

The Effectiveness of the Smoking Cessation Programme for Smoker Prisoners Living with HIV/AIDS

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Abstract This study aims to determine the effectiveness of the SCP (MI+NRT) for smoker prisoners living with HIV. The study design was semi-experimental with pre-test, post-test, follow-up, and a control group. As many as 34 smoker prisoners living with HIV were selected by convenience sampling and randomly assigned to an experimental group and a control group. The experimental group received the SCP, while the control group received no treatment. The research measurement instruments comprised FTND and BMS. MANCOVA models were employed to test the hypothesis. The results showed that the indicators of 'quit smoking' reduced among prisoners in the experimental group.

Keywords Smoking Cessation Programme, MI+NRT, Smoker, Prisoners Living with HIV/AIDS

1. Introduction

Cigarette smoking is a public health problem around the globe. In 2015, more than 1.1 billion people were found to be smokers. Among smokers, the share of men has been found to be higher than that of women [1]. According to a meta-analysis, one-fifth of Iranian men and 2/3% of women have daily smoking habits [2].

The prevalence of cigarette smoking is higher in HIV-positive patients compared to the general population, with many studies reporting the smoking rate among them to be over 40% [3, 4]. In addition, it has been found that about 50%–70% of HIV-positive is smokers [5, 6]. Besides, the prevalence of smoking is much higher in prisoners than in the general population [7, 8], because many prisoners are affected by conditions that are conducive to smoking (substance abuse, psychiatric disorders, poor socio-economic background) [7, 9].

Smoking cigarettes is a well-known risk factor of cardiovascular disease (CVD), heart attacks, chronic

obstructive pulmonary disease (COPD), and pulmonary or larynx cancer. Some diseases like respiratory problems are more common in HIV-positive patients with smoking history than non-smoking individuals [10]. Smoking is also associated with substantial morbidity among HIV-positive patients. Indeed, smoking and HIV infection are independent risk factors for many co-morbid illnesses including bacterial pneumonia [11], chronic obstructive pulmonary disease [12], lung cancer [13], and coronary artery disease [14]. Furthermore, HIV-positive patients with smoking history have an increased risk of oral candidacies and pneumocystis pneumonia [15]. In addition, cigarette smoking is significantly related to growth mortality in HIV-positive patients [4].

Various methods are used to stop smoking. Nicotine Replacement Therapy (NRT), one such method, has been designed to decrease the motivation to smoke. In addition, this therapy plays an important role in reducing psychological and psychomotor withdrawal symptoms [16]. The most common kind is chewing gums. The nicotine in chewing gums increases the level of certain types of chemicals like dopamine. Unlike the nicotine in cigarettes, it does not increase the level of other types of chemicals like epinephrine. The nicotine released by this chewing gum keeps the level of those chemicals in the brain at a certain level so that withdrawal symptoms are reduced. Therefore, this can replace the amount of nicotine a person gets from smoking cigarettes [17]. Miller (1987) describes Motivational Interviewing (MI) as a technique that is initially used for treating alcoholism and it is beneficial for advancing modification in addictive behaviour and other healthy lifestyle behaviours like smoking [18].

Many studies have shown the effectiveness of Nicotine Replacement Therapy [19, 20, 21, 22, 23] and Motivational Interviewing [24, 25, 26, 27] in terms of smoking cessation. Other studies have shown the effectiveness of the Smoking Cessation Programme for people living with HIV [28, 29, 30].

On the one hand, Cigarette smoking is a common behaviour among prisoners and is part of the prison culture [31, 32]. On the other hand, cigarette smoking is a risk factor for AIDS [33]. For these reasons, we decided to conduct our study based on a clinical trial to gauge the effectiveness of the Smoking Cessation Programme (combination of Motivational Interviewing and Nicotine Replacement Therapy) for prisoners living with HIV.

2. Materials and Methods

2.1. Research Design and Participants

The research design was semi-experimental with pre-test, post-test, follow-up, and a control group. A convenience sampling method was used in this study. Among 45 prisoners living with HIV in Mashhad Central Prison, 40 (88%) are cigarette smokers. As many as 36 inmates applied for voluntary service at this clinic over a period of six months.

These people completed basic evaluation relating to demographic information and history of smoking. In order to measure the nicotine dependency of the prisoners, we used Fagerström's test. Also, Bedfont Micro-Smokerlyzer (Bedfont Scientific Ltd, UK) were used to measure the concentration of CO in expired air. To qualify for the intervention, the participants had to meet some inclusion criteria including: 1. Imprisonment for more of nine months; 2. smoking more than five cigarettes daily; 3. positive Western blot tests; 4. the lack of psychotherapy; 5. the absence of psychosis; 6. the lack of substance abuse. Finally, 34 of them were eligible to receive the intervention. The participants were randomly divided into two groups (17 people in per group): the experimental group that received the Smoking Cessation Programme (combination of Motivational Interviewing and Nicotine Replacement Therapy) and the control group that received no treatment.

The demographic information of the participants, such as marital status, education, age, detention, and duration of imprisonment, has been presented in Table 1.

Table 1. Demographic information of participants

Characteristics	Experimental group	Control group	Total
Marital status			
single	7 (41.2)	6 (35.3)	13 (38.2)
married	6 (35.3)	8 (47.1)	14 (41.2)
divorced	4 (23.5)	3 (17.6)	7 (20.6)
widowed	0 (0.0)	0 (0.0)	0 (0.0)
education			
Illiterate	2 (11.8)	3 (17.6)	5 (14.7)
Primary school	4 (23.5)	7 (41.2)	11 (32.4)
Junior high school	10 (58.8)	7 (41.2)	17 (50)
Senior high school	1 (5.9)	0 (0.0)	1 (2.9)
University	0 (0.0)	0 (0.0)	0 (0.0)
Age(mean±SD)	33.70±4.66	32.88±4.40	33.29±4.48
Detention			
First-time offender	2 (11.8)	4 (23.5)	6 (17.6)
Repeat offender	15 (88.2)	13 (76.5)	28 (82.4)
Duration of imprisonment (yrs)	2.18±1.10	2.08±1.17	2.13±1.27
History of drug abuse			
Non drug abuser	14 (82.4)	15 (88.2)	29 (85.3)
Drug abuser	3 (17.6)	2 (11.8)	5 (14.7)
Duration of HIV/AIDS	4.85±1.80	3.28±1.86	4.07±1.97
Age of first cigarettes	15.47±2.09	15.23±2.46	15.35±2.25
Duration of smoking	18.05±4.14	17.64±3.40	17.85±3.74
Times of quitting	2.35±1.65	1.88±0.69	2.11±1.27

2.2. Measures

Fagerström's Test for Nicotine Dependence (FTND)

This test was designed to assess the severity of physical addiction to nicotine. Fagerström's test prepares a descriptive measure of the nicotine dependence of cigarette smoking. It encompasses six items that assess the amount of cigarette use, the compulsion to use cigarettes, and the dependence on cigarettes. In terms of grading, 'Yes' or 'No' items are scored from 0 to 1 and multiple-choice items are scored from 0 to 3. Finally, this questionnaire gives a score of 0 to 10. A score of 0 to 3 indicates the lowest dependency; a score of 4 to 6 shows a moderate dependency; and a severe grade of dependency is marked by a score of 7 or more. It should be noted that Karl-Olov Fagerstorm first designed the Fagerstorm tolerance questionnaire. Then, Todd Heatherton reclaimed this instrument to Fagerström's test for nicotine dependence [34, 35]. One study—Psychometric properties of Fagerström's test for nicotine dependence—showed that the FTND is reliable to assess smokers in various populations. In addition, the internal consistency of the FTND was better than that of the FTQ. Generally, this meta-analysis reported high reliability and the validity of this test [36].

Bedfont Micro-Smokerlyzer (Bedfont Scientific Ltd., UK)

This instrument has been designed to measure carbon monoxide (CO) in the breath of smokers; it also determines the level of CO in blood. Bedfont Micro-Smokerlyzer is used to monitor smoking cessation. In this study, we used this instrument to biochemically establish a person's smoking status. In addition, it is a motivational aid to encourage smokers to measure their progress in terms of smoking cessation. The spectrum grading of this instrument includes non-smokers (0–6), borderline smokers (7–9), low-addicted smokers (10–15), moderately addicted smokers (16–25), heavily addicted smokers (26–35), and very heavy addicted smokers (+36) [37]. It should be noted that each prisoner receiving a score of more than 10 was considered as a smoker in this study.

2.3. Procedure

Mashhad Central Prison is one of the most crowded prisons in Iran. This prison located in Mashhad, capital of Razavi Khorasan. This province is in northeast of Iran. Mashhad Central Prison and accepts the province's native prisoners and prisoners held there have different crimes. This study was accomplished in the 'Smoking Cessation Clinic of Mashhad Central Prison. This clinic provides clinical, psychological, and social support to smokers in this prison. All participants—both in the experimental group and the control group—signed the informed consent form. They were assessed by the FTND, the Bedfont Micro-Smokerlyzer,

and cigarettes smoked per day (according to personal statement) in the pre-test phase. Those in the experimental group received the Smoking Cessation Programme (combination of Motivational Interviewing and Nicotine Replacement Therapy), while those in the control group received no treatment by the end of therapy. In the post-test phase, both groups were tested by the FTND, the Bedfont Micro-Smokerlyzer, and cigarettes smoked per day to measure the level of nicotine dependency and breath carbon monoxide. Six months later, all the participants were assessed by previous instruments as a follow-up stage. Therefore, the time frame of this study is as follows: after the pre-test, Smoking Cessation Programme lasted for three months. At the end of therapy, the post-test was conducted. Finally, follow-up stage applied six month later of post-test stage.

It should be noted after the end of the study process, the control group received the Smoking Cessation Programme. The therapy session was conducted by counsellors who provided more training hours on smoking counselling and the related psychology. All those counsellors who demonstrated good proficiency during the training course entered the study, while the rest received additional supervision and remediation until their scores increased.

This clinical trial was confirmed by the ethics committee of the Educational and Research Centre, District VI of State Prisons, Mashhad, Iran.

2.4. Intervention

In this study, the Smoking Cessation Programme comprised a combination of Motivational Interviewing and Nicotine Replacement Therapy as an intervention. Nicotine Replacement Therapy depends on the level of smoking at any time. For every cigarette per day, smoker prisoners living with HIV used one 2-mg piece of gum. They were suggested to use Nicotine Replacement Therapy for three months. Also, the participants were also involved in Motivational Interviewing (MI). Our study procedure for Motivational Interviewing training was in accordance with the book Group Treatment for Substance Abuse [38]. As many as eight group sessions of Motivational Interviewing were held for 30 minutes every week in the first month and fortnightly in second and third months. A summary of the MI sessions used in this study is presented in Table 2.

2.5. Data Analysis

The data obtained from the FTND and the BMS was analysed by SPSS 21. At first, descriptive statistics were used to show information such as demographic characteristics. For data inference, the covariance analysis (MANCOVA) was used to test the assumption and control the effect of the pre-test.

Table 2. Summary of Motivational Interviewing Group Therapy Sessions

Session 1	Familiarity: Referral, norms and processes of groups, introduction of motivational approach, introduction of change processes, and training and staging
Session 2	Describes a typical day in the life: Daily description of drug use and awareness of its amount and physiological effects of smoking
Session 3	Expectations: To discuss expectations of smokers from cigarettes
Session 4	Confidence and temptation: Identifying triggers, identification of reliable positions, and comparison of the temptation and confidence
Session 5	Rewarding success: Identifying the current success and creating for self-rewarding
Session 6	Effective refusal: Recognition of the current consumer, practice to refuse the offer of having cigarettes, and run the role-playing technique
Session 7	Temptation and impulse control: Discussing the temptation and impulse control method, new ways to enjoy life, and creation of alternative activities
Session 8	Renewed commitment after lapses: Identifying the past useful methods for smoking cessation and discussing the tasks that should be done after lapses.

Table 3. Indicators of quit smoking scores in the experimental group and the control group

groups	variables	stages	N	mean	Std deviation
experimental	Cigarettes smoked per day	Pre-test	17	18/29	9/76
		Post-test	17	6/35	5/53
		Follow-up	17	6/05	5/10
	CO-expiratory	Pre-test	17	27/05	7/30
		Post-test	17	11.76	6/41
		Follow-up	17	11.29	5/49
	Fagerstrom's test	Pre-test	17	6/05	0/96
		Post-test	17	2/35	1/93
		Follow-up	17	2/41	2/06
control	Cigarettes smoked per day	Pre-test	17	18/70	7/50
		Post-test	17	16/64	6/42
		Follow-up	17	15/23	5/79
	CO-expiratory	Pre-test	17	24/70	6/34
		Post-test	17	22/41	5/01
		Follow-up	17	20/64	4/38
	Fagerstrom's test	Pre-test	17	5/58	1/37
		Post-test	17	5/17	1/18
		Follow-up	17	5/11	1/11

Table 4. The results of multivariate test for indicators of quit smoking

variables	value	Hypothesis df	Error df	F	sig	Partial Eta Squared
Cigarettes smoked per day	0/31	2	30	32/14	0/001	0/68
CO-expiratory	0/38	2	30	24/31	0/001	0/61
Fagerstrom's test	0/31	2	30	32/29	0/001	0/68

3. Results

The mean and standard deviation of pre-test and post-test scores of cigarettes smoked per day, CO in expired air, and Fagerstrom’s test in the both groups are presented in Table 3. As can be seen from this table, the mean of variables in the experimental group in post-test and follow-up phases has decreased.

Before presenting the results of multivariate analysis of covariance to compare the experimental and control groups in terms of cigarettes smoked per day, CO-oximetry in expired air, and Fagerström’s test, it should be noted that the results of the Kolmogorov-Smirnov tests were not significant ($p>0.05$). The lack of significance of the Kolmogorov-Smirnov tests indicates that the data is normal. The results of Box’s tests were not significant (post-tests of cigarettes smoked per day $F=0.11$, $P=0.95$; CO-oximetry $F=0.43$, $P=0.72$; Fagerström’s test $F=2.03$, $P=0.10$) either. Therefore, the homogeneity of the variance-covariance matrix assumption was supported. For these reasons, the use of multivariate analysis was permitted. Also, since the homogeneity of the variance-covariance matrix assumption was supported to investigate the significance of multivariate effects, Wilks’s Lambda tests were used for all variables (see Table 4). These tests for all variables showed that the Smoking Cessation Programme has a significant multi-variable impact on the linear combination of the post-test and follow-up phases.

To compare the means of cigarettes smoked per day, CO-oximetry, and Fagerström’s test in both groups in each of the assessment process (post-test and follow-up) separately, the tests of between-subjects effects were used. This test for all variables showed that there is a significant difference between the participants in both experimental and control groups in post-test scores of cigarettes smoked per day, CO-oximetry, and Fagerström’s test (post-tests of cigarettes smoked per day $F=66/42$, $P=0/001$; CO-oximetry $F=63/75$, $P=0/001$; Fagerström’s test $F=48/11$ $P=0/001$). The tests of between-subjects effects showed there is a significant difference between the participants in both experimental and control groups in follow-up scores of all variables (follow-ups of cigarettes smoked per day $F=50/53$, $P=0/001$; CO-oximetry $F=63/57$, $P=0/001$; Fagerström’s test $F=33/43$ $P=0/001$). Therefore, the results demonstrated the effectiveness of the Smoking Cessation Programme in the

experimental group compared to the control group, as can be seen from Table 3, in terms of cigarettes smoked per day, CO-oximetry and Fagerström’s test. The experimental group showed a significant decrease compared to the control group (see table 5).

4. Discussion

In this study, we were looking for the effectiveness of the Smoking Cessation Programme for prisoners living with HIV/AIDS. Data analysis showed that the Smoking Cessation Programme reduced the smoking rates in prisoners living with HIV/AIDS in the experimental group compared to those in the control group. The findings of our study demonstrated that the Smoking Cessation Programme among smoker prisoners living with HIV/AIDS is a useful treatment, as demonstrated by the high-effect size in the post-test phase (cigarettes smoked per day 0/68; CO-expiratory 0/67; and Fagerstrim’s test 0/60) and the follow-up phase (cigarettes smoked per day 0/62; CO-expiratory 0/67; and Fagerström’s test 0/51).

Elzi et al. [28] in their studies have implemented the Smoking Cessation Program on HIV-infected individuals. Their programme comprising individual counselling was based on a cognitive behavioural approach. They focused on stress-coping strategies and the management of nicotine withdrawal symptoms. Also, they have a variety of sub-situations (trans-dermal patch, tablets, inhalers, chewing gums, and sprays) regarding the Nicotine Replacement Therapy. Although their intervention was a little different from our intervention, they showed that the Smoking Cessation Program is a valuable instrument to support HIV-infected individuals to quit smoking. In addition, Ingersoll, Cropsey, and Heckman [29] have used Motivational Interviewing plus the nicotine patch condition (MI + Patch) on HIV-positive smokers. Their results demonstrated that motivational plus nicotine replacement intervention has beneficial effects on HIV-positive smokers. Also, the results of the study of Chew et al [30] are consistent with the results of this study. On the other hand, Jalali et al. [27] compare Motivational Interviewing singly and its combination with the Nicotine Replacement Therapy on quit smoking in prisons; they reported that MI+NRT is more effective than MI alone.

Table 5. The results of test of between-subject effect for comparison groups in indicators of quit smoking

variables	source	Sum of Squares	df	Mean Square	F	P	Partial Eta Squared
Cigarettes smoked per day	Post-test	860/66	1	860/66	66/42	0/001	0/68
	Follow-up	685/55	1	685/5	50/53	0/001	0/62
CO-expiratory	Post-test	1184/14	1	1184/14	63/76	0/001	0/67
	Follow-up	906/76	1	906/76	63/57	0/001	0/67
Fagerstrom’s test	Post-test	83/64	1	83/64	48/11	0/001	0/60
	Follow-up	74/07	1	74/07	33/43	0/001	0/51

The success of the Smoking Cessation Programme in this study and its survival during the follow-up period can be explained in several ways. First, as mentioned in the introduction, many studies indicate the application of Motivational Interviewing I on smokers in preservation and enhancement therapy effectiveness. Generally, an ambivalence between change and avoid among smokers as a coping strategy is a common problem in therapy process. Hence, the application of Motivational Interviewing I as part of treatment in this study helped the therapy for smoker prisoners living with HIV. On the other hand, the creation of therapeutic alliance, empathy, and continued support were important factors in creating motivation to bring in change in this group. In this study, we have tried to change some common lines of thought, such as 'smoking does not mean you are a weak and bad person', and instead tried to portray that smoking refers to lifestyle problems. Also, we have allowed them to express their emotions, concerns, and problems in the context of groups as much as possible. In addition, MI strategies have been used to create motivation for behavioural changes. In fact, Motivational Interviewing recognizes potential problems and fixes a feeling of indecision, thus helping smoker prisoners living with HIV/AIDS. On the other hand, Motivational Interviewing tried to change the patient attitude without dealing with benefits and losses of continue consumption. Generally, it is one of the important tasks of healthcare staff to create the motivation for behavioural changes healthcare staff. Accordingly, Motivational Interviewing is a good way to accelerate changes [39].

Second, to quit cigarettes and other tobacco products has dual patterns of physical and psychological dependence [40]. For this reason, we used the Nicotine Replacement Therapy as a complementary and easy method in the therapy process along with the support in the form of Motivational Interviewing. During the treatment process, nicotine chewing gums eliminated withdrawal symptoms in smoker prisoners living with HIV/AIDS. These chewing gums allow patients to control their emotions by overcoming the drug dependence on nicotine. All these advantages made patients more relaxed and motivated them to participate in group therapy sessions.

Third, people living with HIV/AIDS suffer from mental disorders and a lot of pressure [41, 42]. The specific condition of people living with HIV/AIDS, especially in prisons, in addition to the initial negative experience and failure to satisfy the basic needs and smoking, creates a difficult situation for them. Group therapy provides a context that allows members to work with motivational problems. Moreover, the friendly environment of a group allows them benefit from its supportive role [43]. Patients in group therapy become therapists to each other where they can talk about past experiences about the failure to quit smoking and new learning.

Fourth, all the participants in this study voluntarily participated in the therapy process. This indicator signals that

smoker prisoners living with HIV are highly motivated to quit smoking.

People living with HIV/AIDS can live a healthy and long life. This is very important especially considering the issues that affect their health. Cessation of smoking is one of the ways that might help their health—in fact, this can affect people living with HIV/AIDS in a variety of ways such as more CD4 cell counts and decreased risk for respiratory infections—and smoking is likely to be an increasingly important contributor to morbidity and mortality in HIV-infected populations [43]. Also, cessation of smoking may increase the effectiveness of HIV treatment, response to the antiretroviral treatment, immune functioning, cognitive functioning, and decreased cardiovascular diseases for people living with HIV/AIDS [44].

Finally, it is necessary to note the several limitations of this study. By using the convenience sampling method, several prisoners in both experimental and control groups were on the brink of liberation, and, for this reason, a longer follow-up period was not considered. The presence of participants in group therapy sessions was associated with some limitations such as the coordination to leave the prison wards and the failure to comply with group therapy sessions with proper appointment and inspection.

5. Conclusions

Finally, the results of our study demonstrate that the combination of Motivational Interviewing and the Nicotine Replacement Therapy as the Smoking Cessation Programme is a useful intervention for supporting smoker prisoners living with HIV/AIDS to quit smoking. In fact, integrated drug treatment, psychological intervention, and group benefits were the important factors in the success of this clinical trial. Owing to the difficult condition experienced by prisoners living with HIV/AIDS, the use of this programme in prisons can help to improve their psychological conditions and disease processes.

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