

RESEARCH COMMUNICATION

Factors Associated With Success or Failure of Quit Attempts: A Clinical Approach for Lung Cancer Prevention**Tin Tin Su^{1,3*}, Bin Abu Bakar Sallehuddin², Hj Hussain Murniati², Jit Swinder², Nabilla Al Sadat^{1,3}, Ismail Saimy^{1,3}****Abstract**

The objective of the study is to investigate the success rate of quit attempts and identify factors associated with success or failure of quit attempts in a quit smoking clinic. A cohort study was conducted with 495 smokers who enrolled in a quit smoking clinic from 2005 to 2008. The factors leading to quit smoking successfully were “being Malay”, “having high blood pressure” “type of Nicotine Replacement Therapy” and “duration of follow up”. In contrast, clerical staff had negative association to quit smoking. People who started smoking in their teenage years had a high risk of relapse. Integration of active follow up and tailor-made support programmes for quitters appear necessary in order to maintain their non-smoking status and encourage them to be permanent quitters. Integration of quit smoking clinics and primary care clinics could be another potential step for the success of quit smoking programmes.

Keywords: Smoking cessation - quit attempt - quit smoking clinic - smoking - lung cancer prevention

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Introduction

Despite implementing various antismoking measures by government and agencies all over the world, tobacco smoking remains a major cause of illness and death (WHO, 2003). By the year 2030, about 10 million deaths are estimated because of global tobacco epidemic (World Bank, 1999). It is estimated that smoking can cause about 71% of lung cancer, 42% of chronic respiratory diseases and nearly 10% of cardiovascular disease (WHO, 2010).

In Malaysia, lung cancer remains as third commonest cancer for general population and second commonest cancer among males. The annual report of Ministry of Health Malaysia showed that diseases related to smoking accounted for more than one third of the principal cause of deaths in government hospitals (MOH, 2002). Since the Ministry of Health is the main health care provider in Malaysia, we can assume that a major portion of government health expenditure is used in treating lung cancer and other tobacco related diseases. According to National Health and Morbidity Survey (III) conducted in 2006, the prevalence of ever smokers was 27% of the population in Malaysia approximately one in every four adults (Institute of Public Health, 2008). It had shown an increasing trend because the prevalence of ever smokers among Malaysian adults was 21% in 1985.

The antismoking activities have been intensified in Malaysia since 1991 via both population and clinic approach. Quit smoking clinics were designed for lung

cancer prevention for the particular high risk group, such as current smokers. The quit smoking clinics offer free counselling and provide free medication including Nicotine Replacement Therapy (NRT). However, not all smokers who enrolled in the quit smoking clinics managed to quit successfully. The reason is that tobacco use is typically a chronic addiction and relapses following quit attempts were very common (Zwar, 2008).

There are some available longitudinal studies which identified the factors associated with smoking cessation (Hyland et al., 2006, Zhou et al., 2009). However, these studies focused on the general population and could not capture the population who tried to quit smoking with assistance of health care professionals. To our knowledge, there is still not enough scientific evidence on this area so as to improve the performance of quit smoking clinics. By identifying these factors, health care professionals could offer tailor-made support programmes for smokers in order to maintain their quit smoking status. The objectives of our study are to investigate the success rate of quit attempts and identify factors associated with success or failure of quit attempts in a quit smoking clinic.

Materials and Methods*Study area*

A cohort study was done using quantitative methods. It was conducted in the Tanglin Quit Smoking Clinic in Kuala Lumpur. The study was approved by Ethics

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Committee, University Malaya Medical Centre (Ref. no. 697.19).

This quit smoking clinic was established by the Ministry of Health in May, 2004. The clinic implements the five "As" approach according to the WHO guideline ie Ask, Assess, Advise, Assist and Arrange follow-ups.

Participants

The study population was the clients who made quit attempts between the years 2005 to middle of 2008 and participants were selected using universal sampling. After the explanation about the quit smoking programme, the clients were requested to participate in the quit smoking attempts and if positive, the self-administered questionnaire were given. All clients who came to the quit smoking clinic during the data collection period agreed to make quit smoking attempts and participated in the questionnaire survey. A total of 495 participated in the study, and the response rate to the questionnaire was 100%. Such a high participation rate was possibly due to three reasons i.e. 1) participants who came to the quit smoking clinic had already made up their mind to stop smoking, 2) it was not time consuming to answer the short questionnaire and 3) the contents of the questionnaire were not personally nor culturally sensitive.

Instruments

The study tools were the questionnaire survey and clients' record review. The questionnaire had three parts. The first and second parts covered the socio-demographic characteristics of the client, the smoking history (captures the age of smoking initiation, tobacco consumption and cost, history of previous quit attempts, motivation to quit smoking), and the third part was the "Fagerstrom test", used to measure the level of nicotine dependency of the participants.

The records of the clients were reviewed at the end of their quit attempts, looking into their health status, number of visits, duration of the follow up, types and amount of NRT received and other relevant information. End of quit attempt by the participants were identified by either they receiving the quit smoking certificates or they abandoning the quit attempt. The quit smoking certificates were provided to the clients who successfully abstained from smoking for at least 6 months, not dependent on NRT, had negative urine nicotine tests and the expired carbon monoxide level found to be less than three.

Definition of variables

The outcome variable for the study was "receiving quit smoking certificate". The explanatory variables used for the logit model were socio-demographic characteristics (age, ethnicity and occupation), started smoking at teen age period, level of addiction, having high blood pressure, previous experience of quit smoking attempts, duration of follow ups and type of NRTs received.

The occupation of the participants were categorized into clerical or non clerical staff (clerical staff were clerks plus clerical support workers). The reference group to the clerical staff included all other occupations including housewives and students. Participants who started

smoking younger than 20 years old were categorized as "start smoking at teen age". The level of addiction of the participants was assessed by using Fagerstrom test (Fagerström, 1978). Score 0 to 3, 4 to 5 and 6 to 10 were categorized as low, moderate and high nicotine dependency respectively. In addition, practice of early morning smoking (within 30 minutes after waking up) was used as a proxy for dependency to nicotine.

We used similar definition for hypertension as in the National Health and Morbidity Survey III (Institute of Public Health, 2008). Hypertension is defined as having a systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg, or self reported hypertension on antihypertensive medication. The blood pressure of the participants was measured at the first visit by trained nurses. Duration of follow up visits was taken from the first visit to the time the participants stopped coming to the clinic (either they gave up their quit attempts or they could manage without counselling and/or NRT).

The clinic supplied various forms of NRTs such as patch, gum, inhaler or lozenges based on the level of addiction. Participants received only one type of NRT or a combination such as patch with either gum or inhaler or lozenges. We created the variable "type of NRT" based on whether participants received oral (gum, inhaler, lozenges), or patch, or combined NRTs.

Data management

STATA version 11 was used for data entry for both questionnaire survey and record review. During data entry, several controls were carried out in order to ensure the quality of the data. A set of logical checks were developed which made it impossible to enter numerical values in alphabetical fields or values beyond the pre-defined range. The researchers themselves checked the database for errors, missing values, outliers and implausible records.

Calculation

Descriptive and bivariate statistics (Student t test, and chi-square) were done as a preliminary analysis. Subsequently, a binomial logit model was developed in order to find out factors influential to maintain quit-smoking status. Probability of success among quitters is written as a logit equation by following Greene (Greene, 1997). The variables for the model were selected based on established evidence as well as on statistical ground. Most of the variables which we selected have $p \leq 0.02$ in the bivariate analyses. Logarithmic scale transformation was done for a continuous variable (duration of follow up visit) in order to get normal distribution before running the model. The predictors for the final model were selected by performing a backward stepwise multiple logistic regression analysis. Adjusted odds ratio is derived from the logit model as a measure of effect, describing the strength of association between explanatory and outcome variables. Where,

y = successful quit attempt [Yes = 1, Otherwise = 0]

X_j = a set of predetermined variables

β = a set of parameters to be estimated

There was a four years patients' data from 2005 to 2008. Some individuals who failed to quit smoking

Table 1. Success Rate of Quit Attempts

| Year | Total enrollment (number) | Quit successfully Number (%) |
|-------|---------------------------|------------------------------|
| 2005 | 153 | 33 (22%) |
| 2006 | 126 | 54 (43%) |
| 2007 | 170 | 81 (48%) |
| 2008a | 46 | 28 (61%) |
| Total | 495 | 196 (40%) |

* a Until end of June 2008.

Table 2. Descriptive Analysis (n = 495)

| Variables | Mean (SD) or Number (%) | | |
|----------------------------------|---------------------------|---------------------------|-----------------|
| | Failure to quit (n = 299) | Success to quit (n = 196) | Total (n = 495) |
| Age (years) | 37 (12) | 39 (12) | 38 (12) |
| Being Malay (yes = 1) | 201 (67%) | 139 (70%) | 340(68%) |
| Clerical staff (yes=1) | 54 (18%) | 24 (12%) | 78 (16%) |
| Start at teenage period (yes =1) | 224 (75%) | 134 (68%) | 358(72%) |
| Smoke 30 min aft wake up (yes=1) | 212 (71%) | 121 (61%) | 333(67%) |
| Level of addiction | | | |
| 1 (low) | 92 (31%) | 68 (35%) | 160(32%) |
| 2 (moderate) | 71(24%) | 61 (31%) | 132(27%) |
| 3 (high) | 124 (41%) | 57 (29%) | 181 (37%) |
| High BP (yes =1) | 52 (17%) | 60 (31%) | 112(23%) |
| Previous quit attempts | | | |
| 1 (no attempt) | 51 (17%) | 19 (10%) | 70 (14%) |
| 2 (1 to 3) | 165 (55%) | 124 (63%) | 289(58%) |
| 3 (>3) | 83 (28%) | 53 (27%) | 136(27%) |
| Duration of follow up (months) | 1.8 (2.5) | 5.6 (4.4) | 3.3(3.8) |
| Type of NRT | | | |
| 3 (combine) | 57 (19%) | 43 (22%) | 100(20%) |
| 2 (patch) | 49 (16%) | 34 (17%) | 83(17%) |
| 1 (oral) | 190 (65%) | 119 (61%) | 309(62%) |

in initial years might enrol in the clinic in subsequent years and the same individual might have different quit attempts. As we expected, 30 repeated observations were found since 15 individuals enrolled twice because of relapse. This heterogeneity was controlled by applying Huber/White/Sandwich estimator for variance. The idea was to treat the observed outcome as independent across individuals but not necessarily independent within individuals.

The model goodness-of-fit was assessed by Hosmer-Lemeshow test. Variance Inflation Factor (VIF) was derived in order to detect multicollinearity i.e. the correlation between or among explanatory variables. The mean VIF for the final model was 1.52. According to Allison (1999), the value of VIF less than 2.5 is regarded as indicating no collinearity in the model(Allison, 1999).

Results

The mean age of the study participants was 38 years (SD 12.2 yr) and 96% were male. More than two third of participants were Malay and Muslim. Students made up 3% of the participants. About 37% of the participants were high nicotine dependent and 27% was moderate. 72% of them started smoking in their teen age period and

Table 3. Factors Influencing Success of Quit Smoking Attempts (n =473)

| Variables | Adjusted Odd ratio (95% confidence interval) | Robust Standard Error |
|------------------------------------|--|-----------------------|
| Age (years) | 0.98 (0.96 – 1.01) | 0.011 |
| Being Malay (yes = 1) | 1.80 (1.02 – 3.26)* | 0.539 |
| Clerical staff (yes=1) | 0.38 (0.17 – 0.82)* | 0.149 |
| Start at teenage period(yes =1) | 0.48 (0.25 – 0.89)* | 0.152 |
| Smoke 30min aft wake up (yes=1) | 0.69 (0.33 – 1.41) | 0.252 |
| Level of addiction | | |
| 1 (low) | Ref | |
| 2 (moderate) | 1.36 (0.65 – 2.82) | 0.507 |
| 3 (high) | 0.74 (0.31 – 1.75) | 0.325 |
| High BP (yes =1) | 1.93 (1.04 – 3.5)* | 0.609 |
| Previous quit attempts | | |
| 1 (no attempt) | Ref | |
| 2 (1 to 3) | 1.90 (0.96 – 3.79) | 0.668 |
| 3 (>3) | 1.23 (0.54 – 2.79) | 0.513 |
| Duration of follow up (log. scale) | 6.39 (4.39 – 9.29)** | 1.221 |
| Type of NRT | | |
| 1 (combine) | Ref | |
| 2 (patch) | 2.75 (1.09 – 6.95)* | 1.302 |
| 3 (oral) | 2.26 (1.17 – 5.87)* | 1.078 |

* 5% significant level, **1% significant level

almost all respondents received Nicotine Replacement Therapy (NRT). However only 20% received combined therapy. The mean duration of follow up was 3.3 months. Among the study participants, 71% decided to quit smoking to avoid health risks related to tobacco. Having a disease and advice from doctors (12%), financial reasons (11%), encouragement by family members (3%), social unacceptability (3%) were also identified as motives for smoking cessation.

Among all enrolees of the quit smoking clinic within the data collection period, 40% of them had successful quit attempts. Table 1 shows the success rate of quit attempts based on enrolment to the clinic from 2005 to 2008. The results of the descriptive analysis are presented in Table 2.

The results from the logit model are presented in Table 3. The factor “being Malay”, “having high blood pressure” “receiving NRT oral or NRT patch” and “duration of follow up visit” had positive association to quit smoking successfully. In contrast, clerical staff had negative association to quit smoking. Participants who started smoking in their teenage period had high risk of relapse.

Compared to other ethnic groups, being Malay had 1.8 times more chance to quit smoking successfully. Being clerical staff had 62% less chance for success. Similarly, people who started smoking since their teen age period have 52% less chance of a successful quit attempt.

The participants who had high blood pressure were almost two times more likely to have a success quit attempt. Duration of follow up to quit smoking clinic had positive and significant association for successful quit attempt. The level of addiction and previous experience of quit attempt did not have significant effect on the success of

a quit attempt. Compared to smokers who had combined NRT, those who had either oral or patch alone were more than two times more likely to maintain their quit smoking status.

Discussion

To summarise the results, being Malay, having high blood pressure, regular attendance to the follow up clinic, receiving NRT patch or NRT oral have positive association to quit smoking successfully. Clerical staff and those who started smoking at teen-age period had high risk of relapse.

Occupation is one of the factors related to fail quit attempt. Smoking affects not only the smokers' health but also harms others. Beginning from 1980s, the danger of passive smoking and public health impact were discussed widely. As a consequence, smoking is banned in many public places and work sites in order to protect non-smokers from second-hand smoke (Chapman, 2007). A study conducted in Malaysia found banning smoking at the working place was one of the reasons to quit smoking among workers from the security unit of a public university (Ming, 2007). Work site health promotion programme for specific categories of staff to encourage smoking cessation would be worthwhile and the quit smoking clinics should provide technical support to work site health promotion programmes.

Smoking initiation age plays an important role in the degree of addiction (Hyland et al., 2006). Our study supported the above finding that participants who started smoking during their teen age period were very likely to relapse. Further qualitative studies are needed to determine the exact needs of that particular group, so that the quit smoking clinics would be able to provide tailor-made assistance for them. Otherwise, it would have devastating effects on the future generations and a major public health concern for the country since the rural-based household survey conducted in one of the states in Peninsular Malaysia showed more than 60% of ever smokers started smoking during their teen age period (Su et al., 2009). The reasons for the initiation of smoking among adolescents were curiosity, peer pressure and the feeling of being more matured (Al-Sadat and Binns, 2008, Al-Sadat et al., 2010). In addition, evidence from recent studies showed there was an increase in smoking rates among female adolescents in Malaysia (Al-Sadat and Binns, 2008, Al-Sadat et al., 2010). Health education programmes and anti smoking campaigns should be actively carried out in secondary schools so as to prevent the initiation of smoking among adolescents.

One study reported that health related reasons, social unacceptability and expense incurred for smoking were additional reasons for the decision to quit smoking (Hyland et al., 2004). Among these reasons, health concerns appeared to be a primary motive for quit attempts in several international studies (Bane et al., 1999, McCaul et al., 2006, Yang et al., 2006) and a study conducted in Malaysia (Ming, 2007). The results of the descriptive analysis of our study were in line with findings of the previous studies. Intention to avoid health risks and having a disease were also identified as motives

for smoking cessation. Findings from our multivariate analysis supported the fact that having a chronic disease (hypertension) was one of the strong factors leading to smoking cessation successfully. People with hypertension had a high chance to quit smoking. Hypertension is one of the major health problems in Malaysia. The prevalence of chronic diseases among the Malaysian population was 15.5% and the most common chronic illness reported was hypertension followed by diabetes mellitus (Institute of Public Health, 2008). The household survey conducted in Perak state in 2010 showed that 8.3% of the population with hypertension were current smokers (CRP, 2010). There would be a promising possibility if quit smoking clinics could work hand in hand with primary care clinics to promote smoking cessation among hypertensive patients.

We assumed that participants who were highly dependent to nicotine would be more likely to relapse. However, our findings contradicted our assumption in that there was no association between level of addiction and success of quit attempts. It could be that Tanglin clinic gives free NRT to overcome the withdrawal symptoms of the clients during their quit attempts. The findings from the multivariate analysis supported our assumption that the types of NRT received have significant effect on the success of the quit attempts. The clinic should relook the treatment guideline. Exact criteria for the choice of NRT and strict adherence in following up such criteria are required for the quit smoking clinics.

Quit smoking clinics are essential in assisting their clients to quit smoking because without assistance, the success rate would be low. Approximately, not more than 25% of smokers who attempt to quit can achieve 6 months of abstinence (USDHHS, 1990). Overall success rate for Tanglin clinic was 40%. It was significantly higher than the success rate of those who received no assistance. Our study proved that regular attendance of follow up clinics played an important role to prevent relapse. Active follow-up is one of the possible measures to reduce the rate of relapse and some studies explored the importance of active follow up (Richmond et al., 1986; 1993).

According to the findings from previous population based studies, the habitual quitters repeatedly try but failed to stop smoking (Zhou et al., 2009). However, our result contradicted the previous studies that there was no significant difference between previous quit attempts and the success of quit attempt. It seems the support provided by the clinic might end the habitual quitter phenomenon. Those who tried to quit on their own and used to fail the quit attempts should be advised to seek the assistance from the quit smoking clinics.

The limitation to our study was that the participants were in contact with the clinic to the point when they received their quit smoking certificates. It is also important to know the percentage of those who received "quit smoking certificates" and could maintain their non-smoking status. This information is still not available in the clinics due to the absence of active follow up programmes for ex-smokers after receiving quit smoking certificates. We would like to recommend exploring this area for further research.

In conclusion, integration of quit smoking clinics and the primary care clinics could be another potential step for the success of the quit smoking programme. Work site health promotion programme for specific categories of staff would be worthwhile so as to encourage the adoption of a healthy life style. Further studies are needed to determine the exact needs of the particular group such as those who started smoking during their teen age period. To that particular group, the quit smoking clinic would be able to provide tailor-made assistance accordingly. Health education programmes and antismoking campaigns should be actively carried out in high schools in order to prevent initiation of smoking among adolescents.

Funding of smoking cessation services would help a considerable number of people to quit smoking permanently and prevent lethal health hazards and economic burden of illness due to tobacco smoking.

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