

Timing and risk factors associated with relapse among smokers attempting to quit in Malaysia

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SUMMARY

BACKGROUND: Many smokers attempt to quit smoking, but very few succeed.

OBJECTIVE: To identify the timing and risk factors involved in smoking relapse.

METHODS: We conducted a prospective cohort study among staff in two public universities in Malaysia. Behavioural therapy with free nicotine replacement therapy was given as treatment. Participants were followed up for 6 months. Relapse was defined as returning to smoking after having quit for at least 24 h.

RESULTS: Of 185 smokers who volunteered to participate, 120 achieved at least 24-h abstinence, and 80% of these relapsed within 2 months. Compared to partici-

pants who attended a single smoking cessation session, participants who attended three sessions had a lower likelihood of relapse within 6 months of quitting. In contrast, smokers with a much longer exposure to cigarette smoking in the workplace (>3 h per week) had a greater chance of relapse compared to those with no exposure.

CONCLUSIONS: Frequent attendance at clinic sessions and less exposure to other people smoking in the workplace can potentially reduce the likelihood of relapse among smokers who have recently quit.

KEY WORDS: smoking relapse; environment; worksite; smoking cessation; Malaysian

RELAPSE is the most challenging problem encountered by clinicians and researchers concerning addiction.¹ Studies in the United States have reported that the rate of relapse within 1 year after an attempt to quit smoking ranged from 70% to 90%.^{2,3} Smokers who continuously failed to maintain an abstinence of ≥ 2 weeks after a designated quit date,⁴ and the majority of those who experienced an early initial lapse, eventually progressed to full relapse.⁵

Although there are no previous data on relapse in Malaysia, the rate of relapse identified in Western studies may explain the reason for the high percentage of Malaysian males (49%) who were current smokers in 2006,⁶ despite various efforts by the Malaysian government to establish smoking cessation services, provide free pharmacological treatment and conduct health promotion activities.

Survival curves from smoking cessation trials have shown that the majority of relapse cases occur during the first 5–10 days after an attempt. Thus, the initial 5–10 days act as a window period prior to the achievement of long-term abstinence. After this critical period, relapse curves of both control and treatment groups

in intervention studies become parallel.^{7,8} However, the evidence is contradictory: a study of elderly smokers by Cui et al. in the United States claimed that the grace period was the first 30 days of cessation,⁹ while a recent review paper reported that the maximum number of relapses occurs within 70 days, and reaches nearly zero incidence after 100 days.¹⁰

The process of relapse is determined by multiple factors¹¹ that interact in a non-linear manner, leading to a relapse event.^{12,13} Yong et al. found that relapse occurred sooner among younger smokers, those with many smoking colleagues, smokers with a history of schizophrenia and those who attended fewer smoking cessation programmes.⁹ Shiffman et al. studied multiple psychological and treatment factors that influence the progression from lapse to full relapse.^{7,14,15} These studies have contributed new perspectives on risk factors involved in the process of relapse. However, the complexity of the relapse process may differ across populations and subpopulations, and no isolated measurement can encompass the entire process.¹⁶ A better understanding of the factors that influence the rate of relapse and the dynamics of relapse among Asian

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populations could provide opportunities for future interventions and improved cessation services among these populations.

This study had the following objectives: 1) to describe the process of relapse within the first 6 months of quitting, and 2) to identify factors associated with relapse. This study provides new insights into relapse among Asian populations, which is currently unexplored. This study may also be a useful reference for health care providers and programme designers in developing strategies to prevent relapse following attempts to quit smoking.

METHODS

Recruitment and participation

In a prospective cohort study, data were collected between November 2009 and August 2010 at University A and between March 2010 and November 2010 at University B. We established smoking cessation programmes at each university. Student centres and a student college were used as temporary outreach sites. All employees working at the two sites were targeted for the study with full approval from the university ethics committee and university boards. Informed consent was obtained from all participants.

At University A, there were over 6000 working staff, while University B had a staff population of slightly over 15 000. Both universities encourage smoke-free environments, although enforcement was inadequate. For example, University A had set a maximum of RM200.00 (US\$65) penalty to smokers smoking on campus, but smokers were not fined when they were identified. University B on the other hand, had some anti-smoking activities and penalties in place, but they were not properly implemented. Participants were recruited through e-mails sent to all staff and letters to the heads of departments at both universities. Further invitations were issued through the university staff portal, posters and via the main university websites to enhance participation. Interested staff members who had smoked at least five cigarettes daily in the previous year and who agreed to be followed up, were able to read and write in Bahasa Malaysia and had no serious mental or health condition, were invited to participate in the study.

The treatment consisted of combined medical and cognitive behavioural therapy. Questionnaires related to smoking history, socio-demography, stress and coping and family support were administered prior to treatment. Medical treatment consisted of free nicotine replacement therapy (NRT) gum or patches, depending on the patient's medical history, degree of nicotine dependence and preference. Light smokers (<10 cigarettes/day) were offered 2 mg nicotine gum, and moderate to heavy smokers (≥ 10 cigarettes per day) were offered 4 mg nicotine gum. Smokers who were not able to tolerate the gum due to unwanted

side effects were given a daily supply of nicotine patches (7 mg/24h, 14 mg/24h and 21 mg/24h). Both types of NRT were supplied for a period of 2 months. Adherence to NRT was defined as continued use for >2 weeks.

Cognitive behavioural therapy involved three twice-weekly counselling sessions offered during office hours. The first session was conducted in groups and the two subsequent sessions were individual. These sessions covered coping strategies, risks and benefits of quitting, relapse prevention, stress reduction and weight control. Subsequent follow-ups were also arranged for those requiring additional support. To avoid bias, similar cognitive behavioral therapy sessions were conducted and all sessions were led by the same medical officer and an assistant.

We collected baseline information during the first clinic session at the start of treatment. Abstinence was determined during interview follow-up sessions and was confirmed by carbon monoxide (CO) < 8 ppm¹⁷ using the Mini Smokerlyzer (Bedfont Scientific Ltd, Rochester, UK). Relapse was determined during 2-weekly follow-up appointments for the initial 2 months, and patients were contacted after 6 months. Data on lapses were assessed with a quit-smoking diary during each follow-up visit.

Data collection

Socio-demographic and smoking history

Socio-demographic and smoking history included age group, age at smoking initiation, educational achievement, work category, number of initial cigarettes per day and previous quit attempts.

Quitting history and relapse

A self-reported quit-smoking diary was supplied for each smoker to record the number of cigarettes they smoked per day. The written diary was shown to the medical officer during follow-up. Quitters were those who achieved a minimum of 24 h abstinence during the observation period, as defined by studies on smoking relapse.^{13,18} After achieving 24 consecutive hours of abstinence, any subsequent smoking episode (even a puff) was considered a lapse. The date of an initial lapse episode was counted as the date of relapse. CO assessments were conducted during follow-up and after 6 months to ensure the validity of the reported abstinence. The exact date of smoking relapse was determined from the quit-smoking diary.

Environmental influences

The questionnaire was adapted from a path analysis study of 481 respondents followed by telephone survey for a total of 3 years in a cohort of US adults.¹⁹ The questionnaire consisted of three questions meant to examine the influence of the worksite environment, the home environment and peer smoking on smoking cessation. This is based on the hours of exposure to

other people smoking within the past 7 days both at home and at work, and the number of colleagues smoking at work. The effect of these influences on smoking relapse was examined. The questionnaire was translated into the Malay language using forward and back translation. Reliability analysis revealed Cronbach's alphas between 0.80 and 0.83 and correlations between 0.5 and 0.8.

Statistical analysis

Data management and statistical analysis were performed using a database created with SPSS 15.0 for Windows (Statistical Package for the Social Sciences Inc, Chicago, IL, USA). A descriptive analysis was performed. Categorical variables were analysed using the χ^2 tests, and quantitative variables were analysed by independent *t*-tests. The main analysis of interest for predictors of relapse was survival analysis. The Kaplan-Meier technique was employed to plot the survival graph of the timing of relapse. We investigated potential risk factors for relapse during the first 6 months of cessation using the Cox proportional

hazards model (Cox regression). The level of significance was set at an alpha of 0.05. The hazards ratios (HRs) and 95% confidence intervals (95% CIs) were provided to assess the significant associations between dependent and independent variables.

RESULTS

Socio-demographic characteristics and smoking history

This study included 185 participants, of which 138 were from University A and 47 from University B. All subjects were male, with a mean (standard deviation [SD]) age of 35.9 (SD 10.9) years. The majority (93.4%) of participants were in the support staff group, which included technical, clerical and labour workers. The mean CO measurement performed during the first visit was 15.5 ppm. When comparing the two universities, the socio-demographic variables and smoking history variables were not significant (all $P > 0.05$, Table 1).

Lapse episodes and relapse curve

Only 120 participants were included in the relapse analysis, as the others did not achieve 24 h quit status, including 15 smokers who were not contactable or failed to record their initial lapse episode. After successfully achieving 24 h of abstinence, the participants' average time to an initial lapse was 9.43 days (Figure). The graph can be divided into three phases: the first phase is the first 14 days after the quit date, during which the survival rate quickly decreased from 100% to 40%. The second phase was from day 15 to day 60, the period during which the survival rate gradually fell to approximately 25%. The third phase extended from 60 days to the end of the 6-month period (180th day), during which the curve became

Table 1 Socio-demographic and smoking characteristics

	Total (N = 185) n (%)
Demographic characteristics	
Age group, years	
18–30	77 (42)
31–40	43 (23)
41–50	43 (23)
>50	22 (12)
Education status	
Primary school	5 (2)
Secondary school	107 (58)
Diploma and above	73 (40)
Occupational status	
Support group	175 (93)
Professionals	13 (7)
Marital status	
Single	68 (37)
Married	113 (61)
Divorced	4 (2)
Smoking history	
Number of cigarettes/day	
<10 (light)	28 (15.1)
10–19 (medium)	113 (61.1)
≥20 (heavy)	44 (23.8)
Age at initiation of smoking, years	
8–12	19 (10)
13–18	120 (65)
≥19	46 (25)
Previous quit attempt within 1 year	
No	28 (15)
Yes	157 (85)
Nicotine replacement therapy used	
Non-adherent	76 (41)
Adherent	109 (59)
Counselling sessions attended	
1	74 (40)
2	60 (32)
3	31 (17)
≥4	20 (11)

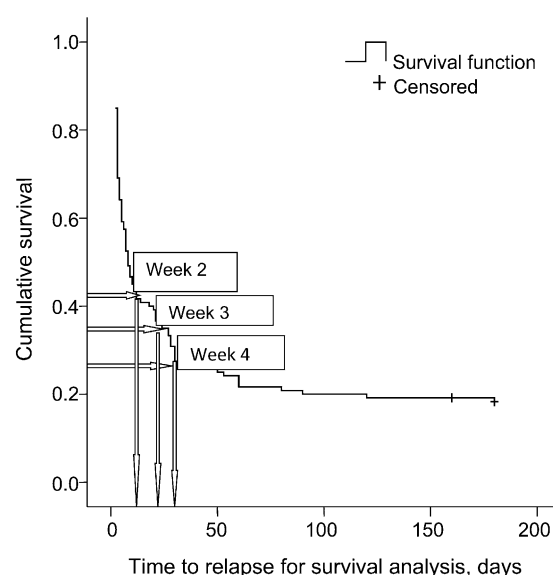


Figure Survival curve of relapse over time.

much flatter. The survival rate at the end of 6 months was 20%. Overall, we may conclude that the vast majority of relapses (up to 80%) occurred during the initial 2 months after the quit date. The highest number of relapses was seen in the first 2 weeks (60%); 20% of participants never relapsed (Figure).

Risk factors of relapse at 6 months

Ten variables were included in the analysis of potential risk factors for relapse at 6 months (Table 2). We identified two factors associated with smoking relapse at 6 months: 1) smokers attending all three smoking cessation sessions had a lower risk of relapse compared to those attending a single session, and

2) smokers who had much longer exposure to cigarette smoking at the workplace (between 3–8 h and ≥ 9 h) had more than twice the likelihood of relapse compared with those with no workplace exposure.

DISCUSSION

The smoking relapse process is dynamic,²⁰ and no single model can explain all occurrences within the relapse period.⁵ Our results indicate that the most important time for preventing smoking relapse is during the first 2 weeks of follow-up and extends to 2 months post-cessation. Based on the survival curve shown, we suggest that at least three clinic follow-up

Table 2 Risk of smoking relapse at 6 months

	Total n (%)	Relapsed (event) cases n (%)	Hazard ratio (95%CI)*
Socio-demographic characteristics			
Occupational status			
Support group	111 (92.5)	87 (91.6)	Reference
Professionals	9 (7.5)	7 (7.3)	1.27 (0.52–3.10)
Marital status			
Single	43 (35.8)	38 (39.6)	Reference
Married	75 (62.5)	57 (59.4)	0.72 (0.41–1.26)
Divorced	2 (1.7)	1 (1.0)	0.30 (0.04–2.43)
Smoking history			
Number of cigarettes/day			
<10	23 (19.2)	18 (18.8)	Reference
≥ 10	97 (80.8)	78 (81.2)	1.04 (0.60–1.79)
Age started smoking, years			
8–12	14 (11.7)	13 (13.5)	Reference
13–18	80 (66.7)	63 (65.6)	0.85 (0.45–1.61)
≥ 19	26 (21.7)	20 (20.8)	0.82 (0.38–1.78)
Previous quit attempts			
0	12 (10)	6 (6.3)	Reference
≥ 1	108 (90)	89 (93.7)	2.14 (0.84–5.46)
Follow-up variables			
Nicotine replacement therapy			
Non-adherent	37 (30.8)	32 (33.3)	Reference
Adherent	83 (69.2)	64 (66.7)	1.36 (0.89–2.09)
Number of sessions attended			
1 only	32 (26.7)	30 (31.3)	Reference
2	42 (35)	32 (33.3)	0.63 (0.37–1.07)
3	28 (23.3)	19 (19.8)	0.34 (0.18–0.63) [†]
≥ 4	18 (15)	15 (15.6)	0.77 (0.41–1.44)
Environmental variables			
Worksite environment (exposure to cigarette smoke), h			
0	14 (11.8)	13 (13.7)	Reference
1–2	38 (31.9)	33 (34.7)	2.12 (0.03–4.34)
3–8	43 (36.1)	31 (32.6)	2.72 (1.31–5.67) [†]
≥ 9	24 (20.2)	18 (18.9)	2.86 (1.34–6.07) [†]
Home environment (exposure to cigarette smoke), h			
0	63 (52.5)	52 (54.2)	Reference
1–4	38 (31.7)	30 (31.3)	0.80 (0.49–1.03)
5–14	13 (10.8)	10 (10.4)	0.80 (0.40–1.6)
≥ 15	6 (5.0)	4 (4.2)	0.67 (0.23–1.9)
Peer influence (number of smoking friends)			
None	2 (1.7)	2 (2.1)	Reference
Very few	17 (14.2)	14 (14.6)	2.79 (0.64–12.23)
Less than half	20 (16.7)	15 (15.6)	1.43 (0.79–2.60)
Most are smokers	81 (67.5)	65 (67.7)	1.39 (0.77–2.50)

*Derived from Cox proportional hazards models, adjusted for age, race and educational status.

[†] $P < 0.05$.

sessions are needed for optimal cessation success. The first follow-up should be within a few days of the quit date, the second between week 1 and week 2 and the final between week 2 and week 3. Moreover, we suggest that health and non-health professionals, including doctors, nurses, psychologists, counsellors and support groups, involved in the area of smoking cessation, should follow up with recently quit smokers up to 2 months post-cessation, which may provide external support to enhance their motivation to sustain quitting effectively.

This study contributes to the limited knowledge about factors involved in smoking relapse. Our first finding showed that smokers who attended multiple clinic sessions had a lower risk of relapse within 6 months. The association between relapse and clinic attendance has been examined in very few studies. One such study, in the United States, reported similar results.⁹ However, we can also relate greater number of clinic sessions to a higher success rate in maintaining smoking abstinence,¹¹ which reduced the number of relapses.

We also found that the hours of exposure to work-site smoking hastened the occurrence of relapse. Our data on the influence of environmental exposure on relapse were consistent with other studies in this area.^{21,22} Although these studies found positive associations between environment and relapse, they did not examine the influence of relapse on the duration of exposure. We hypothesised that extended exposure to the smell, sight and accessories of cigarettes may increase the urge to smoke and act as an external stimulus to initiate smoking after a short period of abstinence. Although we did not study the relationship between smoking urges and extended exposure to the smell, smoking accessories and sight of cigarettes, other studies have proven that these exposures may be related to an increase in temptation²³ and craving.²⁴

Although our study proposes that clinic-based smoking cessation programmes are a good method of increasing cessation rates and preventing smoking relapse, this may not be a viable option worldwide. This is especially true for low- and middle-income countries, where funding is often a major concern. Countries benefit from a more comprehensive tobacco control approach to cover a greater population mass; this entails complete bans on cigarette advertising, increases in taxation and establishing quitline services.²⁵ In addition, clean indoor air restrictions are moderately feasible in developing countries, as this would increase the number of smokers attempting to quit and the number of successful quitters, and prevent subsequent relapse, as this study suggests.

A number of limitations in this study should be acknowledged for future improvements. First, the study sample included a relatively homogeneous group of smokers of primarily Malay ethnicity. The second limitation of this study was the inability to generalise

the findings to clinic- and hospital-based settings. These sites have a variety of smokers, some of whom are referred by specialist clinics and others who are self-referrals. Furthermore, this study may not capture smokers who have achieved abstinence without help or medication, and have then relapsed. Additional obstacles and challenges detected during our face-to-face counselling were lack of awareness of employers in allowing smokers to attend the clinic sessions, poor perception and knowledge about quitting and relapse among smokers, the addictive nature of tobacco and the indirect influence of smoking colleagues. These factors should be considered by health and non-health providers when attempting to implement such programmes. Nonetheless, some of these constraints may not be clear and warrant further research (e.g., cost, acceptability, feasibility).

Our study also has some strengths. First, as a pioneering investigation of the risk factors for smoking relapse in clinic and worksite settings in Malaysia and the Asian region, it provides new insights into the problem of smoking cessation and may promote further research in this area. Second, this was a prospective study, which is more reliable than involving former smokers' retrospective recall,^{26,27} which is subject to bias.²⁸

We conclude that frequent attendance at clinic sessions may potentially reduce the incidence of relapse among former smokers who attempt to quit with assistance. Health care providers, programme implementers and personnel involved in smoking cessation are advised to design appropriate programmes by emphasising the importance of additional follow-up during the first 2 weeks post-cessation, as the likelihood of relapse is very high. To prevent further relapse, we suggest that employers enforce strict smoke-free work-site initiatives and provide a supportive environment for quitting smoking. Lastly, the idea of smoking cessation among Asian populations is still in its infancy, and urgent efforts to promote smoke-free lifestyles and smoke-free environments are required.

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R É S U M É

CADRE : Un grand nombre de fumeurs tentent d'arrêter de fumer, mais bien peu y arrivent.

OBJECTIVE : Identifier le moment de la rechute du tabagisme et les facteurs de risque qui y sont associés.

MÉTHODES : Nous avons mené une étude prospective de cohorte parmi le personnel de deux universités publiques de Malaisie. On a utilisé comme traitement l'approche comportementale et un traitement de remplacement nicotinique gratuit. Les participants ont été suivis pendant 6 mois. On a défini la rechute comme un retour à la fume après un arrêt d'au moins 24 h.

RÉSULTATS : Sur 185 fumeurs qui ont participé volontairement, 120 ont obtenu une abstinence d'au moins 24 h, parmi lesquels 80% ont rechuté ensuite dans les

2 mois. Par comparaison avec les participants qui avaient assisté à une seule session d'arrêt tabagique, les participants ayant assisté à trois sessions encouraient un risque de rechute plus faible au cours des 6 mois après l'arrêt. A l'opposé, on a noté un risque de rechute plus élevé chez les fumeurs ayant été exposés plus longtemps à la fumée de cigarette sur les lieux de travail (plus de 3 h par semaine) par comparaison avec ceux qui n'avaient pas été exposés.

CONCLUSIONS : La participation fréquente à des sessions cliniques et une moindre exposition à la fumée des autres sur les lieux de travail sont susceptibles de réduire les risques de rechute chez les fumeurs qui ont récemment abandonné leur tabagisme.

R E S U M E N

MARCO DE REFERENCIA: Muchos fumadores intentan abandonar el tabaquismo, pero muy pocos lo consiguen.

OBJETIVO: Investigar los aspectos temporales y los factores de riesgo que influyen en las recaídas.

MÉTODOS: Se llevó a cabo un estudio de cohortes prospectivo, en el cual participaron miembros del personal de dos universidades públicas en Malasia. Se suministró como tratamiento una terapia conductual con sustitución libre de nicotina y se practicó un seguimiento de 6 meses a los participantes. La recaída se definió como el regreso al tabaquismo después de haberlo abandonado como mínimo por 24 h.

RESULTADOS: De 185 fumadores voluntarios para participar en el estudio, 120 logró al menos 24 h de absti-

nencia y un 80% presentó una recaída en los 2 meses siguientes. En comparación con los que asistieron a una sola sesión sobre el abandono del tabaquismo, los participantes que acudieron a tres sesiones tuvieron una probabilidad menor de recaída en los primeros 6 meses del abandono. De interés, los fumadores con una exposición mucho más prolongada al tabaquismo en el lugar del trabajo (más de 3 horas por semana) exhibieron un mayor riesgo de recaída que los participantes sin esta exposición.

CONCLUSIÓN: Una asistencia asidua a las sesiones clínicas y una menor exposición a otras personas que fuman puede disminuir la probabilidad de recaída en los fumadores que han abandonado recientemente el tabaquismo.