

## ORIGINAL ARTICLE

# Characteristics, outcome and factors associated with success of quitting smoking in 77 people living with HIV/AIDS who received smoking cessation therapy in Japan

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## Abstract

**Aim:** Smokers with HIV/AIDS have lower success of quitting smoking than smokers with other chronic diseases. However, there have been no studies investigating characteristics and outcomes of success of quitting smoking among people living with HIV compared to HIV-negative people who received smoking cessation therapy. In addition, there have been no studies that investigated factors associated with success of quitting smoking among people living with HIV in Japan. The aim of this study was to elucidate characteristics, outcomes and factors associated with the success of quitting smoking in people living with HIV.

**Methods:** We previously conducted a prospective cohort study on patients who received Japanese smoking cessation therapy (SCT), which consists of smoking cessation intervention five times with nurses' counseling over a 12-week period. Among them, we compared 77 HIV-positive male individuals and 323 HIV-negative male individuals with complications.

**Results:** Smokers with HIV had a larger number of cigarettes smoked per day, and higher scores of nicotine dependence and depression compared with the HIV-negative group. The HIV-positive group had a significantly lower success rate of quitting smoking than the HIV-negative group (35.1 vs. 47.7%,  $p = .046$ ). The subjects living with HIV who had higher self-efficacy showed a significantly higher quit rate compared with those who had lower self-efficacy (odds ratio 9.99,  $p < .01$ ).

**Conclusion:** Smokers with HIV had characteristics that made it difficult for them to quit smoking. Increasing their self-efficacy of quitting smoking through nurses' counseling will lead to success of quitting smoking in HIV-positive smokers receiving the SCT.

## KEYWORDS

characteristics, nursing, people living with HIV/AIDS, smoking cessation

## 1 | INTRODUCTION

It is well known that the prognosis of people living with human immunodeficiency virus (HIV) infection/acquired immunodeficiency syndrome (AIDS) has significantly

improved since the development of antiretroviral therapy (ART). The proportion of deaths due to AIDS-defining conditions among people living with HIV has decreased, whereas the proportion of deaths due to other chronic diseases such as cancer, liver disease, pulmonary diseases, and

cardiovascular disease, has increased (Bonnet et al., 2004; Jain et al., 2003; Louie, Hsu, Osmond, Katz, & Schwarcz, 2002). Cigarette smoking is associated with impaired immune functioning, increased cardiovascular risk and increased cancer risk (Fabbiani et al., 2013; Kirk & Merlo, 2011). These complications are observed more frequently among HIV-infected smokers than among non-HIV-infected smokers (Tirelli et al., 2000). In addition, cigarette smoking attenuates the response to ART (Feldman et al., 2006). Therefore, people living with HIV/AIDS who smoke have a shorter disease-free time than HIV-infected non-smokers (Shuter, Bernstein, & Moadel, 2012).

Despite the elevated risk to their health, cigarette smoking is a highly prevalent behavior among people living with HIV/AIDS. Previous studies indicated that the prevalence of current smoking among the HIV-positive population is between 40 and 60% (Burkhalter, Springer, Chhabra, Ostroff, & Rapkin, 2005; Gritz, Vidrine, Lazev, Amick 3rd, & Arduino, 2004; Patel et al., 2006). HIV-positive smokers had higher risks of depression (Duval et al., 2008) and illicit substance use (Burkhalter et al., 2005) than HIV-negative smokers, which might be causes of the low readiness to quit and low quit rate in this population. However, few reports have studied why HIV-positive smokers have a lower success rate of quitting smoking than other populations with complications (Pacek & Cioe, 2015).

In Japan, the number of people living with HIV was over 27,000 in 2018 (NIID, 2018). Most patients with HIV/AIDS in Japan receive treatment for HIV/AIDS at one of 381 “HIV-designated hospitals” in Japan. Smokers with HIV/AIDS lose more life years to smoking than they do to HIV itself in Japan (Ruzicka, Imai, Takahashi, & Naito, 2018). Therefore, it is important for nurses who work in the HIV clinic to give advice to HIV-positive smokers about quitting smoking or to refer such patients to a smoking cessation clinic.

Understanding the characteristics of smokers is important to provide tailor-made smoking cessation counseling. Some previous studies reported the characteristics and outcome of success of quitting smoking in people living with HIV/AIDS (Humfleet, Hall, Delucchi, & Dilley, 2013; Ingersoll, Cropsey, & Heckman, 2009). Shuter et al. conducted a cross-sectional interview study of 60 smokers living with HIV/AIDS (Shuter et al., 2012). They examined the level of nicotine dependence, self-efficacy to quit smoking, and social support of smokers living with HIV/AIDS. They compared their results with the results of previous studies on smokers in the general population and suggested that nicotine dependence in HIV-positive smokers was not different from that in the general population. Illicit drug use and depression were common among HIV-positive smokers. The study by Shuter et al. (2012) was a cross-sectional study and

the authors compared their results with the results of a general population survey in a previous study. Fuster et al. conducted smoking cessation intervention for people living with HIV who were motivated to stop smoking with nurses' counseling and pharmacotherapy (Fuster et al., 2009). They reported that 39% of the participants stopped smoking 3 months after the treatment (Fuster et al., 2009). However, the study by Fuster et al. (2009) did not compare HIV-positive smokers with HIV-negative smokers. Also, there have been no studies that investigated characteristics and the outcome of success of quitting smoking between HIV-infected individuals and HIV-negative individuals who received the same smoking cessation intervention. On the other hand, some previous studies investigated factors associated with success of quitting smoking among people living with HIV/AIDS (Lloyd-Richardson et al., 2009). Moadel et al. suggested that Latino ethnicity, lower scores on a loneliness scale, and attending seven or more sessions were associated with success of quitting smoking in HIV-infected patients (Moadel et al., 2012). In addition, being employed and having lower scores on a mood disturbance test were associated with success of quitting smoking in a recent clinical trial (Humfleet et al., 2013). However, there have been no studies that investigated factors associated with success of quitting smoking in smokers living with HIV/AIDS in Japan. Assessment of factors associated with the success of quitting smoking can be helpful for nurses to provide appropriate nursing intervention for smoking cessation for smokers with HIV. Thus, we obtained information on HIV-positive and HIV-negative persons who received Japanese smoking cessation therapy (SCT) covered by the Japanese health insurance system. The aim of this study was to elucidate characteristics, outcomes and factors associated with the success of quitting smoking in people living with HIV who received Japanese SCT.

## 2 | METHODS

### 2.1 | Study subjects

We conducted a prospective cohort study to monitor the effect of SCT covered by the Japanese medical insurance system. The subjects of the present study were included in our previous larger study in which study subjects had been recruited from five Japanese hospitals between October 2008 and October 2014 (Taniguchi et al., 2017). In the present study, written informed consent was obtained from 842 persons, including 80 HIV-infected persons, who visited the smoking cessation clinic at one of the HIV-designated hospitals in Japan between October 2008 and October 2014. Among the 842 persons, 268 female and 94 male, had a present psychiatric disorder. Patients with psychiatric disorders

have low motivation to quit smoking compared with patients who have other physical disorders (Addington, el-Guebaly, Addington, & Hodgins, 1997). In addition, withdrawal symptoms and depression symptoms, which are side effects of smoking cessation, are likely to occur in patients with psychiatric disorders (Das & Prochaska, 2017; Green, Turner, & Sareen, 2017), and it takes a longer time for the intervention to result in smoking cessation than in patients with other physical disorders. Therefore, we excluded patients with psychiatric disorders from the present study.

The subjects in the present study were treated at one HIV-designated hospital. This HIV-designated hospital is in the central area of Honshu Island. The nurses of the HIV clinic have routinely advised all smokers with HIV to stop smoking. The nurses have referred patients who had high motivation to stop smoking to the smoking cessation clinic if they wanted to receive the SCT. In the study by Taniguchi et al. (2017), 80 smokers living with HIV were referred to the smoking cessation clinic and gave written informed consent to receive the SCT, as mentioned above. Among these 80 smokers, there were three female patients. All three female patients were foreigners, and the proportion of female patients in the HIV-positive group (3/80, 3.75%) was significantly different from the proportion of female patients in the group of HIV-negative smokers with a complication (130/443, 29%). In consideration of the influence on the results, this study enrolled only male subjects. The remaining 77 HIV-infected male persons were enrolled in the present study. From the subjects in the study by Authors' et al. (2017), we selected as the HIV-negative control group male individuals who had a present chronic illness such as diabetes mellitus, hypertension, cancer and so on ( $n = 323$ ) as they seemed to have high motivation to stop smoking compared with HIV-negative male smokers who had no chronic illness ( $n = 80$ ).

## 2.2 | Sample size, power, and precision

No studies have compared the rate of smoking cessation between HIV-positive and HIV-negative groups in a 12-week SCT. A previous study indicated that the rate of quitting smoking among HIV-positive smokers who received smoking cessation treatment during 12 weeks was 42% (Cui et al., 2010), but did not compare this smoking cessation rate with the rate among HIV-negative smokers. On the other hand, the Central Social Insurance Medical Council in Japan reported that the success of quitting smoking among smokers who received SCT with the Japanese health insurance system was 76.9%. From these data, the estimated sample size was 48 in each group ( $\alpha = .05$ , power = .90, two-sided analysis). Considering the dropouts, 80 HIV-positive smokers were recruited. Regarding the

control group, we targeted 320 subjects (four times the number in the target group).

## 2.3 | Japanese SCT

The SCT covered by the Japanese medical insurance system consists of a total of five sessions: the first visit and 2, 4, 8, and 12 weeks thereafter. Individuals who were preparing to stop smoking could receive the SCT covered by the health insurance system if they were assessed as having nicotine dependence, which was defined as a Tobacco Dependence Screener score (Kawakami, Takatsuka, Inaba, & Shimizu, 1999) of  $\geq 5$ , and Brinkman Index of  $\geq 200$ . At each SCT session, the patient received specific advice concerning the continuation of cessation by trained nurses for about 15–30 min after brief advice from the physician. The carbon monoxide (CO) level in expired air was routinely measured at each session using a Micro CO Monitor (Micro Medical, Hoechberg, Germany) to check whether they are continuing cessation as well as to provide encouragement of self-efficacy to sustain smoking abstinence. Patients were treated with either varenicline (standard use: 12 weeks) or nicotine patches (standard use: 8 weeks).

## 2.4 | Definitions of success of quitting smoking

Success in quitting smoking at the last session of SCT was defined as the condition that subjects replied that they quit smoking for at least the previous 2 weeks, which was verified by the CO concentration in expired air ( $\leq 7$  ppm). Those who dropped out of the SCT from the second to the fifth session were treated as not having succeeded in quitting smoking. The research was approved by the authors' university ethics review board (number: 14-140).

## 2.5 | Data items

### 2.5.1 | Demographic data

We collected demographic information including age, sex, cohabitation, presence of a comorbidity, reason for wanting to quit smoking, and nicotine dependence with the Fagerström Test for Nicotine Dependence (FTND) as well as smoking history and the Brinkman Index, which is calculated as the number of cigarettes smoked per day multiplied by smoking years (Brinkman & Coates Jr., 1963), which were obtained using self-reported questionnaires at the first session. In the FTND, scores range from 0 to 10, and we defined a score of seven and over as indicating severe nicotine dependence. The information associated with HIV infection including the period from their diagnosis to first visit in the SCT, CD4 cell count and HIV RNA level at the time of first diagnosis, post-ART use at the first session of SCT,

sexual orientation and illicit drug use, were extracted from their medical records.

### 2.5.2 | Nurses' interview

Motivation and self-efficacy of quitting smoking (0–100%) were assessed at each session as follows. A nurse asked the participant about his/her motivation of quitting smoking before the intervention as follows: “How strongly are you motivated to quit smoking? If 0% is not at all motivated and 100% is strongly motivated, what percent would you give yourself?” In addition, before the intervention, the nurse asked the participant about his self-efficacy of quitting smoking as follows: “How strongly do you believe that you will succeed in quitting smoking? If 0% is not at all believe and 100% is strongly believe, what percent would you give yourself?” At the second session when the participants started to quit smoking in SCT and subsequent sessions, the self-efficacy of participants who quit smoking was asked as follows: “How strongly do you believe that you will succeed in maintaining cessation? If 0% is not at all believe and 100% is strongly believe, what percent would you give yourself?” At the first session, the 75th percentile of all participants' motivations to quit smoking was 100%, and that of self-efficacy was 80%. Therefore, we defined the cut-off value of motivation and self-efficacy to be 100 and 80%, respectively.

### 2.5.3 | Center for Epidemiologic Studies Depression Scale

At every SCT session, we collected the Center for Epidemiologic Studies Depression Scale (CES-D) score to assess the patient's depression status. The CES-D is a short self-report scale designed to measure depression in the general population and it is widely used for epidemiologic studies on depression (Radloff, 1977). Scores range from 0 to 60, and the standard cut-off score of  $\geq 16$  was used to categorize participants as depressed or not.

### 2.5.4 | Strength of smoking craving

At each session, the nurse assessed the participant's strength of desire to smoke by asking the participant to fill out a questionnaire to assess the strength of smoking craving on a scale from 0 to 3 as follows: score 0: I feel no craving for smoking anymore, 1: I feel a need to put something in my mouth to cope with the craving, 2: I need endurance to cope with the craving, 3: I can hardly continue to stop smoking because of a strong craving (Taniguchi et al., 2014).

## 2.6 | Statistical methods

We classified the study subjects into the following two groups: HIV-positive persons, and HIV-negative persons with the complication of a chronic disease. We compared the proportion of persons with depression by the CES-D score ( $\geq 16$  /  $< 16$ ), motivation to stop smoking (100% /  $< 100\%$ ), self-efficacy to stop smoking ( $\geq 80\%$  /  $< 80$ ) and strength of craving (3 /  $< 3$ ) between the two groups through the five sessions of the SCT using the Chi-square test. Drop-out rates and smoking cessation rates through the five sessions of SCT between the two groups were also compared.

In addition, we performed multivariate logistic regression analysis to elucidate factors associated with 2-weeks point-prevalence abstinence at the end of SCT among the HIV-positive patients using age (continuous variable), cohabitation (living alone / with cohabiter), FTND ( $\geq 7$  /  $< 7$ ), motivation (100 /  $< 100\%$ ), self-efficacy ( $\geq 90$  /  $< 90\%$ ), craving level (0–3) and CES-D ( $\geq 16$  /  $< 16$ ) as potential independent variables.

STATA version 13 (STATA Corp., College Station, TX, USA) was used for statistical analyses.

## 3 | RESULTS

Among the 77 HIV-infected subjects, 55 subjects (71.4%) were homosexual and 15 (19.4%) were bisexual. Ninety-one percent of the HIV infections in the HIV-positive cases had been sexually transmitted. Thirty percent of the subjects had experience of taking illicit drugs. Fifteen subjects (20.6%) received SCT within 1 year after the diagnosis of HIV infection, and 44 subjects (57.1%) received SCT between 1 and 5 years after the diagnosis of HIV infection. Thirty-one subjects (40.3%) had a CD4 count of 200/ $\mu$ L or less, and 22 subjects (28.6%) had expression of AIDS at the time of diagnosis of HIV infection. Seventy-three (94.8%) of the 77 subjects had received ART by the time of the first visit to the smoking cessation clinic.

The mean age of the HIV-positive group was 40.1 (*SD* 8.6) years, and that of the HIV-negative group was 59.2 (*SD* 13.3) years. Table 1 shows characteristics of the subjects in the two groups. The HIV-positive group had significantly higher numbers of cigarettes smoked per day and FTND score at the first session than the HIV-negative group ( $p = .015$  and  $p = .016$ , respectively). Smokers with HIV had a significantly higher CES-D score than the HIV-negative group at the first session of SCT ( $p < .001$ ). Motivation and self-efficacy to quit smoking were not significantly different between the HIV-positive and HIV-negative groups. There were no differences in proportions of patients with prescription of nicotine patch or varenicline between the HIV-positive group and HIV-negative group.

**TABLE 1** Characteristics of the study subjects at the first session in the smoking cessation therapy

		HIV-positive smokers n = 77 (%)	HIV-negative smokers with a chronic illness n = 323 (%)	p value
Cohabitation	Living alone	44 (57.1)	108 (33.4)	<.001
	With cohabiter	33 (42.9)	215 (66.6)	
Number of cigarettes smoked per day	≤20	34 (44.2)	192 (59.4)	.015
	>20	43 (55.8)	131 (40.6)	
FTND	<7	41 (53.2)	219 (67.8)	.016
	≥7	36 (46.8)	104 (32.2)	
Motivation at the first session	< 100%	45 (58.4)	172 (53.3)	.411
	100%	32 (41.6)	151 (46.8)	
Self-efficacy at the first session	< 80%	59 (76.6)	216 (66.9)	.097
	≥ 80%	18 (23.4)	107 (33.1)	
Craving at the first session <sup>a</sup>	0	0 (0)	5 (1.9)	.340
	1	17 (25.8)	65 (24.5)	
	2	19 (28.8)	97 (36.6)	
	3	30 (45.5)	98 (37.0)	
CES-D at the first session	< 16	42 (54.6)	253 (78.3)	<.001
	≥ 16	35 (45.4)	70 (21.7)	
Prescription	Nicotine patch	8 (10.9)	50 (15.5)	.254
	Varenicline	69 (89.6)	273 (84.5)	

<sup>a</sup>0: I feel no craving for smoking anymore, 1: I feel a need to put something in my mouth to cope with the craving, 2: I need endurance to cope with the craving, 3: I can hardly continue to stop smoking because of a strong craving.

CES-D, Center for Epidemiologic Studies Depression Scale; FTND, Fagerström Test for Nicotine Dependence.

Table 2 shows the change in the proportion of subjects in each group with high CES-D scores (≥16), high motivation to stop smoking (100%), high self-efficacy to stop smoking (≥80%) and high strength of craving (level 3) through the

five sessions of the SCT. The proportion with high CES-D score in the HIV-positive subjects was higher than that in the HIV-negative subjects at all sessions. However, the proportion with depression according to the CES-D score in the

**TABLE 2** Comparison of smoking-related variables during smoking cessation therapy in the two groups

		First session (0 week)	Second session (2 weeks)	Third session (4 weeks)	Fourth session (8 weeks)	Fifth session (12 weeks)
CES-D (≥16)	HIV-positive group	35 (45.4%) <sup>a</sup>	30 (46.2%)	21 (38.9%)	19 (43.2%)	12 (34.3%)
	HIV-negative group	70 (21.7%)	62 (23.7%)	43 (17.9%)	41 (20.6%)	27 (15.2%)
	p value	<.001	<.001	.001	.001	.008
Motivation (100%)	HIV-positive group	32 (41.6%)	29 (47.5%)	26 (49.1%)	23 (54.8%)	19 (59.4%)
	HIV-negative group	151 (46.8%)	149 (54.8%)	148(61.9%)	137(66.2%)	130(73.5%)
	p value	.411	.306	.084	.159	.105
Self-efficacy (≥80%)	HIV-positive group	18(23.4%)	37 (60.7%)	36 (66.7%)	33 (78.6%)	24 (75.0%)
	HIV-negative group	101 (33.1%)	164 (60.7%)	174(73.1%)	175(76.3%)	156 (88.1%)
	p value	.097	.990	.597	.754	.048
Craving (≥3)	HIV-positive group	30 (45.5%)	9 (13.9%)	3(5.3%)	5(10.9%)	4(11.1%)
	HIV-negative group	98 (37.0%)	52(18.4%)	30 (12.2%)	17 (8.0%)	11(5.8%)
	p value	.206	.387	.322	.123	.240

<sup>a</sup>Number (percentage) of patients in each group with the indicated characteristic is shown.



HIV-positive subjects slightly decreased over the five sessions (45.4 to 34.3%), as did the proportion with depression in the HIV-negative subjects (21.7 to 15.2%). Motivation and craving level were not significantly different between the two groups. HIV-positive subjects showed a significantly lower self-efficacy to stop smoking at the last session than the HIV-negative subjects. The proportions of subjects with high motivation and high self-efficacy to quit smoking increased in both groups over the course of the SCT. Accordingly, the proportion of subjects with a high strength of craving decreased over the course of the SCT (Table 2).

The drop-out rates in the two groups were almost the same at the second to fourth sessions. The drop-out rate at the last session was higher in the HIV-positive group than in the HIV-negative group (53.3 and 40.9%,  $p = .049$ ) (Table 3). The HIV-positive group had a significantly lower rate of success of quitting smoking than the HIV-negative group (35.1 vs. 47.7%,  $p = .046$ ).

Table 4 shows the odds ratio (OR) for 2-weeks point-prevalence abstinence at the end of SCT among the HIV-positive smokers according to cognitive and behavioral factors at the first session. HIV-positive smokers who had higher self-efficacy at the first session had significantly higher success rates than those with lower self-efficacy (OR = 9.99,  $p < .01$ ).

## 4 | DISCUSSION

The smoking cessation rate in HIV-positive persons was lower than that in the HIV-negative persons as expected. Characteristics of smokers with HIV were a larger number of cigarettes smoked per day, higher score of nicotine dependence and higher depression score compared with the HIV-negative smokers. Higher self-efficacy was associated with success of quitting smoking in HIV-positive smokers. To the best of our knowledge, this is the first study to elucidate characteristics, outcomes and factors associated with the

**TABLE 4** Odds ratios for abstinence for at least 2 weeks before the end of the smoking cessation therapy among the 77 HIV-positive smokers

Characteristic at the first session	Odds ratio	<i>p</i> value	95% CI
Age	0.97	.510	0.89–1.06
Cohabitation	0.50	.312	0.13–1.92
FTND ( $\geq 7$ )	3.04	.102	0.80–11.55
Motivation (100%)	0.61	.442	0.17–2.17
Self-efficacy ( $\geq 80\%$ )	9.99	.007	1.86–53.73
Craving	1.54	.280	0.70–3.36
CES-D ( $\geq 16$ )	0.66	.563	0.17–2.66

Note: Age (continuous variable), cohabitation (living alone / with cohabiter), FTND ( $\geq 7$  /  $< 7$ ), motivation (100% /  $< 100\%$ ), self-efficacy ( $\geq 90\%$  /  $< 90\%$ ), craving level (0–3) and CES-D ( $\geq 16$  /  $< 16$ ) were simultaneously included as the independent variables.

CES-D, Center for Epidemiologic Studies Depression Scale; FTND, Fagerström Test for Nicotine Dependence.

success of quitting smoking in people living with HIV compared with HIV-negative smokers who received smoking cessation intervention in Japan.

In this study, smokers with HIV had a larger number of cigarettes smoked per day and higher score of nicotine dependence. Both covariates were reported to be strongly correlated with physical dependence on nicotine (Pomerleau, Carton, Lutzke, Flessland, & Pomerleau, 1994). High physical nicotine dependence causes withdrawal symptoms such as irritability, anxiety, boosting mood, headache and difficulty concentrating. In addition, our study indicated that HIV-positive smokers had a higher depression score than HIV-negative smokers. Generally, tobacco withdrawal symptoms affect depression and contribute to failure of quitting smoking and to relapse (Dorner, Trostl, Womastek, & Groman, 2011; Leventhal, Ameringer, Osborn, Zvolensky, & Langdon, 2013). From these results, smokers living with

**TABLE 3** Comparison of adherence and smoking cessation rates during smoking cessation therapy (SCT) in the HIV-positive and HIV-negative groups

		Second session	Third session	Fourth session	Fifth session
Number of participants who attended SCT	HIV-positive group	67	57	46	36
	HIV-negative group	288	254	219	191
Drop-out	HIV-positive group	10 (13.0%)	20 (26.0%)	31(40.3%)	41(53.3%)
	HIV-negative group	35 (10.9%)	69 (21.4%)	104(32.2%)	132(40.9%)
	<i>p</i> value	.936	.450	.172	.049
Success of quitting smoking <sup>a</sup>	HIV-positive group	41/77 (53.3%)	42/77 (54.6%)	35/77 (45.5%)	27/77 (35.1%)
	HIV-negative group	184/323 (57.0%)	187/323 (57.9%)	179/323 (55.4%)	154/323 (47.7%)
	<i>p</i> value	.554	.593	.115	.046

<sup>a</sup>Point prevalence of success of quitting smoking.

HIV/AIDS had many barriers to quitting smoking and characteristics related to difficulty in quitting smoking.

On the other hand, the proportion with depression according to the CES-D score in the HIV-positive subjects slightly decreased over the five sessions. Benard et al. conducted a cross-sectional survey to monitor tobacco consumption among HIV-infected patients and to identify motivation, depression, and dependencies among smokers with HIV (Benard et al., 2007). They reported that depressive symptoms were highly prevalent among smokers living with HIV. In addition, current smokers with HIV had a higher CES-D score compared with former and never smokers with HIV. Our findings together with their results (Benard et al., 2007) indicate that success of quitting smoking has not only a physical benefit but also a physiological benefit for people living with HIV/AIDS.

We additionally analyzed the subjects in the HIV-positive group to elucidate factors associated with success of quitting smoking and found that high self-efficacy was the most important factor. Many studies not only in Western countries but also in Japan indicated that self-efficacy is a strong factor associated with success of quitting smoking (Burris, Wahlquist, & Carpenter, 2013; Takahashi, Nakamura, Kinoshita, & Masui, 2000; Taniguchi et al., 2017). This finding confirms the importance of assessing self-efficacy for the smoking cessation intervention in this special population. In addition, self-efficacy to quit smoking at the last session was lower in the HIV-positive group than in the HIV-negative group. This has possibly been the cause of the lower quit-smoking rate at the last session. Thus, we consider that it is important for nurses to conduct a counseling approach to increase the self-efficacy of quitting smoking in HIV-positive smokers over the long term not only in smoking cessation clinics but also in the HIV clinic before they are referred to the smoking cessation clinic.

A strength of this study was that we compared the quit smoking rate between HIV-positive patients and HIV-negative patients with a chronic illness who received the standardized protocol of the SCT in a single outpatient clinic. Potential covariates that are linked to smoking behaviors, including nicotine dependence, motivation of quitting smoking, self-efficacy of quitting smoking, craving level and CES-D score, were adjusted in the analysis. There are some potential limitations in our study. First, our study had a small number of subjects: 77 HIV-positive patients and 323 HIV-negative patients with a chronic illness. This might have resulted in lower statistical power to assess the difference in the success in quitting smoking rate between the HIV-positive and HIV-negative subjects. The second limitation is regarding the representation of this study. The target hospital in our study is one of the major designated HIV/AIDS treatment hospitals in Japan, and many

HIV/AIDS patients in Nagoya city and the surrounding area covering a population of 8 million people visit this center. In addition, this hospital is one of the major general hospitals in this area, and patients are referred to this hospital in various clinical conditions. Most of the HIV-negative participants receiving SCT are outpatients of this general hospital. From these conditions, we considered that the representativeness of both the HIV-positive and HIV-negative participants who received SCT at this hospital are appropriate. Third, our study subjects were all male patients. Therefore, it does not apply to all patients with HIV infection. However, in Japan, among HIV-infected patients who have Japanese nationality, the proportion of females was less than 6% (NIID, 2018). Also, there were three female patients in our study, and they were all foreigners. Therefore, our study enrolled only male participants. Fourth, in this study, the HIV-positive participants were younger than the HIV-negative participants. Generally, younger people are less likely to succeed in quitting smoking (Taniguchi et al., 2017). One of the reasons why HIV-positive smokers had lower success in quitting smoking than HIV-negative smokers in our study may have been their younger age. Fifth, other potential confounders such as socioeconomic status and social support (Casale & Wild, 2013; Park, Tudiver, Schultz, & Campbell, 2004) should have been considered.

In conclusion, our study indicated that HIV-infected smokers had lower success in quitting smoking than HIV-negative smokers in the Japanese SCT. People living with HIV had many barriers to quitting smoking. Self-efficacy was an important factor for success of quitting smoking. We consider that these findings indicate the importance of nurses' counseling to overcome the barriers and increase self-efficacy of quitting smoking in people living with HIV/AIDS. These counseling sessions by nurses might lead to patients' success in quitting smoking.

## AUTHORS' CONTRIBUTIONS

C.T. and H.T. contributed to the conception and design of this study; C.T. and C.H. provided smoking cessation intervention for participants. C.T. performed the statistical analysis and drafted the manuscript; and H.T. and H.S. critically reviewed the manuscript and supervised the whole study process. All authors read and approved the final manuscript.

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## CONFLICT OF INTEREST

No conflict of interest has been declared by the authors.

## AUTHORSHIP STATEMENT

All authors have agreed on the final version and meet at least one of the following criteria:

1. conception and design, or analysis and interpretation of data
2. drafting the article or revising it critically for important intellectual content
3. final approval of the version to be published.

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## REFERENCES

- Addington, J., el-Guebaly, N., Addington, D. & Hodgins, D. (1997). Readiness to stop smoking in schizophrenia. *The Canadian Journal of Psychiatry*, 42(1), 49–52. <https://doi.org/10.1177/070674379704200107>.
- Benard, A., Bonnet, F., Tessier, J. F., Fossoux, H., Dupon, M., Mercie, P. *et al.* (2007). Tobacco addiction and HIV infection: Toward the implementation of cessation programs. ANRS CO3 Aquitaine Cohort. *AIDS Patient Care STDS*, 21(7), 458–468. <https://doi.org/10.1089/apc.2006.0142>.
- Bonnet, F., Lewden, C., May, T., Heripret, L., Jouglu, E., Bevilacqua, S. *et al.* (2004). Malignancy-related causes of death in human immunodeficiency virus-infected patients in the era of highly active antiretroviral therapy. *Cancer*, 101(2), 317–324. <https://doi.org/10.1002/cncr.20354>.
- Brinkman, G. L. & Coates, E. O. Jr. (1963). The effect of bronchitis, smoking, and occupation on ventilation. *American Review of Respiratory Disease*, 87, 684–693. <https://doi.org/10.1164/arrd.1963.87.5.684>.
- Burkhalter, J. E., Springer, C. M., Chhabra, R., Ostroff, J. S. & Rapkin, B. D. (2005). Tobacco use and readiness to quit smoking in low-income HIV-infected persons. *Nicotine & Tobacco Research*, 7(4), 511–522. <https://doi.org/10.1080/14622200500186064>.
- Burris, J. L., Wahlquist, A. E. & Carpenter, M. J. (2013). Characteristics of cigarette smokers who want to quit now versus quit later. *Addictive Behaviors*, 38(6), 2257–2260. <https://doi.org/10.1016/j.addbeh.2013.02.008>.
- Casale, M. & Wild, L. (2013). Effects and processes linking social support to caregiver health among HIV/AIDS-affected carer-child dyads: A critical review of the empirical evidence. *Addictive Behaviors*, 17(5), 1591–1611. <https://doi.org/10.1007/s10461-012-0275-1>.
- Cui, Q., Carruthers, S., McIvor, A., Smaill, F., Thabane, L. & Smieja, M. (2010). Effect of smoking on lung function, respiratory symptoms and respiratory diseases amongst HIV-positive subjects: A cross-sectional study. *AIDS Research and Therapy*, 7, 6. <https://doi.org/10.1186/1742-6405-7-6>.
- Das, S. & Prochaska, J. J. (2017). Innovative approaches to support smoking cessation for individuals with mental illness and co-occurring substance use disorders. *Expert Review of Respiratory Medicine*, 11(10), 841–850. <https://doi.org/10.1080/17476348.2017.1361823>.
- Dorner, T. E., Trostl, A., Womastek, I. & Groman, E. (2011). Predictors of short-term success in smoking cessation in relation to attendance at a smoking cessation program. *Nicotine & Tobacco Research*, 13(11), 1068–1075. <https://doi.org/10.1093/ntr/ntr179>.
- Duval, X., Baron, G., Garelik, D., Villes, V., Dupre, T., Lepout, C. *et al.* (2008). Living with HIV, antiretroviral treatment experience and tobacco smoking: Results from a multisite cross-sectional study. *Antiviral Therapy*, 13(3), 389–397.
- Fabbiani, M., Ciccarelli, N., Tana, M., Farina, S., Baldonero, E., Di Cristo, V. *et al.* (2013). Cardiovascular risk factors and carotid intima-media thickness are associated with lower cognitive performance in HIV-infected patients. *HIV Medicine*, 14(3), 136–144. <https://doi.org/10.1111/j.1468-1293.2012.01044.x>.
- Feldman, J. G., Minkoff, H., Schneider, M. F., Gange, S. J., Cohen, M., Watts, D. H. *et al.* (2006). Association of cigarette smoking with HIV prognosis among women in the HAART era: A report from the women's interagency HIV study. *American Journal of Public Health*, 96(6), 1060–1065. <https://doi.org/10.2105/AJPH.2005.062745>.
- Fuster, M., Estrada, V., Fernandez-Pinilla, M. C., Fuentes-Ferrer, M. E., Tellez, M. J., Vergas, J. *et al.* (2009). Smoking cessation in HIV patients: Rate of success and associated factors. *HIV Medicine*, 10(10), 614–619. <https://doi.org/10.1111/j.1468-1293.2009.00735.x>.
- Green, M., Turner, S. & Sareen, J. (2017). Smoking and suicide: Biological and social evidence and causal mechanisms. *Journal of Epidemiology and Community Health*, 71(9), 839–840. <https://doi.org/10.1136/jech-2016-207731>.
- Gritz, E. R., Vidrine, D. J., Lazev, A. B., Amick, B. C. 3rd & Arduino, R. C. (2004). Smoking behavior in a low-income multi-ethnic HIV/AIDS population. *Nicotine & Tobacco Research*, 6(1), 71–77. <https://doi.org/10.1080/14622200310001656885>.
- Humfleet, G. L., Hall, S. M., Delucchi, K. L. & Dilley, J. W. (2013). A randomized clinical trial of smoking cessation treatments provided in HIV clinical care settings. *Nicotine & Tobacco Research*, 15(8), 1436–1445. <https://doi.org/10.1093/ntr/ntt005>.
- Ingersoll, K. S., Cropsey, K. L. & Heckman, C. J. (2009). A test of motivational plus nicotine replacement interventions for HIV positive smokers. *AIDS and Behavior*, 13(3), 545–554. <https://doi.org/10.1007/s10461-007-9334-4>.
- Jain, M. K., Skiest, D. J., Cloud, J. W., Jain, C. L., Burns, D. & Berggren, R. E. (2003). Changes in mortality related to human immunodeficiency virus infection: Comparative analysis of inpatient deaths in 1995 and in 1999–2000. *Clinical Infectious Diseases*, 36(8), 1030–1038. <https://doi.org/10.1086/368186>.
- Kawakami, N., Takatsuka, N., Inaba, S. & Shimizu, H. (1999). Development of a screening questionnaire for tobacco/nicotine dependence according to ICD-10, DSM-III-R, and DSM-IV. *Addictive Behaviors*, 24(2), 155–166.



- Kirk, G. D. & Merlo, C. A. (2011). HIV infection in the etiology of lung cancer: Confounding, causality, and consequences. *Proceedings of the American Thoracic Society*, 8(3), 326–332. <https://doi.org/10.1513/pats.201009-061WR>.
- Leventhal, A. M., Ameringer, K. J., Osborn, E., Zvolensky, M. J. & Langdon, K. J. (2013). Anxiety and depressive symptoms and affective patterns of tobacco withdrawal. *Drug and Alcohol Dependence*, 133, 324–329. <https://doi.org/10.1016/j.drugalcdep.2013.06.015>.
- Lloyd-Richardson, E. E., Stanton, C. A., Papandonatos, G. D., Shadel, W. G., Stein, M., Tashima, K. *et al.* (2009). Motivation and patch treatment for HIV+ smokers: A randomized controlled trial. *Addiction*, 104(11), 1891–1900. <https://doi.org/10.1111/j.1360-0443.2009.02623.x>.
- Louie, J. K., Hsu, L. C., Osmond, D. H., Katz, M. H. & Schwarcz, S. K. (2002). Trends in causes of death among persons with acquired immunodeficiency syndrome in the era of highly active antiretroviral therapy, San Francisco, 1994–1998. *The Journal of Infectious Diseases*, 186(7), 1023–1027. <https://doi.org/10.1086/343862>.
- Moadel, A. B., Bernstein, S. L., Mermelstein, R. J., Arnsten, J. H., Dolce, E. H. & Shuter, J. (2012). A randomized controlled trial of a tailored group smoking cessation intervention for HIV-infected smokers. *Journal of Acquired Immune Deficiency Syndromes*, 61(2), 208–215. <https://doi.org/10.1097/QAI.0b013e3182645679>.
- NIID. (2018). *The Trend of HIV Infection in Japan*. Retrieved from source 0809, <https://www.niid.go.jp/niid/ja/kansennohanashi/400-aids-intro.html>
- Pacek, L. R. & Cioe, P. A. (2015). Tobacco use, use disorders, and smoking cessation interventions in persons living with HIV. *Current HIV/AIDS Reports*, 12(4), 413–420. <https://doi.org/10.1007/s11904-015-0281-9>.
- Park, E. W., Tudiver, F., Schultz, J. K. & Campbell, T. (2004). Does enhancing partner support and interaction improve smoking cessation? A meta-analysis. *Annals of Family Medicine*, 2(2), 170–174.
- Patel, N., Talwar, A., Reichert, V. C., Brady, T., Jain, M. & Kaplan, M. H. (2006). Tobacco and HIV. *Clinics in Occupational and Environmental Medicine*, 5(1), 193–207, xi. <https://doi.org/10.1016/j.coem.2005.10.012>.
- Pomerleau, C. S., Carton, S. M., Lutzke, M. L., Flessland, K. A. & Pomerleau, O. F. (1994). Reliability of the Fagerstrom tolerance questionnaire and the Fagerstrom test for nicotine dependence. *Addictive Behaviors*, 19(1), 33–39.
- Radloff, L. S. (1977). The CES-D scale: A self-report depressive scale for research in the general population. *Journal of Applied Psychological Measurement*, 1, 385–401.
- Ruzicka, D. J., Imai, K., Takahashi, K. & Naito, T. (2018). Comorbidities and the use of comedication in people living with HIV on antiretroviral therapy in Japan: A cross-sectional study using a hospital claims database. *BMJ Open*, 8(6), e019985. <https://doi.org/10.1136/bmjopen-2017-019985>.
- Shuter, J., Bernstein, S. L. & Moadel, A. B. (2012). Cigarette smoking behaviors and beliefs in persons living with HIV/AIDS. *American Journal of Health Behavior*, 36(1), 75–85.
- Takahashi, H., Nakamura, M., Kinoshita, T. & Masui, S. (2000). Development and validation of a self-management skill scale. *Nihon Kosshu Eisei Zasshi*, 47(11), 907–914.
- Taniguchi, C., Tanaka, H., Nakamura, N., Saka, H., Oze, I., Ito, H. *et al.* (2014). Varenicline is more effective in attenuating weight gain than nicotine patch 12 months after the end of smoking cessation therapy: An observational study in Japan. *Nicotine & Tobacco Research*, 16(7), 1026–1029. <https://doi.org/10.1093/ntr/ntu045>.
- Taniguchi, C., Tanaka, H., Saka, H., Oze, I., Tachibana, K., Nozaki, Y. *et al.* (2017). Cognitive, behavioural and psychosocial factors associated with successful and maintained quit smoking status among patients who received smoking cessation intervention with nurses' counselling. *Journal of Advanced Nursing*, 73(7), 1681–1695. <https://doi.org/10.1111/jan.13258>.
- Tirelli, U., Spina, M., Sandri, S., Serraino, D., Gobitti, C., Fasan, M. *et al.* (2000). Lung carcinoma in 36 patients with human immunodeficiency virus infection. The Italian Cooperative Group on AIDS and Tumors. *Cancer*, 88(3), 563–569.

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