Original Article

The Evaluation of the Smoking Cessation Strategies Related to Quit Results Among Conscripts, Ubon Ratchathani Region from 2014 to 2015

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Background: Smoking cessation services in Ubon Ratchathani region has been established since 2010. Data analysis and summary have yet to be conducted.

Objective: It aimed to evaluate the current smoking cessation strategies related to quit results among smokers living in Ubon Ratchathani region.

Materials and Methods: It was a quasi-experimental, cross-sectional study. All conscripts training at Sanpasithiprasong Military Base were divided into either mouthwash or 'going cold turkey' groups. Patient data were collected at 1st visit, 2nd visit (3- month), and 3rd visit (6- month). Carbon-monoxide (CO) levels were also measured via CO meter. For demographic information, descriptive statistics including, percentage, frequency, mean, standard deviation (SD) were used. Regarding quit results and CO levels between groups at 1-, 3-, and 6-month periods, chi-square test and mixed effects linear regression were implemented. The relation between variables and quit results was analyzed via multiple logistic regression.

Results: Totally there were 1,094 participants, 953 were in 'going cold turkey' group, the other 141 were in mouthwash group. Most participants were married, alcohol drinkers, and smoked cigarettes between 10 and 15 rolls a day. It revealed there were no statistically significant differences of quit results between groups at *3-* and *6-* month periods (p = 0.418, .525 respectively). Average CO levels at *6*-month periods of the mouthwash group was significantly lower than those in the 'going cold turkey' group by 1.79 ppm (95% CI: -3.14, -0.44, p = 0.009). Only two variables including, numbers of cigarettes and CO levels were significantly related to the quit results at 6-month periods (p<0.05).

Conclusion: Overall, both mouthwash and 'going cold turkey' strategies are shown to be effective for smoking cessation. Carbon monoxide (CO) levels were significantly different between groups only at 6-month periods (p<0.05). Only numbers of cigarette rolls and CO levels are significantly related to the quit results (p = 0.001).

Keywords: Smoking cessation strategies, Quit results, Mouthwash, Going cold turkey

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Smoking is a leading cause of illness including chronic respiratory problems, cardiovascular diseases, and various types of cancers[(1)]. In Thailand, the Thai National Statistics Office reported most smokers were adolescents, and this evidence was confirmed by the Global Adult Tobacco Survey (GATS) findings that most daily smokers were in the 15 to 24 age group[(2)]. However, the major concern is the decline in the ages of smokers over the past 20 years in different regions of the worlds including Thailand[(3)]. As young smokers who begin smoking at an early age are more likely to become dependent and have greater difficulty quitting as adults[(4-7)]. Additionally, it has been revealed among people under the age of 24, Thai army officers were also among those high risk groups as reported in Thai literatures[(8-10)]. The previous research indicated that

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the school and military periods were the most critical time for the onset of smoking behavior and literature provided consistent support for friends' social norms as a predictor of adolescent smoking, making it difficult for young people to avoid cigarettes[11]. When focusing on the smoking prevalence by regions, the North-East region of Thailand has the second highest tobacco consumption behind the Southern region. Ubon Ratchathani region was the 13th in a list of provinces regarding the rate of tobacco consumption in 2010. There are current smokers approximately 27.09 percent (per 100,000 population) [12]. Geographically, the province has a population of approximately 2 million, 98 primary schools, four universities, and two colleges. Regarding the prevalence of smoking behavior among young people located in Ubon Ratchathani region, we found that there is no up-to-dated, current data related to school pupils, military personnel available[13].

Between 2009 and 2010, the strategies of tobacco-free campaign in Ubon Ratchathani region have been established via the research team. The multidisciplinary professionals have been joining and working together side by side. Fortunately, the initiation of smoking cessation services via 'Fah-Sai Clinics' have been set up and run by Fah-Sai staff, Ubon Ratchathani University (UBU) and other anti-smoking networks including outpatient-clinic, Sanpasithiprasong Military-Based Hospital. We have also provided smoking history taking, and smoking cessation services for local students, communities, since 2011. Importantly, the available smoking cessation strategies used at Fah-Sai Clinic included; 'going cold turkey' and 0.5% sodium nitrate ($NaNO_3$) mouth-wash alongside with lifestyle modifications. Each strategy was chosen based on the clients' satisfaction. Yet the overall outcomes taken placed have been evaluated. Therefore, the researchers aim to summarize and analyze all data related to the quit results including, demographic information, history of smoking, severity of nicotine dependence, carbon-monoxide (CO) levels, quit results, particularly among the conscripts training at Sanpasithiprasong Military-Based Hospital. Data collection were conducted from year 2014 to 2015. Consequently, we could be able to improve the quality of smoking cessation services, minimize the limitations, and plan for the future tasks.

Materials and Methods

Study design

It was a quasi-experimental, cross-sectional study.

Population and samples

The participants were described as the conscripts traigning in Ubon Ratchathani region and voluntarily underwent smoking cessation strategies from January 2014 to February 2015.

All participants needed to be qualified to enroll into the study. The inclusion criteria included, 1) aged above 15, 2) either current or non-smokers, 3) agree to participate in the study, and 4) ready to undergo smoking cessation services throughout *6*-month periods (only smokers). Totally, there were 1,094 volunteers. All participants were conscripts training at Sanpasithiprasong Military Base, Ubon Ratchathani region.

The participant selection was performed via a purposive sampling method. Those participants, willing to join the study during the study periods, would be recruited. They completed consent forms prior to the study. The personal identification of each participant was strictly confidential for research purpose only. The participants were also informed that they can leave the study unconditionally.

Ethic considerations

The study protocol was reviewed and approved by the Mahidol University Institutional Review Board (MU-IRB) (COA.No 2014/011.401). A smoking history form was filled out at three different times including: first visit, *3*-month visit, and *6*-month visit. Before the commencement of the study, the authors obtained the approval of Sanpasithiprasong Military-Based Hospital and Fah-Sai Clinic, Ubon Ratchathani University.

Research tools

The data form contained four types of information and the patient data were collected at three different periods of time: 1st visit, 2nd visit (*3*-month), and 3rd visit (*6*-month). At 1st visit, participants were asked about 1) Demographical information (*5 items*) including, age, weight, marital status, drinking habit, medical history; 2) History of cigarette smoking (*4 items*) including, type of cigarette, duration of smoking, numbers of cigarettes, time to start smoking after waking up. Also, the available cessation strategy for each individual to be chosen: 1) 0.5% sodium nitrate ($NaNo_3$) mouthwash, and 2) 'going cold turkey' strategies. At 2nd (*3*-month), and 3rd visit (*6*-month), the cessation outcome : carbon monoxide (CO) levels, and quit results were also gathered.

Process

All participants qualified to the present study, were informed the objectives and steps of the study. Then, they underwent the study process. First, they were taken some demographic information (6 items) : gender, age, weight, marital status, drinking habit, and medical history. Then, they were measured carbon-monoxide (CO) levels via CO meter. Additionally, history of cigarette smoking (2 items) : duration of smoking, numbers of cigarette rolls (per day). At 2nd (3-month), and 3rd visit (6-month), all participants were asked about the cessation outcomes including, carbon-monoxide (CO) levels, and quit results.

Regarding the carbon-monoxide levels, they were used as indicators related to the severity of nicotine addiction. If CO level was low, it indicated the participant was likely to smoke less and had low severity of nicotine addiction.

CO levels	Severity of Nicotine Addiction
0-3 ppm	Normal
4-5 ppm	Moderate
≥ 6 ppm	Severe

Note: CO cutting points are based on the standard guideline of Medical Professionals for Tobacco Control, Thailand [14]

For those who agreed to take mouthwash, needed to follow the instructions. For example, the participants using the mouthwash were required to gargle 2 ml of 0.5% $NaNO_3$ solution before smoking a cigarette. Meanwhile, if the participant chose to quit smoking immediately, called 'going cold turkey', they were required to undergo 'withdrawal symptoms' management program. However, if they want to change their lifestyles to minimize the craving condition, the counselors would give some advice. The durations of both treatments were six month periods. For each visit, the counselors including, physicians, pharmacists and nurses assessed a stage of cessation and dealt with an individual issue.

Data analysis

For demographic information, descriptive statistics including, percentage, frequency, mean, standard deviation (SD) were used to compare between groups. For qualitative variables, chi-square test or fisher's exact test was used for group comparisons whereas quantitative variables were analyzed via Independent t-test or Mann-Whitney Test. Regarding quit results, descriptive values including: frequency, and percentage. For quit results between groups at

Table 1: Demographic data of participants (n = 1,094)

Demographic items	Cessation Strategies		*p*-value
	'going cold turkey' (n=953)	0.5% $NaNO_3$ (mouthwash) (n=141)	
Gender(s)			
Male	953 (100)	141 (100)	
Female	0	0	0.958[c]
Marital status			
Single	758(79.5)	121(85.8)	0.080[c]
Married	195(20.5)	20(14.2)	
Age (years)			0.198[b]
Mean±SD	23.9±11.5	22.9±7.7	
Weight (kg)			
Mean±SD	61.2±10.3	61.6±8.8	0.595[b]
Alcohol drinking			
Never	174(18.3)	15(10.6)	
Sometimes	534(56.0)	72(51.1)	
Regular	245(25.7)	54(38.3)	0.003[a]
Medical history			
No	873(91.6)	130(92.2)	0.812[a]
Yes	80(8.4)	11(7.8)	
Duration of smoking (months)			0.169[c]
Median(Q_1, Q_3)	60(24, 72)	60(48, 72)	
Number of cigarette rolls (per day)			<0.001[c]
Median (IQR)	10(5, 5)	15(10, 20)	

Note: [a] Chi-square test [b] Independent t-test [C] Mann-Whitney U test [d] Fisher's exact test

Table 2. Frequency, percentage of quit results at *3*-, *6*-month periods between groups

Quit results	3-month			6-month		
	'going cold turkey'	0.5% $NaNO_3$ (mouthwash)	*p*-value	'going cold turkey'	0.5% $NaNO_3$ (mouthwash)	*p*-value
Quit	160 (19.4)	23 (16.4)		114 (14.9)	18 (12.9)	
Non-quit	663 (80.6)	117 (83.6)	0.418	650 (85.1)	122 (87.1)	0.525

1-, 3-, and 6-month periods, chi-square test with significance .05 was implemented. Carbon-monoxide (CO) levels of both groups were evaluated via mean, standard deviation (SD). The CO levels between groups at 3 different periods were analyzed via mixed effects linear regression with significance .05. Finally, the variables including, cessation strategies, duration of smoking, CO levels, and alcohol drinking related to the quit results were also investigated via multiple logistic regression.

Results

Totally, there were 1,094 participants, divided to two groups, 141 smokers treated with mouthwash solution, and the other 953 smokers underwent 'going cold turkey'. The majority were single (80%) with an average age of twenty-three. They both weighed approximately 60 kilograms. Noticeably, they were regular alcohol drinkers (80%) with no medical histories. Importantly, those in the mouth-wash group were likely to drink more often than another (p=0.003). They both smoked between 10 and 15 rolls per day (Table 1).

Quit results at *3*-, *6*-month periods

Quit results at *3*- and *6*-month periods of the mouth-wash group were 16.4% and 12.9 %, respectively, while those in the 'going cold turkey' group were 19.4 % and 14.9 %, consecutively. When compared quit results between groups, there were no statistical significant differences at 3- and 6-month periods (p= .418, .525, respectively), (Table 2)

When considered the average CO levels between groups at different periods, the findings revealed the average of CO level in 'going cold turkey' group was 3.10 ppm and continually increased throughout 6-month period (4.38 ppm). It implied the 'going cold turkey' group might have a moderate level of nicotine addiction. Whereas, the average of CO level in the mouth-wash group started from 3.64 ppm and continually decreased through the 6-month periods (3.93 ppm). It meant those using the mouthwash strategy might have quit smoking at last (6-month periods), (Figure1).

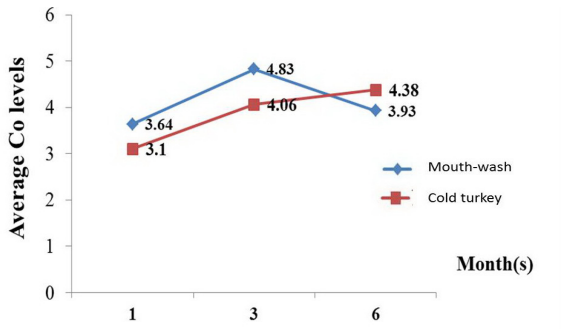

Figure 1. Average CO levels at *3*-, *6*- month periods between groups.

The comparison of the average CO levels

When controlled some variables including, duration of smoking, number of cigarette rolls, and alcohol drinking, the results showed the average CO levels at *6*-month periods of the mouthwash group was significantly lower than those in the 'going cold turkey' group by 1.79 ppm (95% CI: -3.14, -0.44, p = .009). Whereas, the average CO levels between groups at 3-month periods were not significantly different (p= .638), (Table 3).

Table 3. The comparison of the average CO levels at *3*- and *6*-month periods between groups

Duration	$Meandiff_{adj.}$	95% CI diff	*p*-value
1-month	ref		
3-month	-0.19	-0.99, 0.61	0.638
6-month	-1.79	-3.14, -0.44	0.009

Note: $Meandiff_{adj}$ is the difference of average CO levels between groups when controlled some variables including, duration of smoking, number of cigarette rolls, and alcohol drinking

Variable related to the quit result (at 6-month periods)

The findings revealed only two variables : numbers of cigarettes and CO levels were significantly related to the quit results at 6-month periods (p<0.05). When controlled some variables : duration of smoking, CO levels, alcohol drinking, and cessation strategies; if numbers of cigarettes were increased, a quit failure would be increased by 1.02 (1/0.978). Similarly, if CO levels were increased, a quit failure would be increased by 22.22 (1/0.045), (Table 4).

Discussion

In Thailand, when a smoker is ready to quit, a standard cessation method called 'going cold turkey' or 'going it alone' is provided. If multiple attempts of going cold turkey were done, however, smokers could not quit smoking, they would move on to nicotine replacement therapy (NRT). But if it doesn't work, many smokers will decide to try something else such as alternative and pharmaceutical methods (e.g., bupropion, nortriptyline, sodium nitrate, acupuncture, herbs, hypnotherapy)[15]. As it is mentioned in western studies that quit success rates could improve with the addition of cessation medication to behavior counseling[16-18]. Therefore, the groups of going cold turkey or 0.5% sodium nitrate mouthwash was also given to the participants in the study too. As we know 'going cold turkey' is the most common method to quit smoking. However, it can also be the most difficult solitary way at the same time. As a result, it is recommended to use this method for light to moderate smokers whose characteristics were similar to those in the study. Similarly, using 0.5% sodium nitrate mouthwash as a cessation treatment was aimed to enhance the quit success via the chemical properties of changing taste bud functions. Consequently, smokers don't feel enjoyable while smoking.

Although the CO levels of mouthwash group was significantly lower than 'going cold turkey' groups at *6*-month periods. However, the overall CO levels at *3*-, *6*- month periods were closed to the normal range. Therefore, it might be possible that the participants were likely to smoke less after underwent either 'going cold turkey' or mouthwash strategy. Additionally, both cessation strategies could be the effective tools to quit smoking. When focusing on carbon monoxide (CO) levels, similar findings indicated carbon monoxide levels can efficiently dichotomize smokers and non-smokers. Smokers who failed to quit had high CO levels as some cigarette residues left inside the lungs after smoking. The CO particles will stay inside the lungs for approximately 3 days prior to the body excretion. As a result, if we can detect CO level within 3 days after smoking, the values are still accurate and reliable[19-21]. Additionally, the previous study revealed the highest rate of success in quitting smoking was observed among those with expired CO level < 11-20 ppm and cigarette consumption less than 30 cigarettes per day which was similar to the present study[22].

The findings also indicated CO levels and numbers of cigarettes were significantly related to the quit success, (Table 4). This similar result was found in a Thai and Malaysian study, indicated numbers of cigarettes, and health problems played an important factor for quit attempt and quit success[23]. Whereas, some previous studies conducted among infantry, revealed numbers of cigarettes was not related to the quit results among the infantry, except current medical conditions, health insurance, and age[24,25]. Noticeably, most participants in both groups were likely the regular alcohol drinkers. Even alcohol consumption was not significantly related to quit results, (Table 4). However, it was still doubtful with the finding. A previous study indicated that approximately 80 percent of people with

Table 4. Variables related to the quit results at *6*-month periods

Variables	Crude OR	95%CI OR_{Crude}	Adjusted OR	95%CI OR_{adj}
Cessation strategies				
Going cold turkey	1		1	
0.5% $NaNO_3$ (mouthwash)	1.147	0.672, 1.957	0.798	0.094, 6.755
Duration of smoking	0.99**	0.985, 0.995	0.957	0.813, 1.126
Numbers of cigarette rolls (per day)	0.906**	0.877, 0.937	0.978*	0.959, 0.997
CO levels	0.065**	0.025, 0.166	0.045**	0.014, 0.151
Alcohol drinking				
Never	1	1	1	1
Sometimes	0.786	0.453, 1.364	2.132	0.421, 10.807
Regular	0.648	0.350, 1.198	2.638	0.419, 16.609

Note: * with significance 0.05. ** with significance 0.001

heavy alcohol drinkers smoke cigarettes and that most of these smokers are nicotine dependent[26]. Conversely, smokers are at two to three times greater risk for alcohol dependence than nonsmokers[27]. Interestingly, there was an evidence showed smokers with alcohol consumption are more addicted to nicotine, smoke higher nicotine cigarettes, smoke more per day, and score higher on nicotine dependence measures and on carbon monoxide assessment[28,29]. Therefore, when treating these smokers, the clinicians must take into account the characteristics of tobacco dependence in alcohol-consumed populations when determining how best to treat these patients' nicotine dependence. If a smoker had a history of mild alcohol drinking, he could possibly be advised to quit both alcohol and cigarettes. If not, he could be advised to choose either quit drinking or smoking first then tried to achieve another because to address both addictions concurrently would be too difficult for patients, and would adversely affect recovery from heavy alcohol consumption[30]. The other demographic characteristics including, gender(s), marital status, and age were not purposely focused to investigate the relation with the quit results due to uncertain results[32-35]. Thus, more investigations need to be addressed. Finally, the continuous abstinence is advisedly monitored for the conscripts who serve at least 2 years at the military base, because they can relapse at any time during the cessation periods.

Some limitations of the present study need to be noted. First, only conscripts presenting at the time were enrolled into the study, some were missed. Second, a number of participants in each group should be similar to enhance the creditability of the results. Third, numbers of cigarette rolls and alcohol consumption between groups were significantly different. Thus, these differences might affect the study outcomes. As a result, multi-centered trials are recommended to minimize these limitations.

Conclusion

Both mouthwash and 'going cold turkey' strategies are shown to be effective for smoking cessation. Carbon monoxide (CO) level is widely used to investigate the severity of nicotine addiction. Only numbers of cigarette rolls and CO levels are significantly related to the quit results. Further investigations involving other issues related to quit results should be recommended.

What is already known on this topic?

Smoking cessation strategies available in Thailand can be divided into 2 types: 1) pharmacological, and 2 non-pharmacological strategies. For pharmacological strategies, there have been current medications for quitting cigarettes including, nicotine replacement therapy (NRT) (e.g., nicotine gum, patch), and non-nicotine replacement therapy (e.g., clonidine, nortriptyline, bupropion, 0.5% sodium nitrate mouthwash). However, some smokers do not want to use the medication due to some common side effects. Thus, this target group prefers to quit smoking immediately called "go cold turkey". Nevertheless, this strategy might not be easy for everyone, especially those who smoke heavily. As they might experience some 'nicotine withdrawal symptoms' such as hand shaking, sweating, losing concentration, mood irritation. As a result, they need some medications to cope these symptoms. Recently, there has been an alternative for smoking cessation called "0.5% sodium nitrate mouthwash solution" developed to use with some current smokers who cannot undergo 'go cold turkey' but prefer to cut down number of cigarettes. This strategy has been widely used for some time. Until now, there is little known about the efficacy of mouthwash regarding smoking cessation. As a result, the investigation of the efficacy of mouthwash was conducted by comparing with another cessation strategy (go cold turkey). The main reason to choose these two cessation strategies as they are commonly provided among Thai conscripts who are the target group in the study.

What is this study added?

The overall results showed no significant differences in quit results and CO levels between the two strategies. Thus, the selection of the appropriate cessation strategy for a current smoker depends on his smoking background and his own preference. Noticeably, those who do not smoke heavily (less than 10 cigarette rolls per day), the 'go cold turkey' might be the best way to quit effectively. Nevertheless, somebody who smokes more than 10 rolls per day, the cutting down of cigarettes alongside with mouthwash solution could be feasible, as they could not stop smoking immediately after a long duration of smoking. Interestingly, the study also showed at *6*-month periods, CO levels and numbers of cigarettes are the only key factors related to quit success. Therefore, healthcare workers need to focus on these two factors to increase the potency of quit success. Also, the integration of lifestyle modifications and family & friend supports could possibly enhance the smoking cessation achievement.

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Potential Conflicts of interest

The authors declare no conflict of interest.

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