyze categorical expressions. Shapiro-Wilk test was used to determine whether the parameters in the study showed a normal distribution. Mann-Whitney-u test was used in paired group analysis for parameters that did not show normal distribution. Spearman correlation analysis was used to analyze the relationship between continuous measurements. Statistical significance level was taken as $p<0.05$ in all tests.

RESULTS

A total of 63 patients, 30 in the intervention group and 33 in the control group, were included in the study. Among these patients, 5 patients in the intervention group and 8 patients in the control group could not be reached during the controls, so the patients were excluded from the study. When the socio-demographic data of the patients included in the study were examined, the mean age of the participants was 40.58 (SD:12.5). 31 (62%) of these participants were under 45 years old, 14 of them were between 45 and 55 years old, and five of them were between 55-65 years old. The majority of the participants were aged 40 (54%) and below.

Thirty-six percent of the participants were female and 64% were male. Seventy percent of them were married and 68.6% of the married participants were men. Of the singles 46.7% were female participants. 42% of them were college graduates. 71.4% of college graduates were male. Eight (66.6%) of the primary school graduates were female and four (33%) were male. The number of participants who did not work in any job consisted of 18 people. Nine (50%) were female and nine (50%) were male. Although four of them were retired and had a certain income, all of them were men. The income level of 38% of the participants was 3500 TL and above. When the intervention and control groups were compared, there was no

statistically significant difference between the groups in terms of gender, marital status, educational status, employment status, income status and age (Table 1).

Table 1. Evaluation of the demographic characteristics of the patients and the differences between the groups

	Intervention	**Control**	**Total**	**p**
	n (%)	**n(%)**	**n(%)**	
Gender				
Women	11 (44)	7 (28)	18 (36)	0.239
Men	14 (56)	18 (72)	32 (64)	
Marital Status				
Single	6 (24)	9 (36)	15 (30)	0.355
Married	19 (76)	16 (64)	35 (70)	
Education				
Elementary school	6 (24)	6 (24)	12 (24)	0.771
Secondary school	3 (12)	1 (4)	4 (8)	
High school	6 (24)	7 (28)	13 (26)	
University and higher	10 (40)	11 (44)	21 (42)	
Working status				
Unemployed	7 (28)	11 (44)	18 (36)	0.239
Working	18 (72)	14 (56)	32 (64)	
Income				
Less than 2000 TL	9 (36)	8 (32)	17 (34)	0.664
2000-3500	8 (32)	6 (24)	14 (28)	
Over 3500	8 (32)	11 (44)	19 (38)	
	Intervention	Control	Total	
	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)	
Age	40 (19-60)	37 (18-64)	40 (18-64)	0.705

* p<0,05, Chi-square and Fisher exact test, Mann Whitney-U test=Median (Min-Max)

According to the Fagerström Test for Nicotine Dependence (FTND), the mean addiction score in the sample was 4.22 ± 2.65 points. The mean FTND value of the case group was 4.16 points, and the mean FTND value of the control group was 4.04 points. There was no significant difference between the two groups in terms of FTND scores. Evaluation of the degree of addiction is divided into five classes (0-2= very little dependence, 3-4= little dependence, 5=moderate dependence, 6-7= high degree of dependence, and 8-10=very high degree of dependence) as applied in clinical practice. In the evaluation of addiction degrees according to FTND, the rate of very little, little, and highly dependent (7 people each) was the same in the case group, while the rate of highly dependent (9 people) was found to be higher in the control group. However, no significant finding was found in the differences between the FTND scores of the patients and the groups.

The FTND scores of the intervention and control groups and their smoking cessation status at the first, second and third months were evaluated. The median FTND score was 5 for those who quit smoking in the first month, 4.5 for those who quit at the third month, and 4 for those who quit at the sixth month. In our study, the degree of dependence according to FTND did not affect the success of smoking cessation in both groups. It was determined that the differences between FTND scale scores and smoking cessation in the first, third and sixth months were not statistically significant (Table 2).

Table 2. Comparison of patients' smoking cessation and FTND scores

	First month		**Third month**		**Sixth month**	
	No	**Yes**	**No**	**Yes**	**No**	**Yes**
FTND score	4 (0-7)	5 (0-10)	4,5 (0-7)	4,5 (0-10)	5 (0-7)	4 (0-10)
p	0.314		0.688		0.812	

* p<0,05, Mann Whitney-U test=Med (Min-Max)

In the intervention group 64% of the patients and 32% of the patients in the control group quit smoking at the end of the first month. The success of quitting at the end of the first month was found to be statistically more significant in the intervention group than in the control group (p=0.024). At the end of the third month, 56% of the intervention group still did not smoke, while this rate was 32% in the control group. Although the rate of those who quit smoking was higher in the intervention group, it was not statistically significant. Patients who did not continue smoking at the end of the sixth month were 44% in the intervention group and 24% in the control group, and there was no statistically significant difference between the two groups. Of the 50 patients, 16 never smoked for six months (Table 3).

Table 3. Evaluation of the patients' first month, third and sixth month smoking cessation findings and the differences between the groups

Quit smoking	Intervention	Control	Total	p
	n(%)	n(%)	n(%)	
First month				
Yes	16 (64)	8 (32)	24 (48)	**0.024**
No	9 (36)	17 (68)	26 (52)	
Third month				
Yes	14 (56)	8 (32)	22 (44)	0.087
No	11 (44)	17 (68)	28 (56)	
Sixth month				
Yes	10 (44)	6 (24)	16 (32)	0.225
No	15(56)	19 (76)	34 (68)	

* p<0,05, Chi-square and Fisher exact test

In the first month follow-up of the study, 66.7% of women quit smoking in the intervention and control groups, while it was 37.5% in men. In terms of gender, women quit smoking at a higher rate than men in the first month (p= 0.048). Among the age groups, the highest quitting success was in the 55-65 age group (60.0%), while the 18-24 age group (16.6%) achieved the lowest success.

There was no statistically significant difference between age groups in terms of success. According to educational status, smoking cessation success was found to be close to each other in primary school (58.3%), secondary school (50%) and high school (53.8%), while the success rate was 38.1% in the university and higher education group. There was no statistically significant difference in success between the education groups. In the first month follow-up, the quit rates of married and single individuals were found to be very close to each other and no difference was observed between the groups (Table 4).

Table 4. Comparison of patients' quit success at the end of the first month in terms of sociodemographic characteristics

	Successful	Unsuccessful	P
	n(%)	n(%)	
Gender			
Women	12 (66.7)	6 (33.3)	**0.048**
Men	12 (37.5)	20 (62.5)	
Marital Status			
Single	7 (46.7)	8 (53.3)	0.902
Married	17 (48.6)	18 (51.4)	
Education			
Elementary school	7 (58.3)	5 (41.7)	
Secondary school	2 (50)	2 (50)	0.686
High school	7 (53.8)	6(46.2)	
University and higher	8 (38.1)	13 (61.9)	
Working status			
Unemployed	9 (50)	9 (50)	0.832
Working	15 (46.9)	17 (53.1)	
Income			
Less than 2000 TL	9 (52.9)	8 (47.1)	
2000-3500	9 (64.3)	5 (35.7)	0,157
Over 3500	6 (31.6)	13 (68.4)	
Age			
18-24	1(16,6)	5(83,4)	
25-34	5(55,5)	4(44,5)	
35-44	8(50)	8(50)	0.753
45-54	7(50)	7(50)	
55 and over	3(60)	2(40)	
Number of cigarettes consumed per day			
10 and less	8 (57.1)	6(42.9)	
11-20	16 (50)	16 (50)	0.303
21-30	0 (0)	3 (100)	
31 and more	0(0)	1(100)	
Presence of other smokers in the house			
Yes	9 (36)	16 (64)	0.089
No	15 (60)	10 (40)	
Receiving advice to quit smoking by the physician			
Yes	13 (48.1)	14 (51.9)	0.982
No	11 (47.8)	12 (52.2)	

* p<0,05, Chi-square and Fisher exact test

In the third month follow-up of the study, the success of smoking cessation was 61.1% for women in the total intervention and control groups, while it was 34.4% for men. There was no difference in the success of quitting according to gender in the third month follow-up. Among the age groups, the highest quitting success was in the 55-65 age group (60.0%), while the 18-24 age group (16.6%) achieved the lowest success. There was no statistically significant difference between age groups in terms of success. When the relationship between income status and smoking cessation was examined, higher quitting success was observed in those with income status of 3500 TL and below (p= 0.031). In the first month follow-up, the quit success rates of married and single people were found to be very close to each other and no difference was observed between the groups. No statistically significant difference was found between the other parameters and the success of quitting smoking at the third month.

In the sixth month follow-up of the study, the success of quitting smoking was found to be 55.6% for women in the total intervention and control group, while it was 21.9% for men. In terms of gender, the success of quitting smoking was found to be significantly higher in women in the sixth-month follow-up (p= 0.016).

Among the age groups, the highest quitting success was in the 55-65 age group (60.0%), while the 18-24 age group (16.6%) achieved the lowest success. There was no statistically significant difference between age groups in terms of success. No statistically significant difference was found between the other parameters and the success of quitting smoking at the sixth month.

DISCUSSION

Statement of Principal Findings: Of the patients, 64% in the intervention group and 32% of the patients in the control group quit smoking at the end of the first month. The success of quitting at the end of the first month was found to be statistically more significant in the intervention group than in the control group (p=0.024). Patients who did not continue smoking at the end of the sixth month were 44% in the intervention group and 24% in the control group, and there was no statistically significant difference between the two groups. Of the 50 patients, 16 had never smoked for six months. Smoking cessation intervention with Beat Smoking was found to be effective on 30-day smoking cessation success, but not on longer (3 months and 6 months) quitting success. Being in the intervention group in the first month increased success 2 times, at the third month 1.75 times, and at the sixth month 1.6 times.

Comparison with the Existing Literature: Bindhim et al. in their randomized controlled study with 684 participants, a smartphone decision aid application with support features and an information-only application were compared. The intervention included mandatory information on smoking cessation options, benefits and harms, as well as push notifications from the study server and daily motivational messages. The control application contained non-essential information about withdrawal options, benefits and harms, similar to those found in the intervention application. It did not provide any structured process for evaluating the options, benefits, and harms of quit methods, nor did it provide ongoing support for adhering to the decision to quit. As a result of this study, only information was available at the first (28.5% vs. 16.9%), third (23.8% vs. 10.2%) and sixth (10.2% vs. 4.8%) months. It was found that the intervention group was more likely to abstain from smoking compared to the application that included it (12). The phone application we used was also an application containing more information, but it also suggested additional activities that can be done when smoking is desired. There were no motivational messages sent daily. The absence of notifications required the participant to willingly enter the practice. Although there was no statistical significance in the third and sixth months, we achieved higher smoking cessation percentages in the first month (64% vs. 32%), the third month (56% vs. 32%), and the sixth month (44% vs. 24%). Compared to this study, our participants quit smoking at a much higher rate. The features of the phone application may be insufficient for long-term smoking cessation. Motivational interviews with both groups over the phone or face-to-face at regular intervals may have increased the dropout percentages of the total participants.

Whittaker et al., in a systematic review conducted in 2016, examined 12 studies with a six-month smoking cessation output and found that mobile phone-based interventions increased smoking cessation success 1.67 (1.46 - 1.90) times (13).

Graham et al. conducted a systematic review and meta-analysis of 40 studies that included internet interventions for adult smoking cessation. In the study, interactive internet interventions were found to be 2.10 (1.25-3.52) times more effective than smoking cessation interventions with printed materials. No significant results were obtained when static internet interventions were compared with printed materials (14). In our study, it was observed that the intervention increased the success rate in the first month by 2 times, similar to interactive internet interventions. Unlike this study, our phone application did not contain active motivational messages. However, we think that the use of a phone application and motivational interviews with weekly follow-ups in the first month may have increased our success, similar to this meta-analysis.

Vidrine et al. in a randomized study conducted with 95 participants in HIV-positive patients, participants who received mobile phone intervention were found to be 3.6 times more likely to quit smoking than participants who received

normal care (15). Personally designed mobile phone applications for those with chronic diseases can be more helpful in quitting smoking.

In a randomized study of 1865 people examining the effect of online interventions containing motivational or action-oriented information to quit smoking, the 7-day point prevalence of smoking cessation at 2, 6, and 12 months (no smoking in the last 7 days) was found to be significant only at 6 months (16). This may be due to the fact that the online intervention used, unlike our study, was defined specifically for the individual. In addition, we evaluated long-term smoking cessation rates (3 months and 6 months), not point prevalence. The phone application may have been insufficient to maintain long-term withdrawal. It may be more useful to identify the "active ingredients" that make Internet-based smoking cessation programs more effective to these applications.

In the thesis study conducted at Ege University Health Sciences Institute in 2017, the WhatsApp application, which was integrated into standard outpatient services, was used. Fifty percent of 130 individuals reached at the end of the first month; at the end of the third month, 38.3% of the 128 individuals reached were successful in quitting smoking (17). In our study, the success rate of 48% in the first month and 40% in the third month is similar to this study. However, during our study, the covid-19 pandemic broke out and follow-up interviews with the patients had to be made mostly via telephone. In addition, the motivation of the patients was also affected due to the quarantine conditions. This situation may have reduced our quit success.

In the study conducted by Kaur Ubhi et al., using the SmokeFree28 (SF28) phone application and investigating the effects of the application on smoking cessation, 1170 people were included in the study and their 28-day smoking cessation rates were examined. However, not all of the participants used the application every day and the rate of quitting was found to be higher in those who used it. The rate of those who did not smoke for 28 days or longer was found to be 18.9%. This study concluded that SF28 may help some smokers quit (18). Similarly, we found significance in the intervention group at the end of the first month. In our study, first month dropout rates were higher in both groups.

Strengths and Limitations of the Study: Data collection and interviews with the patient were carried out by a single researcher, and the motivational interview was written down on paper and transferred to the patients so that it could be applied to each patient in a similar way. Thus, a standardization was achieved by avoiding the differences depending on the physicians in the interviews. With telephone and face-to-face interviews, it was ensured that the participants used the application and their adaptation to the study was increased. Beat Smoking smartphone application is an application for smoking cessation in Turkey, which is used in Turkish and provides evidence-based information and content. In addition to similar mobile applications that are still in use in the world, it is also advantageous that it offers additional suggestions that a person can enter when he/she wants to smoke.

One of the limitations of this study is that smoking cessation was self-reported and not biochemically validated. In addition, there is no remote access to the application, where we can evaluate whether the patients use the application or not. It is reported via self-report; as automatic recording of usage data is not possible. Another limitation is the 6-month follow-up of smokers. After 6 months, recurrences can be seen up to a year. This will need to be addressed in the future development and evaluation phase. The decrease in the number of patients at the beginning of our study may have reduced the power of the study, as the patients did not want to spend a long time in the hospital due to the COVID-19 pandemic.

CONCLUSION

Smartphone applications for smoking cessation are increasingly used worldwide. Although there are many phone apps for quitting smoking on the market, few studies have evaluated their effectiveness. For this reason, there is a need for more studies on the use of smartphones in smoking cessation in our country.

Acknowledgement: The authors declare that they did not receive any funding or support for the present study and that there are no potential conflicts of interest related with it.

REFERENCES

1. World Health Organization. WHO report on the global tobacco epidemic, 2019. https://www.who.int/teams/health-promotion/tobacco-control/who-report-on-the-global-tobacco-epidemic-2019 Access date: 15.05.2021
2. Doll R, Peto R, Wheatley K, Gray R, Sutherland I. Mortality in relation to smoking: 40 years' observations on male British doctors. 1994;309(6959):901-11.
3. "Turkish Statistical Institute, Turkey Health Survey, 2019. https://data.tuik.gov.tr/Bulten/Index?p=Turkiye-Saglik-Arastirmasi-2019-33661 Access date:30.05.2021
4. Shaw M, Mitchell R, Dorling D. Time for a smoke? One cigarette reduces your life by 11 minutes. BMJ. 2000;320(7226):53.
5. Stead LF, Bergson G, Lancaster T. Physician advice for smoking cessation. Cochrane Database Syst Rev. 2008 Apr 16;(2):CD000165.

6. Ogur P, Utkualp N, Aydınoğlu N. Continuing medical education journal.2015;(24)3: 237–244.
7. Lüscher J, Berli C, Schwaninger P, Scholz U. Smoking cessation with smartphone applications (SWAPP): study protocol for a randomized controlled trial. BMC Public Health. 2019;19(1):1400.
8. Ubhi HK, Kotz D, Michie S, van Schayck OCP, Sheard D, Selladurai A, et al. Comparative analysis of smoking cessation smartphone applications available in 2012 versus 2014. Addict Behav. 2016; 58: 175–81.
9. Abroms LC, Boal AL, Simmens SJ, Mendel JA, Windsor RA. A randomized trial of Text2Quit: A text messaging program for smoking cessation. Am J Prev Med. 2014;47(3):242–50.
10. Fagerstrom KO, Schneider NG. Measuring nicotine dependence: a review of the Fagerstrom Tolerance Questionnaire. J Behav Med. 1989;12(2):159–82.
11. Uysal MA, Kadakal F, Karşıdağ C, Bayram NG, Uysal O, Yilmaz V. Fagerstrom test for nicotine dependence: reliability in a Turkish sample and factor analysis. Tuberk Toraks. 2004;52(2):115–21.
12. Bindhim NF, McGeechan K, Trevena L. Smartphone Smoking Cessation Application (SSC App) trial: A multicountry double-blind automated randomised controlled trial of a smoking cessation decision-aid "app.". 2018;8(1):17105.
13. Whittaker R, et al. Mobile phone-based interventions for smoking cessation (review). Cochrane Database Syst Rev. 2016; 4:1–22.
14. Graham AL, Carpenter KM, Cha S, Cole S, Jacobs MA, Raskob M, et al. Systematic review and meta-analysis of Internet interventions for smoking cessation among adults. Subst Abuse Rehabil. 2016;7: 55–69.
15. Vidrine DJ, Arduino RC, Lazev AB, Gritz ER. A randomized trial of a proactive cellular telephone intervention for smokers living with HIV/AIDS. 2006;20(2):253–60.
16. O'Connor M, Whelan R, Bricker J, McHugh L. Randomized Controlled Trial of a Smartphone Application as an Adjunct to Acceptance and Commitment Therapy for Smoking Cessation. Behav Ther. 2020;51(1):162–77.
17. Durmaz S. (2017) The Effect of Using Whatsapp Application in the Smoking Cessation Outpatient Clinic on Smoking Cessation Success: A Randomized Controlled Intervention Study. Ege University Institute of Health Sciences, PhD Thesis, İzmir.
18. Ubhi HK, Michie S, Kotz D, Wong WC, West R. A mobile app to aid smoking cessation: preliminary evaluation of SmokeFree28. J Med Internet Res. 2015 Jan 16;17(1):e17.