

Study of some methods of smoking cessation

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Background Addiction of tobacco is both mental and physical. For many smokers, the best way to quit is a combination of medical, behavioral, and emotional support. The aim of the work was to study the effectiveness of aversion therapy using onion-powdered cigarette as a method of quitting compared with nicotine replacement therapy and conventional behavioral (5As) therapy in smoking cessation.

Patients and methods A prospective, randomized study recruited 60 smokers from Ain Shams University Hospitals who were divided into three groups. Group I: included 20 participants subjected to a brief verbal (5As) therapy for smoking cessation; group II: included 20 participants subjected to a brief verbal (5As) with adding nicotine gum; group III: included 20 participants subjected to brief verbal (5As) with adding aversion therapy in the form of single onion-powdered cigarette by mixing tobacco with dried onion powder by an equal amount. Weekly interviews were conducted for follow-up, for at least 6 months from the beginning of treatment.

Results All participants were male smokers within the age range of 21–70 years. There were significant statistical differences ($P \leq 0.05$) between the three studied groups as regards the outcome: the complete success rate of quitting was significantly higher among group 1 (30%) versus 15% in group II and 15% in group III. On other hand, the partial success was recorded in 45, 55, and 20% of group I, II, and III, respectively. Lastly failed attempts were recorded in 25, 30, and 65% of group I, II, and III, respectively. There were

significance statistical correlations ($P < 0.05$) found between the outcome and the age, pack/year, duration of smoking, craving time, presence of relapsing causes, and nicotine dependence score. However, there was no statically significant correlation ($P > 0.05$) found between the outcome and age of initiation, occupation, presence of comorbidities, marital status, and previous quitting attempts.

Conclusion Behavioral therapy (5As) is most effective in smoking cessation program. Nicotine replacement therapy and aversion therapy may be an adjuvant in the smoking cessation program. Aversion therapy is a simple procedure, economic, practical, easy to apply, and may be effective in smoking cessation.

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Introduction

Smoking affects human health seriously and in many cases may be deadly. There are ~4000 chemicals in cigarettes, and the majority of them are poisonous [1].

Cigarette smoke is damaging by several ways, one is oxidative stress that mutates DNA, stimulate atherosclerosis, and leads to lung injury. Oxidative stress is believed to be the agent of cancer development, cardiovascular disease, and chronic obstructive pulmonary disease [2].

Cessation of smoking programs is designed to help smokers identify and deal with issues that appear during quitting. Statistics have clarified that the best programs include either face to face or group counseling [3].

In the absence of contraindications, patients should be encouraged to use one or more of the pharmacological therapies in combination with behavioral approaches. The American Cancer Society concluded that about 25–33% of smokers using medication can maintain quitting for more than 24 weeks [1].

Many ways of aversion therapy have been applied to adjust a range of behavioral disorders, such as addictions. It is a form of psychological therapy in which the patient is exposed to a stimulus and being subjected to a form of inconvenience at the same time [2].

Addiction of tobacco is both physical and mental; the optimum way of quitting is a combination of medicine, emotional support, and behavioral change [4].

This study aimed to study the effectiveness of aversion therapy using onion-powdered cigarette as a method of quitting compared with nicotine replacement therapy (NRT) and conventional behavioral (5As) therapy in smoking cessation

Patients and methods

This is a prospective, randomized study that was proceeded on a sample of 60 smokers collected from

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Ain Shams University Hospitals (inpatient and outpatient clinics) who were divided into three groups during the period from July 2016 to March 2017. These groups were: group I: consisted of 20 participants who were recruited and subjected to the brief verbal intervention method for smoking cessation, according to the Agency for Health Care Policy and Research and The United States Public Health Service guideline, which developed a simple five-step algorithm called the five 'A's' for assessing tobacco use and addressing smoking cessation (ask, advice, assess, assist, arrange) [5]. Group II: 20 participants were recruited and subjected to brief verbal intervention method and NRT (nicotine gum) according to the number of cigarette smoked per day [5]. Weekly interviews were conducted for follow-up and giving nicotine gum according to the craving episodes. Group III: 20 participants were recruited and subjected to brief verbal intervention method and aversion therapy. Aversion therapy was conducted by providing the smoker with a single onion-powdered cigarette by mixing tobacco with dried onion powder by equal amount and refilling of cigarette again for each craving episode and avoiding 'usual' tobacco cigarettes. The smokers know the content of the cigarettes (not a blind study). Weekly interviews were conducted for follow-up and refill of the powdered cigarettes pack according to the frequency of the craving episodes, where the smoker was allowed to smoke up to three cigarettes per day and every week he received another pack of cigarette until one of the three outcomes was achieved. Our proposed outcomes were:

- (1) Complete success: when the smoker stops any cigarettes with gradual decrease in number of nicotine gum per day till zero. Or when the smoker stops any other cigarettes except that of the study or even that of the study after a period of time 3–6 months from the study and continue without smoking.
- (2) Partial success: when the smoker stops cigarettes for a period not less than 3 months and not able to stop nicotine gum and finally return to smoking or when the smoker stops any other cigarettes for a period of not less than 3 months and not able to stop cigarettes of the study and finally returns to smoking.
- (3) Failure: smokers considered failed stopping if not able to stop cigarettes from the start of the study or refuse to continue in the study at any time.

Inclusion criteria

Any adult smoker without obstructive airway diseases above 18 years old showed motivation to stop smoking and agreed to take part in the study.

Exclusion criteria

Any smoker who does not show motivation to stop smoking, any smoker with a neuropsychiatric disorder, smokers having allergy to onion powder.

All participants were subjected to full history taking (age, occupation, comorbidities with detailed smoking history including age of initiation, duration, pack/year, previous quit attempt, craving time, and severity of nicotine dependence by a six-item Fagerstrom tolerance questionnaire) [6], clinical examination, spirometry, and chest radiograph. Verbal consent was taken from the participants to participate in the study. The study was approved by the institutional ethics committee.

Statistical analysis

Data were collected and entered to the statistical package for the social sciences (IBM SPSS; SPSS Inc., Chicago, Illinois, USA) version 20. Qualitative data were shown as number and percentages while quantitative data were shown as mean, SD, and ranges. χ^2 -test and/or Fisher's exact test was used. One-way analysis of variance is used to compare between two independent groups with parametric distribution while Kruskal–Wallis test is used to compare between more than two independent groups with nonparametric data. The confidence interval was set to 95% and the limit of error agreeable was set to 5%. So, the *P* value was considered significant as the following: ($P > 0.05$: nonsignificant; $P < 0.05$: significant; $P < 0.01$: highly significant).

Results

All participants were men with age ranging from 21 to 70 years. There was insignificant statistical difference among the three studied groups as regards sociodemographic distribution, smoking history, presence of comorbidity, age of initiation, craving time, nicotine dependence score, previous quit attempts, and relapse causes ($P > 0.05$; Table 1). There were significant statistical differences between the three studied groups as regards the outcome (Table 2). The complete success rate of quitting was significantly higher among group I (30%), versus groups II and III (15 and 15) While partial success was higher in group II (55%) versus (45%) in group I and 20% in group III. And failed attempts were higher in group III (65%) versus group II and group I (30 and 25%, respectively; Table 3). There was significant

Table 1 Sociodemographic data among the studied groups

	Group I: verbal (N=20) [n (%)]	Group II: verbal+nicotine gum (N=20) [n (%)]	Group III: verbal+aversion (N=20) [n (%)]	χ^2/Fa	P value
Age (years)					
Mean±SD	40.25±12.89	36.20±11.88	39.85±11.84	0.668 ^a	0.517
Range	21–70	21–60	24–60		
Sex					
Male	20 (100.0)	20 (100.0)	20 (100.0)	NA	NA
Job					
Unemployed	2 (10.0)	1 (5.0)	2 (10.0)	0.737	0.947
Worker	8 (40.0)	7 (35.0)	8 (40.0)		
Employed	10 (50.0)	12 (60.0)	10 (50.0)		
Marital statue					
Single	4 (20.0)	9 (45.0)	6 (30.0)	14.167	0.028
Married	16 (80.0)	11 (55.0)	9 (45.0)		
Divorced	0 (0.0)	0 (0.0)	3 (15.0)		
Widow	0 (0.0)	0 (0.0)	2 (10.0)		
Duration (years)					
Median (IQR)	17.5 (10.5–27.5)	11.5 (6.5–22.5)	16 (12.5–25.0)	2.177	0.337
Range	5–40	5–30	5–30		
Pack/year					
Median (IQR)	20 (12.0–35.0)	13.5 (6.5–40.0)	22.5 (15.0–40.0)	2.060	0.357
Range	5–75	5–60	5–60		
Comorbidities					
No	16 (80.0)	18 (90.0)	12 (60.0)	5.217	0.074
Yes	4 (20.0)	2 (10.0)	8 (40.0)		
Age of initiation					
Mean±SD	21.35±4.27	21.25±4.70	21.50±7.63	0.010	0.990
Range	15–30	15–30	11–42		
Craving time					
Morning	6 (30)	10 (50.0)	8 (40)	9.925	0.127
Evening	0 (0)	2 (10.0)	4 (20)		
After meals	8 (40)	6 (30.0)	7 (35)		
After stress	6 (30)	2 (10.0)	1 (5)		
Nicotine dependence ^b					
Highly dependent	3 (15.0)	5 (25.0)	5 (25.0)	2.098	0.718
Low Dependence	7 (35.0)	7 (35.0)	4 (20.0)		
Moderate dependence	10 (50.0)	8 (40.0)	11 (55.0)		

^aOne-way analysis of variance test. ^bNicotine dependence score according to Heatherton *et al.* [6]. $P>0.05$, nonsignificant. $P<0.05$, significant. $P<0.01$, highly significant.

Table 2 Outcome among the studied groups

Outcomes	Group I: verbal [n (%)]	Group II: verbal+nicotine gum [n (%)]	Group III: verbal+aversion [n (%)]	χ^2	P value
Completed successfully	6 (30.0)	3 (15.0)	3 (15.0)	9.500	0.049
Partial success	9 (45.0)	11 (55.0)	4 (20.0)		
Failed	5 (25.0)	6 (30.0)	13 (65.0)		

statistical correlation ($P\leq 0.05$) found between the outcome and the age, pack per year, duration of smoking, craving time, presence of relapsing causes, and nicotine dependence score. However, there was no statically significant correlation ($P>0.05$) between the outcome and the age of initiation, occupation, presence of comorbidities, marital status, and previous quitting attempts (Table 3).

Discussion

Cessation of smoking is the operation of stopping inhalation of smoked substance. It the most valuable step that smokers can do to improve the quality of their lives [7].

By the time, a person becomes mentally and physically addicted to nicotine, both physical and mental factors must be modulated in the smoking cessation program.

Table 3 Study of the outcome of all patients and its relations to different parameters

	Completed successfully (N=12) [n (%)]	Partial success (N=24) [n (%)]	Failed (N=24) [n (%)]	$\chi^2/Fa/\chi^2$ ^{a,b}	P value
Age (years)					
Mean±SD	29.83±5.94	40.50±12.85	41.50±11.99	4.600 ^a	0.014
Range	21–42	21–70	21–62		
Sex					
Male	12 (100.0)	24 (100.0)	24 (100.0)	NA	NA
Job					
Unemployed	2 (16.7)	3 (12.5)	0 (0.0)	5.120	0.275
Worker	5 (41.7)	10 (41.7)	8 (33.3)		
Employed	5 (41.7)	11 (45.8)	16 (66.7)		
Marital statue					
Single	6 (50.0)	7 (29.2)	6 (25.0)	7.047	0.317
Married	6 (50.0)	16 (66.7)	14 (58.3)		
Divorced	0 (0.0)	0 (0.0)	3 (12.5)		
Widow	0 (0.0)	1 (4.2)	1 (4.2)		
Duration (years)					
Median (IQR)	11 (6–15)	20 (10.5–28.5)	20 (12.5–25)	7.618 ^{b,*}	0.022
Range	5–20	5–40	5–40		
Pack/year					
Median (IQR)	12 (6–20)	20 (10.5–40)	28 (16–40)	6.660 ^b	0.028
Range	5–40	5–60	5–75		
Comorbidity					
Yes					
HTN	0 (0.0)	1 (4.2)	1 (4.2)	5.229	0.515
DM	0 (0.0)	1 (4.2)	2 (8.3)		
Both	0 (0.0)	4 (16.7)	5 (20.8)		
Others	0 (0.0)	0 (0.0)	0 (0.0)		
No	12 (100.0)	18 (75.0)	16 (66.7)		
Age of initiation (years)					
Mean±SD	19.00±3.95	21.58±5.27	22.33±6.49	1.452 ^a	0.243
Range	12–27	15–31	11–42		
Previous quit attempt					
Median (IQR)	0 (0–2.50)	2 (0–2.50)	1 (0–1.5)	2.252 ^b	0.324
Range	0–3	0–5	0–4		
Craving time					
Morning	0 (0.0)	12 (50.0)	12 (50.0)	20.179	0.003
Evening	1 (8.3)	3 (12.5)	2 (8.3)		
After meals	5 (41.7)	9 (37.5)	7 (29.2)		
After stress	6 (50.0)	0 (0.0)	3 (12.5)		
Relapse causes					
Craving	0 (0.0)	5 (20.8)	8 (33.3)	63.865	0.000
Friends	0 (0.0)	13 (54.2)	7 (29.2)		
No	12 (100.0)	0 (0.0)	0 (0.0)		
Stress	0 (0.0)	6 (25.0)	9 (37.5)		
Nicotine dependence score ^c					
Highly dependent	0 (0.0)	5 (20.8)	8 (33.3)	28.720	0.000
Low dependent	11 (91.7)	5 (20.8)	2 (8.3)		
Moderate dependent	1 (8.3)	14 (58.3)	14 (58.3)		

DM, diabetes mellitus; HTN, hypertension; IQR, interquartile range. ^aOne-way analysis of variance test. ^bKruskall–Wills test. ^cNicotine dependence score according to Heatherton *et al.* [6].

Brief verbal called five ‘A’s was used in this study to help quitting smoking by helping the participant know the risk of cigarette smoking and motivating them to quit [6].

NRT was used in this study in group II. The NRT is a technique for providing nicotine by ways other than

tobacco. It is used in smoking cessation or stopping chewing tobacco. It increases the possibility of smoking cessation by about 50–70%. Often it is combined with other behavioral techniques. The types of NRT include the adhesive patch, chewing gum, lozenges, nose spray, and inhaler. Simultaneous

use of different types NRT proved to be more effective [8].

Aversion therapy is used in group III. Aversion therapy is a form of psychological therapy in which a substance causing discomfort feeling combined with an unwanted attitude so as to decrease or terminate that attitude [9].

In this study, there was a statistically significant correlation between age of the smokers and success rate of cessation. GATS: Global Adult Tobacco Survey [10] and Messer *et al.* [11] suggested that young adults quit smoking successfully more than older adults. But Nelson *et al.* [12] and Saeed *et al.* [13] found that smoking cessation was independent of age of the smoker. This difference may be due to the different sample size.

In this study, there was a statistically insignificant link between the age of initiation and success rate of cessation. This was consistent with Saeed *et al.* [13] who found there was no significant correlation between the outcome and age of initiation of smoking. On the other hand, Hymowitz *et al.* [14], Breslau and Peterson [15], Khuder *et al.* [16] and in addition, Lando *et al.* [17] reported that the age of initiation of smoking appears to be significant in correlation with smoking cessation. This difference could be explained by the different sample sizes used with different age groups and may be due to genetic difference.

In the present study, although employee smokers had the highest success rate which might be explained by the fact that employees are better educated and could be more aware of the hazards of smoking which could be a good motive to quit, but there was no statistically significant linkage between success rate and the occupation of smokers among the groups. This was consistent with the study commissioned by the National Institute for Health and Clinical Excellence and undertaken by the UK Centre for Tobacco Control Studies [18].

In the current study, there was no statistically significant correlation between success rate and marital status of smokers in different groups. This was in agreement with Saeed *et al.* [13] and the study carried out by Liubov *et al.* [19]. But was inconsistent with Reitzel *et al.* [20] who suggested that social cohesion may facilitate smoking cessation.

As regards comorbidities, there were insignificant statistically significant correlation between presence of comorbidities and success rate. This was matching

with Saeed *et al.* [13]. On the other hand, Reitzel *et al.* [20] concluded that the more the frequency of comorbid diseases in smokers the more difficult to stop smoking. This could be explained by different sample sizes and percentage of presence of comorbidity.

In this study, there was significant statistical relation between the outcome and nicotine dependence. This means smokers with higher nicotine dependence have a less chance to make a quit attempt and have more chance to relapse. This coincided with Saeed *et al.* [13] and with Xiaolei *et al.* [21].

In this study, there was insignificant correlation between the outcome and the detailed history of previous attempts to quit smoking. This was consistent with Saeed *et al.* [13].

As regards the craving time in this study, there was a statistically significant correlation between the craving time and success rate. This was in contrast to Saeed *et al.* [13] who showed no significant correlation between outcome and craving time. The difference may be due to the different sample sizes, different occupations, and social status which may cause different levels of stress.

As regards relapse causes, in this study there was a highly significant difference between outcome and presence of relapse causes. This coincided with the Hughes *et al.* [22] study.

As regards success rate, complete successful result was recorded in 30, 15, 15% of groups I, II, and III, respectively. On the other hand, the partial success was recorded in 45, 55, and 20% of groups I, II, and III, respectively. Lastly failed attempts were recorded in 25, 30, and 65% of groups I, II, and III, respectively. There was a significant statistical difference between the three studied groups as regards the outcome; the success rate was significantly higher among group I who was subjected to 5As only, followed by an equal success rate of group II and group III. This was in agreement with Margaret Miller *et al.* [23] who concluded that a higher success rate was among participants who had psychological therapy alone.

This trial included smokers without obstructive airway diseases; hence, the study population has the potential to be homogeneous, which increases the reliability. Further strengths of the trial are the randomized design. A potential limitation of the trial was its small size sample, lack of blinding of participants and staff, thus increasing the risk of performance bias. Furthermore, there was self-reported smoking

cessation without biochemical validation. Furthermore, it may be expected that some participants especially in the second and the third group will be motivated to stop smoking merely due to their participation in the trial; this may potentially limit any incremental effects of the smoking cessation intervention. Lastly a dose–response to aversion stimulation has not been clearly demonstrated.

Conclusion

Behavioral therapy (5As) is most effective in smoking cessation program. NRT and aversion therapy may be an adjuvant in smoking cessation program. Aversion therapy is a simple procedure, economic, practical, easy to apply, and may be effective in smoking cessation.

Conflicts of interest

There are no conflicts of interest.

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