PUBLIC HEALTH RESEARCH

Outcome and Predictors for Smoking Cessation in a Quit Smoking Clinic

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ABSTRACT

Received 19 September 2016
Accepted 28 February 2017

Introduction Smoking is one of the addiction problems that needs an effective intervention. Smoking cessation studies have shown the promising result, but the central issue was to prevent relapse. A retrospective cohort study was conducted at Quit Smoking Clinic in Klinik Kesihatan Tanglin, Kuala Lumpur to determine the outcome and predictors of smoking cessation.

Methods A cohort of 770 smokers attended the clinic between the year 2008 and 2015 was selected through simple random sampling. Smokers were defined as current smokers while smoking abstinence is defined as cessation for more than 6 months and relapse as any smoking episode even a puff since the quit date.

Results The majority were Malays, Muslims and had at least secondary education. The mean age of smoking initiation was 17.6 years old. The majority of the respondent smokes between 11 to 20 sticks per day and had a higher nicotine dependence score (43.0%). The smoking cessation outcome was good with 52.5% of the respondent abstained from smoking at 6 months. The predictors for smoking cessation were numbered of the quit attempt (1 to 10 times) (AOR = 1.582, 95% CI = 1.012-2.472*)* and pharmacotherapy (aOR = 0.711, 95% CI=0.511-0.989).

Conclusions More frequent follow-up was essential during the first 6 month period to enhance not only medication compliance but also a motivational aspect to smokers to maintain cessation. Emphasis should also be made for smokers who make first quit attempt.

Keywords Kuala Lumpur – Quit Smoking Clinic – Smoking Cessation – Cohort.

INTRODUCTION

Tobacco smoking was one of the leading preventable cause of non-communicable disease (NCD) mortality based on the Global Burden of Disease 2010.[1] Smoking still remains as one of the main public health problems in Malaysia. According to WHO Report 2015, [2] the prevalence of smoking in Malaysia in 2015 was estimated at 21.7%, compared to the global prevalence of 21%. The latest National Health and Morbidity Survey (NHMS) 2015 shows the prevalence of smoking was 22.8%. [3] Furthermore, according to the Global School-Based Student Health Survey in 2012, the prevalence of smoking among youth was alarming at 20.9%. Based on Malaysia GATS Report 2010, [4] the quit ratio among Malaysian adults was 9.5% but differed according to age group with lowest 3.4% in 15 to 24 age group and 34% in those more than 65 years old. Given the highest benefit of smoking cessation in younger age group, it is important to look into factors affecting this disparity .[5] Despite low quit rate, the prevalence of at least one quit attempt among smokers was nearly half (48.6%) and almost 80% of them attempted without any assistance.[4] Almost 32.4% of smokers who stop smoking for the past 12 months had a history of visiting a health care provider. [4] Yet, only half of them being advised to quit by health care provider.[4] Therefore, the window of opportunity for health care provider to reinforce smoking cessation intervention not been fully utilised.

WHO Framework Convention on Tobacco Control (FCTC) requires every party involved to take effective measures to promote tobacco cessation and adequate treatment for tobacco dependence.[6] Malaysia became one of the signatory parties of FCTC in 2005. The treatment for tobacco dependence includes the provision of behavioural support or medications or both. Based on the national clinical practice guideline intervention that was offered in Quit Smoking Clinics includes counselling, behavioural modification and pharmacotherapy. [7] There are more than 294 Quit Smoking Clinics at government health clinics with a different success rate.[8] Hence, the outcome of the Quit Smoking Clinic needs to be explored further in detail. Studies for smoking relapse and cessation were mostly conducted in the Western population. There are limited studies in Malaysia that look into the natural courses of smoking cessation and factors associated with smoking cessation with very limited data and lack of generalizability to analyse this pattern. [9,10,11] It is important to understand factors that are contributing to cessation to provide new insight and direction. Therefore, this study intends to look into the outcome of Quit Smoking Clinic and the predictors for smoking cessation. By understanding factors related to successful cessation, a suggestion for the quit smoking program modification can be made to help smokers achieve lifelong smoking cessation.

METHODS

Study area

A retrospective cohort study was done at the Tanglin Quit Smoking Clinic, located in Klinik Kesihatan Tanglin, Kuala Lumpur. It was one of the pioneer clinics in government health facilities that provide smoking cessation service. It has started its operation since 2004. This study was approved by the Medical Research Ethics Committee, Ministry of Health Malaysia (Ref no: 5KKM/NIHSEC/P16-125).

Instrument and participants

This study used secondary data retrieved from the clinic records. A list of all smoker attending the clinic was acquired and entered into a standardised proforma by the research enumerator. Exclusion and inclusion criteria were then applied. The study population was defined as all new smokers registered with the Quit Smoking Clinic between 1st of January 2008 until 30th September 2015. The exclusion criteria were those who only came once during registration without any further follow up, case files with missing main dependent variables and missing case files. Based on the final list of smokers, a simple random sampling method was applied.

Smokers received a standard counselling session and behavioural modification therapy. The intervention was then given either nicotine replacement therapy, other pharmacotherapy (Bupropion or Varenicline) or cold turkey method. The quit date was defined as quit smoking attempt for 24 hours and are considered as quitters. The quit date is considered as the zero time. After making a quit attempt, respondent was follow up weekly for the first month, and two weekly for the second and third month. After that monthly from fourth until sixth months. Those who successfully quit smoking at 6 months will be tested through carbon monoxide analyser. Those who defaulted for follow-up were contacted by telephone. The follow-up period was 6 months and the primary endpoint was the relapse episode. During the follow-up and telephone calls, participants were asked if they had any episode of smoking even a puff and the date was verified. Relapse was defined as any episode of smoking even a puff since the quit date. Censored was considered when the study

ended on 31st March 2016 and when they were unable to be followed up by visit or telephone call (the last date of follow-up is considered). The method of treatment and allocation of treatment at the quit smoking clinics were based on the Malaysian Clinical Practice Guidelines for Treatment of Tobacco Smoking and Dependence, 2003. [7]

The explanatory variables were sociodemographic characteristics and smoking characteristics. The sociodemographic were age, gender, ethnicity, occupation, education level, marital status, and religion. Occupation was furthered divided into 4 main groups based on Malaysia Standard Classification of Occupations (2008) .[12] The nicotine addiction scores were based on Modified Fagerstrom Test for Nicotine Dependence questionnaire and categorised into low (0-3), medium (4-5) and high (6-10).[13] The smoking characteristics were initiation age of smoking, the number of cigarettes smokes per day, a method of acquiring the first cigarette, type of smoking, numbers of years smoking, the reason for a quit attempt, the number of the quit attempt, method of intervention and comorbidity.

Statistical analysis

Data was entered and analysed using SPSS version 21.0. In descriptive statistic, categorical data were presented as percentage (%) and continuous data were described either mean and standard deviation or median and interquartile range. All missing data were excluded from the analysis. Significant level was taken at alpha (α) of 0.05 and all *p* values reported are two sided. For the predictor of smoking cessation, univariate analysis was done using simple logistic regression to obtain the crude odds ratio. Factors that are significantly associated were included in the multivariate analysis. For multivariate analysis, multiple logistic regression methods were used using ENTER method to determine the adjusted odds ratio and its 95% confidence interval. The sample size was calculated based on Lemeshow and Lwanga formula [14] for hypothesis testing for two population proportion as in Figure 1 below. A minimum sample size of 770 was needed to detect 8% differences of smoking cessation between two group with 80% power at a significance level of 0.05.

Figure 1: Hypothesis testing for two population proportion formula.

$$N = \frac{\left(Z_{\alpha/2}\sqrt{2p(1-p)} + Z_{1-\beta}\sqrt{p_1(1-p_1)p_2(1-p_2)}\right)^2}{(p_1-p_2)^2}$$

Where,
N = Sample size estimate
$Z_{\alpha/2}$ = standard error associated with 95% confidence interval = 1.96
$Z_{1-\beta}$ = standard error associated with 80% power = 0.842
P_1 = population proportion 1
P_2 = population proportion 2
$P = (P_1+P_2) / 2$
The chosen sample size estimation was based on initiation age of starting smoking and cessation. The calculation was based on smoking cessation study in Malaysia [15].
$P_1 = 0.37$ (proportion of cessation among smoker starting smoking at teenage)
$P_2 = 0.45$ (proportion of cessation among smoker starting smoking in adulthood)
$P = P_1+P_2 / 2 = (0.37 + 0.45) / 2 = 0.41$

$$N = \frac{\{1.96\sqrt{2}(0.41)(1-0.41) + 0.842\sqrt{0.37(1-0.37)0.45(1-0.45)}\}^2}{(0.37-0.45)^2}$$

$= 383$
Taking into account adjustment for comparison between two groups = 383 x 2 = 765
Estimated sample size was rounded to 770.

RESULTS

The total number of smokers attended the Quit Smoking Clinic from 1st January 2008 to 30th September 2015 was 893 smokers. Based on the inclusion and exclusion criteria, there were 6 missing files from the medical records, 7 were excluded for being non-Malaysian, another 6 due to no follow-up after enrollment and further 13 were excluded due to missing dependant variable. The final eligible smokers based on the inclusion and exclusion criteria were 861 from which, a simple random

sampling was performed to get the required 770 sample size.

Sociodemographic and smoking characteristics

Table 1 describes the sociodemographic characteristics of the smokers. The mean age was 38.6 year (±SD 12.8) and 95.5% of the smokers were male. The majority are Malay (69.6%), Muslim (71.3%), married (69.5%) and had at least secondary education. In terms of occupation, the majority are from the professional, managers and technician groups. Table 2 describe the smoking characteristics of smokers. The majority of them initiate smoking at the age of secondary school (13-18) and acquired the first cigarette through friends (66.6%). The mean cigarette per day was 18 and the mean money spent per day was around RM 10. The type of cigarette was mostly manufactured cigarette (93.2%). In terms of quit smoking attempt, the majority have had an attempt before and the main reason cited for quitting the habit was concerning personal health. However, a 24.4% of them did not report any co-morbidity. The mean nicotine addiction score was 4.9 (±SD 2.5).

Table 1 Baseline sociodemographic characteristics of smokers. (n=770)

Characteristics	Mean (±SD)	n (%)
Age (Years)	38.6 (12.8)	
18 or less		41 (5.3)
19-30		196 (25.5)
31-40		211 (27.4)
41-50		170 (22.1)
51 or more		152 (19.7)
Gender		
Male		735 (95.5)
Female		35 (4.5)
Ethnicity		
Malay		536 (69.6)
Chinese		123 (16.0)
Indian		95 (12.3)
Others		16 (2.1)
Religion		
Muslim		549 (71.3)
Christian		28 (3.6)
Buddha		99 (12.9)
Hindu		77 (10.0)
Other		17 (2.2)
Education level		
Primary or no		83 (10.8)
Secondary		371 (48.2)
Diploma or higher		316 (41.0)
Marital status		
Single		217 (28.2)
Married		535 (69.5)
Divorced		18 (2.3)
Occupation		
Professional, managers or technicians		313 (40.6)
Clerical, service or arm forces		182 (23.7)
Manual		145 (18.8)
Retiree, housewife, students or unemployed		130 (16.9)

Table 2 Baseline smoking characteristics of smokers (n=770)

Characteristics	Mean (± SD)	n (%)
Initiation age of smoking (Years)	17.6 (4.2)	
12 or less		50 (6.5)
13-18		468 (60.8)
19 or more		252 (32.7)

Mean cigarette per day	18.0 (9.5)	
10 or less		194 (25.2)
11-20		435 (56.5)
21 or more		141 (18.3)
Years of smoking	21.1 (12.0)	
10 or less		151 (19.6)
11 -20		258 (33.5)
21-30		196 (25.5)
31-40		113 (14.7)
41 or more		52 (6.7)
How to acquire the first cigarette		
Self		227 (29.5)
Family		30 (3.9)
Friends		513 (66.6)
Smoking type		
Manufactured cigarette		718 (93.2)
Kretek		45 (5.9)
Hand-rolled cigarette		7 (0.9)
Number of quit attempt		
0		103 (13.4)
1-10		601 (78.0)
11 times or more		66 (8.6)
Reason for quit		
Concern for own health		503 (65.3)
Concern for people around		66 (8.6)
Price of cigarette		154 (20.0)
Others		47 (6.1)
Fagerstrom Test for Nicotine Dependence Score	4.9 (2.5)	
Low (0-3)		227 (29.5)
Medium (4-5)		210 (27.3)
High (6-10)		333 (43.2)
Method of Intervention		
Nicotine replacement therapy		282 (36.6)
Other pharmacotherapy (Varenicline or bupropion)		484 (62.9)
Cold turkey		4 (0.5)
Comorbidity		
No		582 (75.6)
Yes		188 (24.4)

Outcome results

The outcome of the smoking cessation attempt was described in Table 3. All 770 smokers were able to set a quit date and make a quit attempt. After the initial quit date, 404 (52.5%) of the respondent were able to maintain smoking cessation at 6 months follow-up. In terms of visit follow-up, the majority of the respondent attended at least 3 visits follow up after the quit date.

Table 3 Outcome of quit smoking clinic (n=770)

Characteristics	n (%)
No of visit follow up attended	
First	11 (1.4)
Second	83 (10.8)
Third	676 (87.8)
Quit Attempt (Quitters)	770 (100)
Outcome (Quit rate)	
Abstinence	404 (52.5)
Relapse	366 (42.5)
Quit rate by year (No of enrolment)	
2008 (n=84)	53 (63.1)
2009 (n=126)	55 (43.7)
2010 (n=89)	49 (55.1)

2011 (n=132)	83 (62.9)
2012 (n=96)	60 (62.5)
2013 (n=87)	51 (58.6)
2014 (n=82)	41 (50.0)
2015 (n=74) *	12 (16.2)

*Until 30th September 2015

Predictors of smoking cessation

Simple logistic regression was used to determine the crude odds. Multiple logistic regression using ENTER method was then used to determine the adjusted odds ratio and predictors for smoking cessation. Table 3 shows the significant variables that are a number of quit attempt and method of interventions after adjusted for age group, gender, and ethnicity. Those with previous quit attempt (1-10) have 1.6 times higher odd for cessation compared to those first time attempt. That given Varenicline or Bupropion have lower odd for cessation compare to those given nicotine replacement therapy (aOR = 0.711). Multicollinearity assumptions were checked and the model was valid (χ^2=60.588, df=23, *P* <0.001). However, the model only explained 10.1% of the variation in the smoking cessation (Nagelkerke R^2= 0.101).

Table 4 Predictors of smoking cessation

Variable	Outcome n(%)			Crude OR (95% CI)	Adjusted OR (95% CI)	P
	Cessation	Relapse	Total			
Age group						
18 or less	23	18	41 (5.3)	Reference	Reference	
19-30	130	66	196 (25.5)	1.571(0.777-3.178)	1.277(0.490-3.327)	0.617
31-40	129	82	211 (27.4)	2.100(1.043-4.229)	1.150(0.378-3.497)	0.806
41-50	111	59	170 (22.1)	3.194(1.561-6.537)	1.459(0.403-5.280)	0.565
51 or more	88	64	152 (19.7)	2.513(1.222-5.167)	2.648(0.591-11.868)	0.203
Ethnicity						
Malay	342	194	536 (69.6)	Reference	Reference	
Chinese	67	56	123 (16.0)	1.267(0.853-1.883)	1.104(0.711-1.716)	0.659
Indian	59	36	95 (12.3)	0.909(0.587-1.406)	0.855(0.537-1.362)	0.510
Others	13	3	16 (2.1)	0.928(0.343-2.509)	1.147(0.413-3.182)	0.793
Gender						
Male	461	274	735 (95.5)	Reference	Reference	
Female	20	15	35 (4.5)	0.399(0.193-0.826)	0.515(0.235-1.130)	0.098
Education level						
Primary or no	47	36	83 (10.8)	Reference	Reference	
Secondary	233	138	371 (48.2)	1.819(1.122-2.949)	1.309(0.712-2.404)	0.386
Diploma or higher	201	115	316 (41.0)	1.535(0.941-2.506)	1.166(0.626-2.173)	0.629
Marital status						
Single	131	86	217 (28.2)	Reference	Reference	
Married	337	198	535 (69.5)	1.652(1.202-2.270)	1.061(0.699-1.612)	0.780
Divorced	13	5	18 (2.3)	1.027(0.390-2.704)	0.843(0.296-2.399)	0.749

Table 4 Predictors for smoking cessation (Continue)

Variable	Outcome n(%)			Crude OR (95% CI)	Adjusted OR (95% CI)	P
	Cessation	Relapse	Total			
Initiation age of smoking (Years)						
12 or less	33	17	50 (6.5)	Reference	Reference	
13-18	283	185	468 (60.8)	1.251(0.696-2.250)	1.148(0.596-2.211)	0.680
19 or more	165	87	252 (32.7)	1.872(1.014-3.453)	1.485(0.708-3.116)	0.296
Years of smoking						
10 or less	97	54	151 (19.6)	Reference	Reference	
11 -20	158	100	258 (33.5)	1.733(1.151-2.608)	1.594(0.905-2.805)	0.106
21-30	130	66	196 (25.5)	2.886 (1.860-4.478)	2.158(0.965-4.824)	0.061
31-40	67	46	113 (14.7)	1.881(1.147-3.084)	0.836(0.282-4.478)	0.746
41 or more	29	23	52 (6.7)	1.485(0.787-2.802)	0.570(0.159-2.039)	0.387
Number of quit attempt						
0	64	39	103 (13.4)	Reference	Reference	
1-10	376	225	601 (78.0)	1.644(1.078-2.507)	1.582(1.012-2.472)	0.044*

11 times or more	41	25	66 (8.6)	1.051(0.563-1.960)	1.001(0.520-1.926)	0.998
Method of Intervention						
Nicotine replacement therapy	159	123	282 (36.6)	Reference	Reference	
Other pharmacotherapy	319	165	484 (62.9)	0.803(0.598- 1.078)	0.711(0.511-0.989)	0.043*
(Varenicline or bupropion)	3	1	4 (0.5)	12862(0.001-e)	162562(0.001-e)	0.999
Cold turkey						
Comorbidity						
No	367	215	582 (75.6)	Reference	Reference	
Yes	114	74	188 (24.4)	1.551(1.110-2.168)	1.310(0.888-1.932)	0.174

* P<0.05

R^2= 0.101 (Nagelkerke)

DISCUSSION

The sociodemographic characteristics of the respondent were generally comparable to previous studies. [10,11] Most of the smokers were between 19 to 50 years old with the mean age of 39. The majority were from working age group and more than 95% of the smokers that attended the clinic were male consistent with the NHMS findings.[3] In terms of the ethnicity composition, the majority of them were Malays and had at least secondary education level. NHMS 2015 findings also show that the prevalence of smoking in tertiary education group was low but the prevalence of quit attempt was higher and it increased with level of education.

The mean initiating age of smoking was 17 years old and majority starts smoking during their secondary schools. Therefore, these explain the findings that majority acquired their first cigarette through friends due to peer influence. Other published local study demonstrates similar findings. [9,10,11,15] It is important that smoking cessation and prevention activity should be enhanced at the school level. All of the smokers attended were cigarette tobacco users with more than 93.2% of them smoke manufactured cigarette. More than 86.4% of the smoker had a quit attempt before. Thus they were themselves a relapser either with or without assistance.

Nevertheless, only 37.5% of them relapsed at the end of the follow up with 23.9% relapsed less than 6 months. Other published local studies also have shown similar findings. [9,10,11,15] Most of the reason cited for quitting were for their own health despite only one-fourth of the smokers reported having a medical illness. Overall, all smokers were able to set a quit date and make a quit attempt. More than 52.5% able to maintain smoking cessation for more than 6 months. This result is higher than others reported at local health clinics. Lee reported 31.8% of smokers attending QSC in Federal Territory from 2006 to 2007, while other studies showed a range between 17% to 30%. [9,11,16] Based on the NHMS Report 2015, Kuala Lumpur had the highest proportion of current smokers who have made a quit attempt in the past 12 months. [3]

In the multivariate analysis, a method of intervention and previous quit attempt was significantly associated with smoking cessation. Those have previous quit attempt less than 10 have higher odds for cessation, compare to the first timer. A study from a large cohort survey has indicated that smokers will make multiple quit attempt and eventually succeed. [17] Factors associated with successful cessation might be different for smokers who make the first attempt and on subsequent attempts. Borland [18] suggest that there are differences in motivation for smokers making quitting attempt and ex-smoker who maintain cessation. These motivational factors were not studied and captured in this research. Motivation emphasis should be made to those who make the first quit attempt in order for them to succeed and reattempt.

This study found that those receiving pharmacotherapies have lower odds for cessation compare to NRT. Based on a Cochrane review in 2013, Varenicline was shown to be more effective compared to NRT or Bupropion alone or when compared to placebo.[19] This study found contradicting finding, as those receiving pharmacotherapies have lower odds of cessation compare to NRT. However, there is a factor associated with those that are not measured such as medication compliance, combination therapy and counselling sessions attended. Other local study concurred that more frequent follow-up associated were more likely to quit. [9,11] Frequent follow-up can enhance compliance issue, providing counselling to enhance cessation and motivate them to maintain cessation. A study by Wu [20] found that additional follow-up such as by telephone, post cessation can enhance smoking cessation and prevent relapse. Schedule follow-up and additional telephone followed up were also among the recommended measures to maintain smoking cessation.[7]

The limitation of this study was information bias with the cessation verification. The date was based on self-reporting, which has a potential for recall bias. There was also a limitation with the verification of smoking cessation status as some were only verified through telephone follow-up without carbon monoxide (CO) analyser as they do not turn up for visit follow-up. Therefore, we cannot use CO analyser as standard confirmation of smoking cessation status. However, Pisinger [21] found no difference between biochemical validation and self-reported results.

CONCLUSION AND RECOMMENDATION

Overall, the outcome of smoking cessation at the Tanglin Quit Smoking Clinic was good with 52.5% of the smokers have achieved smoking abstinence at 6 months follow-up. The predictors for smoking cessation are the number of quit attempts and methods of intervention. Those who had previous attempts of less than 10 and those receiving NRT were more likely to achieve cessation, compare to the first timer and other pharmacotherapy group respectively. It is recommended that healthcare providers should increase the frequency of follow-up during the first 6 month period to enhance medication compliance and also a motivational aspect to smokers. Emphasis should also be made for those who make first quit attempt. It is also recommended that further studies at the local health clinics should look at other related factors such as environmental, psychological and social factors. These areas will be able to address other factors that contribute to the cessation in quit smoking attempts. Health clinics should also capture this data for further monitoring and evaluation of the quit smoking clinic outcome.

Funding: None
Conflict of interest: None declared
Ethical approval: Ethical approval has been obtained for this study from the UPM Ethics Committee for Research Involving Human Subject [UPM/TNCPI/RMC/1.4.18.1(JKEUPM)/F1] and MOH Medical Research Ethics Committee (MREC) (5KKM/NIHSEC/P16-125).
Acknowledgements: We would like to thank the Director General of Health Malaysia for his permission to publish this article.

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