Rate of smoking cessation and factors associated with successful quit smoking in Seremban District of Malaysia

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ABSTRACT

Introduction: Smoking is a major public health significant and a leading preventable cause of premature mortality. Assisting smoking cessation is important due to potential positive health impacts. The establishment of “Quit Smoking Clinics” reflect a great commitment by the health authority to reduce the national burden of smoking prevalence.

Aim: The objective is to measure the prevalence of smoking cessation and factors associate with successful quit smoking in all public healthcare “Quit Smoking Clinic” in Seremban district, Malaysia.

Method: This retrospective cross-sectional study uses registry data and clinical notes from public healthcare clinics in Seremban district from January 2019 to June 2019. The outcome of interest was the proportion of smokers that enrolled in “Quit Smoking Clinic” who remained abstinent at six months of follow-up. Multivariate analysis was done to determine the predictors for successful smoking cessation in the study.

Result: Out of the 285 smokers included in this study, 86 smokers (30.2%) quit smoking in this programme. Significant predictors of quitting smoking were use of nicotine replacement therapy (NRT), frequency of attending the appointments, presence of diabetes comorbidity, and Malay ethnicity. The Hosmer test showed a good model fit (p-value 0.998) and area under the curve (AUC) was 0.96% (95% CI 0.94–0.98) in the receiver operating characteristic (ROC) curve.

Conclusion: The “Quit Smoking Clinic” programme showed good outcome and the service should be expanded to the private sector. Predictors for smoking cessation identified can be used by policy makers to design more targeted approaches, ensuring more smokers quit smoking.

1. Introduction

Smoking remains a public health threat though it can be prevented. The World Health Organisation (WHO) reported around 8 million people a year succumbed to death due to smoking, with current estimated numbers of 1.3 billion smoker worldwide.¹ In addition, almost 80% of them live in low-and-middle income countries. In Malaysia, the prevalence of smoking has plateaued over three decades; the prevalence

remained steady at 24.8% in 1996, 21.5% in 2006, and 22.8% in 2015 among the population.² The reasons there was a small increase between 2006 and 2015 are as yet unknown, but one postulated factor is the increase in smoking rates amongst previously non-smoking groups, namely women and adolescents.

The harmful health effects of smoking is well known and have been documented in numerous epidemiological studies. The devastating negative impacts are not only seen among smokers, but in non-smoker

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due to second hand smoke exposure. The mechanism by which smoking causes diseases involves multiple complex pathways such as exposure to free radicals from the components of tobacco smoke that subsequently lead to increased oxidative stress, inflammation, and DNA damage.³ Nonetheless, other chemical toxins that are present in cigarettes can be transported to nearly every part of the body, thus exerting carcinogenic effects.⁴ The causal relation between smoking and cancers of the head, neck, liver, bladder, cervix, oesophagus, colon, and rectum has been well documented in the literature. In addition, smoking is also associated with the development of chronic pulmonary diseases such as chronic obstructive pulmonary disease and is known to exacerbate asthma.⁵

Although prevention of smoking initiation is of paramount importance, quitting from current smoking status is equally crucial. The need for smoking cessation stems from its potential benefit gained. Besides enjoying better quality of life, the cardiocirculatory function will improve immediately, injured lungs start to heal within 1 year, and the risk of developing coronary diseases and cerebral accidents halves.^{1,6} In view of the direct and indirect impact of smoking towards burdens of disease as well as the benefit gained from smoking cessation, Malaysia as well as other countries has signed a declaration to accelerate “hard-hitting” measures to reduce tobacco use under the document called the Framework Convention on Tobacco Control (FCTC) led by WHO.⁷ One of the outlined measures is offering help to quit smoking.⁸ In response to this, the Malaysian Ministry of Health (MOH) has launched a range of initiatives through various platforms including collaboration with other government agencies, as well as through community empowerment, such as *Komuniti Sihat Pembina Negara* (KOSPEN; loosely translated to “Healthy Community Builds the Nation”). Within the MOH itself, Quit Smoking Clinics have been established to ensure the availability of the service in the community is free of charge.⁹ Quit Smoking Clinics were set up by central government in 2011, offering pharmacological (nicotine patches and Nicorette) and psychological treatment (motivational interviewing) for quitting smoking. Such clinics are part of pre-existing government health clinics, and usually contain a medical officer, a nurse, a medical assistant, and a trained counsellor where possible. Individuals are referred and follow an algorithm lasting 24 weeks, with a combination of in-person and telephone treatment offered.⁹

Apart from counselling and pharmacological treatment, identifying factors associated with successful smoking cessation is imperative to enhance the smoking cessation rate. Evidence shows that multiple factors can predict successful quit smoking outcomes. Among the predictors are; smokers who are in the elderly age group, married status, have junior or high school education, higher income, smoking less than 20 cigarettes per day, delayed involvement in smoking, perception of one’s health as good or excellent, and lower level of stress, are more likely to quit smoking.¹⁰ However, to the best of the authors’ knowledge there is no local evidence, at specific district level, determining predictors for smoking cessation. Conducting localised situational analyses is crucial especially as the population of Malaysia (generally) and Seremban district (specifically) is so diverse racially and culturally. Through identification of localised predictors for smoking cessation, policy makers can formulate more targeted approach that will yield higher quit smoking rates. The aims of this study is hence to describe the prevalence and factors associated with smoking cessation among clients attending the public “Quit Smoking Clinic” in Seremban District, Malaysia, throughout the year 2019.

2. Methods

2.1. Study design

This is a retrospective cross sectional study. Data were obtained through examining records of all smokers who attended “Quit Smoking Clinics” in all 12 public health facilities in Seremban district, from January 2019 to June 2019. The authors (MAIAZ, SAAK, AHA & AAI)

extracted the data from all the case notes for every visit and follow-up. Any discrepancy of information was verified with the medical personnel in charge.

2.2. Sample and procedure

The samples were smokers who attended clinics who had either been self-referred or had been referred by their doctors from out-patient clinics or Non-Communicable Disease clinic. The “Quit Smoking Clinics” have designated and trained health personnel with competence in the module to assist smokers to quit smoking. They are also trained to provide brief intervention and free nicotine replacement therapy (NRT). Each smoker was assessed at the point of first contact, provided with health education, and a quit date was fixed. They were encouraged to cease smoking either after the first or second visit. Follow-up sessions at their respective clinics are according to the recommendation i.e. once a week for the first month, every two weeks for the subsequent month, and once a month for follow-up from the third to sixth month.

2.3. Measures

All data in registry and clinical notes were available in either Malay or English. Socio-demographic characteristics included were age, gender, ethnicity, and locality status. As for smoking information, method of participation, quit date, treatment received, and frequency of appointments attended were retrieved. Other information included were comorbidities such as diabetes, hypertension and ischaemic heart disease. Our primary outcome was self-reported smoking status at six months follow-up. Those who did not attend follow-up at six month were assumed to be smoking.

2.4. Statistical analyses

Data was tabulated in Microsoft Excel while analysis was done using SPSS 21.0. Descriptive statistics were used to analyse the socio-demographic characteristics of smokers. Statistical test for association for continuous data was done using Independent T-test, while Chi Square test for categorical variable. In addition, multiple logistic regression was conducted among the variables with p-value <0.25 to determine significant predictors for successful quit smoking.¹¹ Backward Likelihood Ratio (LR) method was used for the model and alpha value was set at 0.05 to reject null hypothesis. Subsequently the Hosmer and Lemishow test was conducted to look for model fitness.

Ethical approval

The study has been approved by the Medical Research & Ethics Committee of the Ministry of Health Malaysia (MREC) and registered with the National Medical Research Register (NMRR).

3. Result

A total of 285 participants of “Quit Smoking Clinic” were included in this study. As Table 1 suggests, the majority of samples were male (96.4%), of Malay ethnicity (67.7%), residing in urban areas (74%), and participating in the study following referral from their doctor (61.4%) Hypertension was the commonest comorbidity (28.8%) among smokers followed by diabetes (11.9%) and ischaemic heart disease (IHD) with 4.9%. In terms of quit smoking clinic interventions, as Table 2 suggests, only one third of participants were prescribed with nicotine replacement therapy (NRT). Only 10.5% of participants attended appointments between 7 and 9 times during the follow-up, while only 9.8% attended more than 10 times.

Our study found that 30.2% (n = 86) of smokers successfully quit smoking within six month of follow-up. In bivariate analysis, as per Table 3, five factors showed a significant association with success of quit

Table 1
Baseline characteristic of smokers in the program.

Variable	N	%
Age^a	46.5 (14.9)	–
Gender		
Male	269	94.6
Female	16	5.4
Ethnicity		
Malay	193	67.7
Chinese	37	13
Indian	53	18.6
Others	2	0.7
Residence Locality		
Urban	211	74
Rural	74	26
Co-morbidity		
<u>Hypertension</u>		
Yes	82	28.8
No	203	71.2
<u>Diabetes</u>		
Yes	34	11.9
No	251	88.1
<u>Ischaemic Heart Disease</u>		
Yes	14	4.9
No	271	95.1

^a Mean (SD).

Table 2
Behaviour at quit smoking clinics.

Variable	n	%
Mode of Participation		
Voluntary	110	38.6
Referred	175	61.4
Treatment Nicotine Replacement Therapy (NRT)		
NRT	87	30.5
Non NRT	198	69.5
Frequency of Attended Appointments		
0	44	15.4
1 to 3	132	46.3
4 to 6	51	17.9
7 to 9	30	10.5
≥ 10	28	9.8

smoking, namely age (p-value 0.0001); those with comorbidities hypertension (p-value 0.0001), diabetes (p-value 0.01), ischaemic heart disease (p-value 0.035); and frequency of attended appointment (p-value 0.0001). In view of skewedness of data for ethnicity, the factor was collapsed into two classes (Malay and non-Malay).

All ten factors were included in multiple logistic regression. Four predictors were obtained from this model as suggested in Table 4. Smokers who were treated with NRT had almost three times higher odds of quitting smoking. Apart from that, diabetic smokers have four times higher odds of quitting smoking. In addition, those who attended “Quit Smoking Clinic” had more than ten times greater odds of successfully quit smoking. Nevertheless, our finding showed that Malay ethnicity had three times odds to achieve smoking cessation.

There was no multicollinearity detected among factors in the model (VIF value < 2). The Nagelkerke, r^2 value for the model was 75.4% and Hosmer & Lemeshow test showed model fitness (p-value 0.998). The

Table 3
Bivariate analysis.

	Success	Fail	Chi Square	df	p-value	N
Mean Age^a	13.80 (51.63%)	14.80 (44.23%)	7.402	283	0.0001^b	–
Gender						
Male	30.9%	69.1%	–	–	0.407 ^c	269
Female	18.8%	81.3%				16
Ethnicity						
Malay	64 (33.2%)	129 (66.8%)	1.579	1	0.13	193
Others	22 (23.9%)	70 (76.1%)				92
Locality						
Urban	61 (28.9%)	150 (71.7%)	0.618	1	0.463	211
Rural	25 (33.8%)	49 (66.2%)				74
Hypertension						
Yes	39 (47.6%)	43 (52.4%)	16.515	1	0.0001	82
No	47 (23.2%)	156 (76.8%)				203
Diabetes Mellitus						
Yes	17 (50.0%)	17 (50.0%)	7.201	1	0.01	34
No	69 (27.5%)	182 (72.5%)				251
Ischaemic Heart Disease (IHD)						
Yes	8 (57.1%)	6 (42.9%)	–	–	0.035^c	14
No	78 (28.8%)	193 (71.2%)				271
Intake Participation						
Volunteer	38 (34.5%)	72 (65.5%)	1.624	1	0.233	110
Referral	48 (27.4%)	127 (72.6%)				175
No of attended appointment						
None	3 (6.8%)	41 (93.2%)				44
1 to 3	7 (5.3%)	125 (94.7%)	149.734	4	0.0001	132
4 to 6	26 (51.0%)	25 (49.0%)				51
7 to 9	23 (76.7%)	7 (23.3%)				30
10 and more	27 (96.4%)	1 (3.6%)				28
Treatment Option						
Nicotine Replacement Therapy	30 (34.5%)	57 (65.5%)	1.103	1	0.327	87
Non-medical therapy	56 (28.3%)	142 (71.7%)				198

^a Mean (SD).

^b Independent T-test.

^c Fisher's Exact Test.

model showed a good Receiver Operating Characteristic (ROC) curve with area under the curve (AUC) of 0.96% (95% CI 0.94–0.98), as suggested by Fig. 1.

4. Discussion

Smoking cessation remains as a challenge not only to healthcare personnel but also to the smoker who attempted it. However, this study showed a good proportion (30.2%) of quit smoking success among those enrolled in public facilities’ “Quit Smoking Clinic” - at Seremban district. The figure is in line with the national target (>30% success) set by the Ministry of Health (MOH), as a measure to reduce the mortality burden attributed to tobacco. Nevertheless, the figure obtained from this study and the target set to achieved is almost similar to the rate of smoking cessation reported in the USA.¹² Although the number is

Table 4
Multiple logistic regression.

No	Variable	Crude Odd Ratio (95% CI)	B	S.E.	Wald	df	Sig.	Adjusted Odd Ratio	UL CI	LL CI
1	Treatment Option									
	NRT	1.34 (0.78, 2.29)	1.034	0.479	4.654	1	0.031	2.811	1.099	7.189
	Non NRT	1						1.00		
2	Diabetes Mellitus									
	Yes	2.64 (1.28, 5.46)	1.464	0.627	5.456	1	0.02	4.321	1.266	14.756
	No	1						1.00		
3	No. of attended appointment				33.975	4	0.001			
	10 and more	369.00 (36-46-3735.04)	4.295	1.482	8.394	1	0.004	73.309	4.012	1339.534
	7 to 9	44.91 (10.58-190.61)	1.873	1.136	2.715	1	0.099	6.506	0.701	60.345
	4 to 6	14.21 (3.90-51.86)	0.832	1.061	0.614	1	0.433	2.297	0.287	18.382
	1 to 3	0.77 (0.19-3.10)	-1.615	1.072	2.27	1	0.132	0.199	0.024	1.626
	Nil							1.00		
4	Ethnicity									
	Malay	1.58 (0.90, 2.78)	1.014	0.505	4.039	1	0.044	2.757	1.025	7.414
	Others	1						1.00		
5	Hypertension	3.01 (1.75, 5.18)								
6	Ischaemic Heart Disease	3.30 (1.11, 9.82)

Fig. 1. Receiver operating characteristic (ROC) curve.

encouraging, more effort needs to be put in place to increase quit smoking rate especially among those seeking the service. This is because smoking cessation has always been associated with significant improvement in health outcomes due to the restoration of normal body physiological function.

The finding in this study revealed several predictors of successful quit smoking; the use of nicotine replacement therapy (NRT), frequency of appointments attended, presence of diabetes comorbidity, and Malay ethnicity. Nicotine is a compound in tobacco smoke and is the principal modulator for psychopharmacological effects associated with addiction.¹³ Therefore, substituting the nicotine in tobacco with NRT medication will help to ease the physiological and psychological withdrawal symptoms, hence ultimately reducing the motivation to continue smoking. This could be the possible explanation for the difference in the duration to successful quit time between the NRT group and the non NRT group. Apart from that, the use of NRT to aid in the process of quit smoking has been widely available with numerous modalities in the market or upon prescription such as nicotine gum, nicotine lozenge, nicotine tablet, nicotine oral inhaler, nicotine nasal spray and nicotine

transdermal patch.¹⁴ However, in public healthcare settings in Malaysia, the option for treatment is only limited to nicotine patch and nicotine tablets that can only be supplied when registered with “Quit Smoking Clinic”. Regardless of any treatment modalities, evidence suggest that NRTs increase the rate of quit smoking by 50%–60% as published by Cochrane library,¹⁵ which far exceeded our data (34.8%). Although all the samples were registered in the program, not all were supplied with NRT. Some of the respondents refused NRT early in the program while some discontinued the treatment prematurely. This is not uncommon as literature have reported several reasons such as concern about safety, lack of confidence in efficacy, the perception of being in a highly addictive state, as well as fear of the side effect and relapses.^{16,17}

We also found that smokers who attend more “Quit Smoking Clinic” appointments performed better in term of successful smoking cessation rate as compared to those who attended only a few. It is possible that sessions with medical personnel during the visit increases their motivation and will power to quit smoking. More importantly, these medical personnel have undergone extensive training of the module prior to running the Quit Smoking Clinic, which was based on the Trans-theoretical model (TTM) of behaviour change. The model was elucidated and validated by Prochaska and colleague following rigorous study of more than 300 theories in psychotherapy and behaviour since over the last 30 years.¹⁸ According to TTM, a change in behaviour occurs in stages, namely precontemplation, contemplation, preparation, action, and maintenance together with a concept of relapse stage that may set one back to earlier stage.¹⁹ In addition to this, TTM extensively illuminates in depth the ten processes of change, two decisional balance and three temptation domains (social situation, craving/habitual, and negative affect situation). As such, TTM has been widely employed in quit smoking program all over the world,^{20–22} despite other literature reporting *au contraire*.²³

Our finding suggest that presence of diabetes is a strong predictor to successful quit smoking. The result might differ from the study done in South Korea²⁴ but this could be a good sign to the setting. At the moment, the country is facing increased prevalence of both diabetes and smoking. On top of that, the presence of diabetes among smoker is very alarming from the synergistic interaction effect. For example, the joint effect of diabetes and smoking caused a pooled relative risk of 1.55 for total mortality and 1.45 relative risk for cardiovascular mortality.²⁵ This figure concurred with earlier studies that showed overall increment of mortality risk in those who both smoke and have diabetes.²⁶ Therefore, vigorous promotional activities need to be targeted to this population to prevent the adverse outcome. Apart from that, we found that other comorbidities such as hypertension and ischaemic heart disease (IHD) were confounders in this study. This is plausible as smoking is a risk factor for hypertension and both have a strong association with IHD.

Despite older age being a statistically significant predictor to quit smoking in bivariate analysis, the variable was not a significant predictor upon multivariable analysis. The finding is different from previously reported studies that proposed several reasons for a higher chance of quit smoking in older age.²⁷ The difference in results could arise from the dissimilarity of sample size, in which the current study is only one tenth in its size. Therefore, more data may be needed to compare gender differences in smoking cessation success.

This study has some limitations. Firstly, the use of registry (tabulated data) may limit other potential predictors to be included in the analysis. Socioeconomic variables were unable to be included despite literature suggested some contribution towards smoking cessation.^{24,28} Secondly, the outcome measured (smoking cessation) was measured based on self-report without biochemical verification. This method tends to be skewed in smoking behaviour due to subject recall bias and social desirability bias.^{29,30} In addition to this, our study was only limited to those seeking treatment in public healthcare facilities which may not reflect the other spectrum of people who successfully quit smoking in the private sector. Therefore, it is necessary to exercise caution when attempt is made to generalise the findings for the whole country.

5. Conclusion

In summary, the rate of smoking cessation among smokers utilising “Quit Smoking Clinic” in Seremban public health facilities is good (30.2%) and comparable to worldwide data. Treatment with NRT, frequency of attending appointments, being Malay ethnicity and comorbidity of diabetes were significantly associated with rate of smoking cessation. Hence, these predictors can be used by the Seremban health authority to design specific interventions to enhance rates of smoking cessation among the population.

Declaration of competing interest

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