Smoking cessation intervention in parents of young children: a randomised controlled trial

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ABSTRACT

Objective To examine whether telephone counselling based on the stages of change component of Transtheoretical model of behaviour change together with educational materials could help non-motivated smoking parents of young children to cease.

Design Randomised controlled trial.

Setting Hong Kong Special Administrative Region, PR China.

Participants 952 smoker fathers and mothers of Chinese children aged 5 years.

Intervention Participants were randomly allocated into two groups: the intervention group received printed self-help materials and three-session telephone-based smoking cessation counselling delivered by trained counsellors; the control group received printed self-help materials only. A structured questionnaire was used for data collection at baseline and at 1, 3 and 6 month follow up.

Main outcome measures The main outcome is 7 day point prevalence quit rate at 6 months (defined as not smoking during the 7 days preceding the 6 month follow up) determined by self reports. Other secondary outcomes were self reported 24 h point prevalence quit rate and self-reported continuous quit rate and bio-chemically validated quit rate at 6 months.

Results A total of 952 smoker fathers and mothers were randomized to the intervention ($n = 467$) and control ($n = 485$) groups. Most were daily smokers (92.4%) and the mean number of cigarettes smoked per day was 14.5 (SD = 8.9). By using intention-to-treat analysis, the 7 day point prevalence quit rate at 6 month follow up was significantly greater in the intervention group (15.3%; 68/444) than the control group (7.4%; 34/459) ($P < 0.001$). The absolute risk reduction was 7.9% (95% confidence interval: 3.78% to 12.01%). The number needed to treat to get one additional smoker to quit was 13 (95% CI: 8–26). The crude odds ratio of quitting was 2.3(95% CI: 1.5–3.5). The adjusted odds ratio was 2.1 (95% CI: 1.4–3.4) (adjusted for age, number of years smoked, and alcohol dependency).

Conclusion Proactive telephone counselling is an effective aid to promote smoking cessation among parents of young children.

KEYWORDS Chinese, intervention, parents, randomized controlled trial, smoking cessation, young children.

INTRODUCTION

In Hong Kong, smoking is the greatest preventable cause of death, accounting for about one fifth of all deaths and kills about 6000 people per year [1]. In Hong Kong, 14.4% (26.1% male and 3.6% female) of adults were daily smokers (smoked at least one cigarette daily at the time of the survey) in 2002 [2]. The prevalence of daily

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smoking had been decreasing steadily over the years from 23% in 1982[3]–14.4% in 2002 [2]. Smoking rates were higher among males in all the age groups than females, and among older age groups in all surveys [2,3].

Passive smoking also kills hundreds every year and causes misery for many. Previous studies have shown that the health of Hong Kong children are adversely affected by passive smoking at home [4]. Furthermore, children whose parents smoke are more likely to become smokers in the future. If the smoking father or mother could quit smoking, their risks of smoking related morbidity and mortality will reduce and the children's exposure to passive smoking will be removed. Therefore encouraging smoking parents to quit smoking would have significant public health benefits. Telephone counselling, both proactive [5,6,7] and reactive, [5,6,8] have been shown to be an effective way to promote smoking cessation treatment in several studies [5–8]. Furthermore, the cost-effectiveness of telephone counselling for smoking cessation has also been established [6].

The efficacy of proactive telephone counselling has been supported by several meta-analytical reviews [5,6,9]. For example, in the meta-analysis of Lichtenstein *et al*. [5] intervention effect at both short-term and long-term follow-ups was reported [odds ratio (OR), 1.20–1.34]. However, the long-term outcomes were less consistent than short-term effects in this analysis. A recent study by Zhu *et al*. reported the effectiveness of proactive calls in the real-world situation [10]. However, in this study subjects were well-motivated and called the Quitline before receiving proactive calls. Two other studies attempted to recruit all eligible hospital patients for a proactive telecounselling, [11,12] but it was possible that subjects in these studies were well motivated as they were experiencing myocardial infraction. One criticism of reactive counselling is that it relies on callers to be proactive and ignores those who are not motivated [13]. There is lack of evidence on the effectiveness of proactive counselling among the non-motivated smokers [6] who would benefit from an organised smoking cessation programme. On the other hand, the benefit of a smoking cessation programme among parents of young children has not been reported. This group of people is particularly important to investigate as the benefits of quitting smoking among them would have impact on their children too. A recent review by Roseby *et al*. identified 18 studies that used different interventions to reduce exposure of children to environmental tobacco smoke (ETS) [14]. Although six of these 18 studies aimed for parental or carer smoking cessation or reduction, but the main goal was to examine its impact on the reduction of ETS exposure to children. Moreover, these studies were carried out at the level of population or community settings or among parents in the well child setting or in the ill child health care setting. We found no trial, which solely aimed at promoting smoking cessation among parents of young children. Moreover, there is lack of evidence on the effectiveness of telephone based smoking cessation intervention in the East. We found no such data for Chinese in the literature.

We used stages of change model to design our intervention due to its wide applicability in the promotion of smoking cessation [15,16,17]. The model propose that interventions that take into account the current stage of the individual will be more effective and efficient than a generic intervention for all. However, the model has been criticised for its limited effectiveness [18,19,20] and inapplicability to other complex health behaviours [21]. Another criticism for stage based intervention in the smoking cessation is that it includes those who are in the action stage as a potential target subject. Because these subjects are already in action and do not smoke for less than six months, including them with baseline smokers may inappropriately contaminate intervention's effectiveness (i.e. quitting outcome). In this study, we reported our findings by excluding those who were in the action stage of smoking cessation.

In this study we examined whether telephone counselling on quitting smoking based on the stages of change component of the Transtheoretical model of behaviour change [16] together with educational materials could help smoking parents of young children to quit.

METHODS

Study design

This is a randomized controlled trial (RCT). The study protocol was approved by the Ethics Committee of the Faculty of Medicine, the University of Hong Kong and the participants provided verbal consent.

Participants

The sampling frame was derived from the list of all fathers and mothers that smoked and included in the '1997 Birth Cohort Study' of the Department of Community Medicine, University of Hong Kong [4]. The original cohort included 8327 parent-infant pairs who paid their first visit to the maternal and child health centres after birth in April and May, 1997. Smoking history of the parents was recorded and all subjects were followed up for 18 months. To be eligible for the trial, the subjects had to be daily or occasional smokers or quitters of less than 6 months, residing in Hong Kong for at least 5 days a week, and able to speak Chinese. Subjects were excluded if they were receiving other smoking cessation programs. All the 2311 smoking fathers or mothers in the list were approached by mail followed by telephone calls during

the period of October 2000 to July 2003. The mailed letter described the aim of the study and that participants would be randomized. It also explained that a nurse would call them to discuss the health related issues of their child and also the process of participation in this study. The letter was signed by the head of the Department of Community Medicine, The University of Hong Kong and the principal investigator. Of these 2311 subjects, 1420 were eligible and 952 (67%) agreed to participate in the trial (Fig. 1).

Interventions

After the baseline measures, research staff opened a serially labelled opaque sealed envelope to reveal the assignment to intervention or control group. If both spouses were smokers, they were assigned to the same group.

For the intervention group, after the initial assessment a trained nurse counsellor gave 20–30 min of counselling over the telephone. All counsellors had attended a 4-day training course on smoking cessation organised by the University of Hong Kong and passed the final assessment examination. The training course included a combination of lecture, problem based learning, practice, and clinical attachment in a smoking cessation clinic. The counsellor provided information on the health consequences of smoking, emphasised the benefits of quitting to smokers and their children, explained the hazards of second hand smoking and encouraged the smokers to quit smoking.

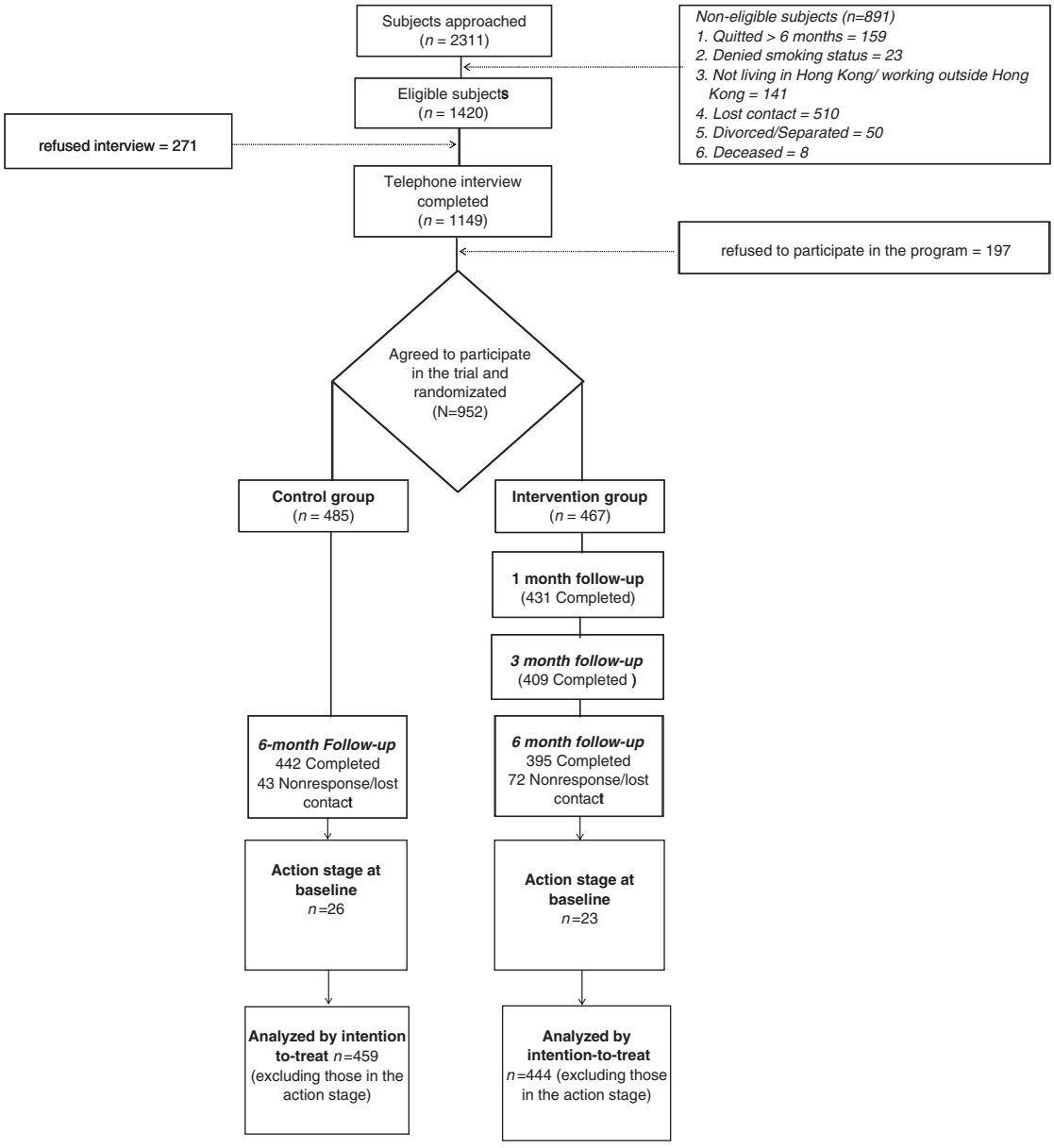

Figure 1 Flow of participants through trial

Details of the counselling content is described in another article [22]. Briefly, counselling was provided based on the queries and the needs of individual clients which was determined by their smoking status, physical dependence and the perceived barriers to quitting. The counsellors adopted a non-directive approach, which is based on the stages of change component of Prochaska's Transtheoretical model [16]. These included advancing clients' stage of readiness in quitting smoking, strengthening clients' motivation to quit smoking using '5R' (Relevance, Risks, Rewards, Roadblocks and Repetition) approach, [9] and addressing physiological craving, psychological dependence and socio-cultural factors in relation to tobacco dependency. Those who were in the action stage were given supportive messages about quitting smoking and tips on things that they can do to overcome withdrawal symptoms and difficult situations. Counsellors gave no information on NRT use during counselling. However, in response to queries from subjects regarding NRT use, counsellors tried to keep the discussion as minimal as possible without giving any direct advice to use NRT. Counsellors gave no direct advice on restrictions about smoking in the home but mentioned that smoking at home might increase children's respiratory and other health problems. Ten percent of the calls were audio-recorded and evaluated by one of the researchers (Y. W. Mak) for their completeness and accuracy, which was satisfactory. Stage matched smoking cessation self-help materials were also provided. Stage matched materials were developed by the Hospital Authority of the Government of the Hong Kong SAR. These were designed to target smokers at different stages of readiness to stop smoking. For those participants who were in the preparation or action stage, the self-help materials emphasised the benefits of quitting and provided tips as to how to become a successful quitter. For those in the pre-contemplation or contemplation stage, the self-help materials described the harms of smoking and benefits of quitting and provided tips as to how to move through stages and become a successful quitter. All participants received only one stage-matched self-help material based on their baseline stage. No other materials were mailed to them after follow up. A hotline number was provided through which they could contact counsellors to discuss any difficulties in their quitting process and to receive problem-oriented solutions. However, only very few called the hotline. Telephone counselling was further provided as appropriate at the first and third month follow up.

The control group subjects only received the stage-matched self-help materials by mail.

Follow up

Follow up assessment and relapse prevention counselling was carried out at 1 and 3 months after the first contact for the intervention group. At 6 months after the first contact, both the intervention and control group was followed up for final assessment. An independent interviewer, who was unaware of subjects' group allocation, carried out the 6 months follow-up. All follow up counselling lasted for less than 15 min per call.

Biochemical validation

In the final assessment at 6 months, all respondents who reported that they were not smoking during the preceding 7 days were invited to attend the research centre for biochemical validation. To validate the self-reported quit rate we measured carbon monoxide level in the exhaled air (quitting was defined as <9ppm), [23] or urinary cotinine level (quitting: <100 mmol/mol)[24,25]. A subject who passed either test or both was considered as a quitter.

Data collection and questionnaire

Data was collected at baseline and at each follow up through telephone interview. Counsellors conducted interviews at 1 and 3 months and an interviewer at 6 months. A structured questionnaire modified from the questionnaire used by the Hong Kong Smoking Cessation Health Centre [17] was used for data collection in this study. The baseline questionnaire included demographic information, smoking and quitting history, detailed information on the children's and the smokers' own health, and alcohol use. The follow up questionnaire included, in addition to the above domains, reasons for quitting smoking, and withdrawal symptoms. The validity and reliability of the questionnaire is reported elsewhere [26].

Outcome measures

The main outcome was 7 day point prevalence smoking cessation rate at 6 months (defined as not smoking during the 7 days preceding the 6 month follow up) determined by self reports. We used self-reporting as our main outcome because many smokers do not come for follow up which is related to the busy lifestyles in Hong Kong [13]. Other secondary outcome variables included: 24 h point prevalence quit rate at 6 months without validation (defined as not smoking during the 24 h preceding the 6 month follow up); continuous quit rate at 6 months without validation (defined as continuously not smoking during the 6 month preceding the 6 month follow up) and validated (by measuring either exhaled carbon monoxide or urine cotinine or both) 7 day point prevalence quit rate. We also reported five other exploratory outcomes: a 50% reduction in the number of cigarettes smoked per day, the occurrence of abstinence of at least 24 h at some point, the implementation of a complete

restriction of smoking at home, the implementation of a partial restriction of smoking at home, and improvement in stage of change.

Sample size and power

Our sample size calculation was based on an unpublished local study [27] and we assumed that in the current study the quit rates in the control and intervention group would be 1% and 5%, respectively. This yielded a total sample size of 858 (429 in each group), based on a significance level of 5% and power of 90%. We achieved a final sample size which was a bit higher than planned so as to obtain a greater power.

Analysis of data

Data were entered into Epi Info and analysed using SPSS for Windows. We used bi-variate analysis to compare the outcomes between the intervention and control groups, separately for baseline smokers (in the pre-contemplation stage to preparation stage) and baseline non-smokers (in the action stage). We reported both crude and adjusted (adjusted for the variables that differed between the intervention and control group) ORs with 95% confidence intervals for all the outcome measures. We did all analysis on an intention-to-treat basis. Follow up variables with missing data were set to their baseline values (e.g. current smoker).

RESULTS

Baseline characteristics

Of the subjects ($n = 952$), most were fathers (84.3%), married (97.7%), had attained education to secondary school level or above (81%), currently employed (86.4%), had a monthly household income of HK$10,000 (US$1 = HK$7.8) or above (84.3%) and daily smokers (92.4%). The mean number of cigarettes smoked per day was 14.5 (SD = 8.9) and the average number of years the subjects had smoked was 19.8 (SD = 7.3). Table 1 shows that the demographic and other variables were similar in the two groups, except for age distribution, number of years smoked and alcohol dependency level.

Quitting outcomes

Table 2 shows that at 6 month follow up the 7 day point prevalence quit rate was significantly greater in the intervention group (15.3%; 68/444) than the control group (7.4%; 34/459) ($P < 0.001$). The absolute risk reduction was 7.9% (95% confidence interval: 3.78% to 12.01%). The number needed to treat to get one additional smoker to quit was 13 (95% CI: 8–26). The crude OR of quitting was 2.26 (95% CI: 1.5–3.5). The OR for self-reported 7 day smoking abstinence after adjusting for the variables that differed between the intervention and control group was 2.1 (95% CI: 1.4–3.4). All the secondary outcomes of quitting were significantly greater in the intervention group than the control group.

Table 2 also shows that significantly more of those in the intervention group had quit for at least a day (adjusted OR = 2.0), were biochemically confirmed as quit for seven days (adjusted OR = 2.2), reduced cigarette consumption by at least 50% (adjusted OR = 2.1), implemented complete restriction of smoking at home (adjusted OR = 1.4), and had made improvements in their stages of readiness to quit (adjusted OR = 1.4).

Table 3 shows that, among baseline non-smokers, there was no significant difference in the outcome measures between the intervention and the control group.

Feasibility of the study

We asked the parents about their satisfaction with the telephone counselling and whether the counselling time (average 38 min per smoker in three contacts) was adequate. More than 90% of the respondents were satisfied with service and the duration of counselling. Structured interview was also conducted with all the four counsellors and we found that all the counsellors were satisfied with the counselling and feedback process.

DISCUSSION

The findings of this study show that proactive telephone counselling is an effective aid to promote smoking cessation among parents of young children over the provision of self help materials alone. Previous studies in Australian [8] and American [28] smokers have also found proactive telephone counselling to be beneficial. In the present study, the self-reported and bio-chemically validated (urine cotinine or exhaled CO or both) 7 day point prevalence quit rate was significantly higher in the intervention group. The self-reported 7 day point prevalence quit rate of 15.3% in our intervention group was higher than the reported quit rates of proactive telephone counselling (11.4–14.8%) in the meta-analysis of the US clinical practice guidelines [9]. It was also higher than the 6 months quit rate (12.8% in the intervention group) in the proactive counselling based American Quitline [13] and higher than the 12 months quit rate (12.0%) among British smokers who received proactive counselling [29]. The quit rates of 7.4% in our control group was lower than that in the meta-analysis [9]. The overall point prevalence

Table 1 Baseline demographic, smoking and other characteristics of intervention and control groups.

Characteristics	*All subject (n = 952)* %	*Control group (n = 485)* %	*Intervention group (n = 467)* %
Parents category			
Father	84.0	83.9	84.2
Mother	16.0	16.1	15.8
Marital status			
Married	97.7	98.1	97.2
Divorced/Separated	2.3	1.9	2.8
Occupational status			
Currently employed	86.4	85.0	87.9
Unemployed	7.6	6.0	3.7
Housewife	1.1	7.9	7.3
Full time student	4.9	1.0	1.1
Age			
35 or below	34.7	34.1	35.3
36–45	54.6	51.4	57.8
46 or above	10.7	14.5	6.9
Educational attainment			
Primary of below	19.0	21.4	16.5
Secondary (F1–F5)	74.0	71.8	76.4
Matriculation or above	66.0	6.8	7.1
Monthly house hold income			
HK$9999 or less	15.7	18.6	12.9
HK$10 000–29 999	66.7	64.6	69.0
HK$30 000 or above	17.5	16.8	18.2
Smoking status			
Daily smoker	92.4	91.1	93.8
Occasional smoker	3.0	3.9	2.1
Recent quitter <6 months	4.5	4.7	4.1
Daily cigarette consumption in the past month			
10 or less	42.4	45.8	38.8
11–20	48.7	46.2	51.3
21 or above	8.9	8.0	9.9
Nicotine dependency level†			
Low	56.2	55.7	56.7
Moderate	25.4	27.2	23.6
Severe	18.4	17.0	19.7
Years of smoking	8.8	9.2	8.4
1–10	47.7	45.7	50.0
11–20	43.3	45.1	41.5
20 or more			
Spouse smoking status			
Smoker	24.5	23.7	25.3
Non-smoker	74.4	74.8	73.9
Don't know	1.2	1.4	0.9
No. of previous quitting attempt(s)			
None	28.0	28.2	27.8
One or more	72.0	71.8	72.2
Length of abstinence in the last quitting attempt**			
1–30 days	56.4	53.1	59.8
>30 days	43.6	46.9	40.2
Stage of change			
Pre-contemplation	67.9	70.5	65.1

Table 1 *Cont.*

Characteristics	*All subject (n = 952)* %	*Control group (n = 485)* %	*Intervention group (n = 467)* %
Contemplation	22.9	20.6	25.3
Preparation	4.1	3.5	4.7
Action	5.1	5.4	4.9
Alcohol dependency level[#a]			
Not dependent	95.9	97.5	94.2
Dependent	4.1	2.5	5.8

[a]Ewing, J. A. Detecting Alcoholism—the Cage Questionnaire. JAMA 1984; 252: 1905–07.
*The total number is not equal to 952 due to missing data.
**Question only for those parents who had attempted quitting smoking in the past.
†Nicotine dependence level was measured by Fagerstrom scale. It is divided into 3 levels: low (score 0–3), moderate (score 4–5) and severe (score = 6–10).
#Those who answered 'yes' to any two of the following four item CAGE questionnaire were considered as alcohol dependent: (1) in the past six months whether you have ever felt the need to reduce alcohol consumption; (2) in the past six months whether you have ever felt guilty or unhappy because of your drinking; (3) in the past six months whether you have ever been annoyed by other people's criticism on your drinking, and (4) in the past six months whether you have ever needed to drink to calm nerves in the morning.

Table 2 Unadjusted and adjusted ORs for quitting outcomes using different outcome indicators in the intervention and control group at 6 month follow up, by intention to treat* (baseline smokers[a]).

	Control (n = 459) n (%)	*Intervention (n = 444)* n (%)	*OR (95% CI)*	*Adjusted OR (95% CI)***
Main outcome				
Self-reported 7 day point prevalence quit rate	34 (7.4)	68 (15.3)	2.3 (1.5–3.5)	2.1 (1.4–3.4)
Secondary outcomes				
Self-reported 24 h point prevalence quit rate	40 (8.7)	77 (17.3)	2.2 (1.4–3.3)	2.0 (1.3–3.0)
Self-reported continuous abstinence rate	12 (2.7)	18 (4.1)	1.6 (0.7–3.5)	1.8 (0.9–5.0)
Bio-chemically validated (either CO or urine cotinine or both) quit rate	19 (4.5)	40 (10.6)	2.5 (1.4–4.4)	2.2 (1.2–3.9)
Other outcomes				
Had not quit but had reduced smoking by at least 50% from the baseline level	76 (18.1)	122 (32.6)	2.2 (1.6–3.0)	2.1 (1.5–3.0)
Stopped smoking for at least 24 h at some point prior to the interview	112 (29.7)	97 (32.7)	1.1 (0.8–1.6)	1.2 (0.8–1.6)
Complete restriction of smoking at home[ϕ]	99 (24.6)	128 (34.1)	1.6 (1.2–2.2)	1.4 (1.0–2.0)
Partial restriction of smoking at home[ϕϕ]	225 (56.4)	234 (62.7)	1.3 (0.9–1.7)	1.2 (0.9–1.6)
Improvement in the stages of readiness to quit	94 (20.5)	127 (28.7)	1.5 (1.1–2.1)	1.4 (1.1–1.9)

Note: OR = odds ratio; CI = confidence interval.
[a]Included those who were in precontemplation, contemplation or preparation stage at baseline.
*Subjects who did not complete the intervention (withdrawn/could not be contacted) were considered not quitting. Those who had no validation were also considered as not quitting.
**Adjusted for variables (age distribution, number of years smoked, alcohol dependency and marital efficiency) which differed between intervention and control group.
[ϕ]Not smoking at all inside the home; [ϕϕ]not smoking within 3 meters near the child at home.

quit rate of 11.3% in our study is lower than that found in another Hong Kong study of Quitline callers to a reactive telephone counselling (20%) [13]. This might be due to the fact that callers to the Quitline were usually motivated and they called to seek help, while in the studies on proactive calls, smokers were not prepared to quit and were less motivated. However, the nature of proactive counselling was different in the American Quitline study, [10] in which smokers called a Quitline and if they were ready to quit and wanted counselling, then they were proactively called. Therefore, in reality, it was a mix of reactive and proactive calls, while ours was mainly proactive.

Our subjects included a higher proportion of males than females. It is related to the large gender difference in the daily smoking rate between male and female in Hong Kong (26.1% in male versus 3.6% in female) [2]. Addi-

Table 3 Unadjusted and adjusted ORs for quitting outcomes using different outcome indicators in the intervention and control group at 6 month follow up, by intention to treat* (baseline non-smokers[a]).

	Control (n = 459) n (%)	*Intervention (n = 444) n (%)*	*OR (95% CI)*	*Adjusted OR (95% CI)***
Main outcome				
Self-reported 7 day point prevalence quit rate	17 (65.4)	14 (60.9)	0.8 (0.3–2.6)	0.7 (0.3–2.4)
Secondary outcomes				
Self-reported 24 h point prevalence quit rate	18 (69.2)	14 (60.9)	0.6 (0.2–2.2)	0.6 (0.2–1.9)
Self-reported continuous abstinence rate	14 (53.8)	12 (52.2)	0.9 (0.3–2.9)	0.7 (0.2–2.1)
Bio-chemically validated (either CO or urine cotinine or both) quit rate	15 (57.7)	9 (39.1)	0.4 (0.2–1.5)	0.5 (0.08–2.0)
Other outcomes				
Had not quit but had reduced smoking by at least 50% from the baseline level	21 (83.3)	19 (84.2)	1.1 (0.2–6.0)	1.2 (0.2–5.3)
Stopped smoking for at least 24 h at some point prior to the interview	17 (66.7)	9 (40.0)	0.3 (0.09–1.2)	0.3 (0.08–1.4)
Complete restriction of smoking at home[ϕ]	20 (79.2)	18 (78.9)	1.1 (0.2–5.1)	0.8 (0.3–5.3)
Partial restriction of smoking at home[ϕϕ]	24 (92.3)	22 (95.6)	1.8 (0.1–55.2)	1.8 (0.1–51.2)

Note: OR = odds ratio; CI = confidence interval.
[a]Included those who were in action stage at baseline.
*Subjects who did not complete the intervention (withdrawn/could not be contacted) were considered not quitting. Those who had no validation were also considered as not quitting.
**Adjusted for variables (age distribution, number of years smoked, alcohol dependency and marital efficiency) which differed between intervention and control group.
[ϕ]Not smoking at all inside the home; [ϕϕ]not smoking within 3 meters near the child at home.

tionally, many women might have quit smoking because of their pregnancy, as smoking in pregnancy is stigmatised in Hong Kong society.

Our ORs of 2.1 (95% CI, 1.4–3.4) for self-reported quit rate and 2.2 (95% CI, 1.2–3.9) for bio-chemically validated quit rate are greater than the aggregate ORs (OR = 1.56; 95% CI 1.38–1.77) reported in a meta-analysis of 13 randomised proactive telephone interventions [6]. In another review, proactive telephone counselling was associated with an estimated OR for quitting of 1.2 (95% CI 1.1–1.6) [9]. The effect size of our proactive telephone counselling among Chinese parents of young children is not unexpected and appears better than trials targeting other smokers who are not parents of young children.

We found that the difference in the continuous quit rates between the intervention (4.1%) and control group (2.7%) was not significant. This might be due to insufficient statistical power. It is also plausible that the initial intervention was not adequate to develop strong motivation among the participants, but the feedback and additional counselling provided during the follow up at 1 and 3 months could encourage them to quit, thus increasing the short-term quit rates (24 h point prevalence and 7 day point prevalence) among the intervention group participants. This indicates that continuous intervention provided on several occasions would be needed to improve long-term quit rate. A recent systematic review showed that multiple contacts timed around a quit attempt was effective in encouraging smoking cessation [6].

In this study we reported several other outcome measures, some of which had improved for subjects in the intervention group. Because, behaviour change for smokers could not only be assessed from their quitting of smoking, but other measures such as reducing smoking or making a serious quitting attempt lasting at least a day or making other positive changes could also be informative. As most studies do not report such results, we argue that any future studies to report these outcomes as supplementary information for better understanding of interventions' effectiveness.

The drop out rate of 15% (72/467) in the intervention group was slightly lower than in another study among parents of young children (17%), [30] but higher than the control group (8.9%). The higher drop out rate in the intervention group might be due to the intervention itself. Some subjects who were unsuccessful in their quitting attempt might be unhappy with the outcome and did not want to be contacted further.

The high recruitment and retention rate in this study might be due to the importance of the topic and its relationships with their child's health. Smoking by women is not acceptable in Chinese culture and smoking by pregnant women is even more discouraged. Therefore, it was possible that some women might have stopped smoking for the sake of their child's health and to conform to social

expectations. Some of these women might return to smoking later or might have continued their behaviour without reporting.

The high level of satisfaction with the telephone based counselling among the parents and counsellors is encouraging and indicates that the quality of the service was high. Moreover the time spent per smoker (average 38 min) seems reasonable, which should be affordable by any health promotion programme given the long-term public health benefits of quitting smoking. All these reflect the feasibility of the intervention and indicate the potential for proactive telephone counselling in promoting smoking cessation to targeted population.

Limitations

There are several limitations of the study, which are included below. First, not all eligible people contacted agreed to participate in the counselling programme increasing the risk of participation bias. However, once subjects enrolled, the drop out rate and loss to follow up was relatively low. Second, there were some differences in the baseline characteristics among the intervention and the control group subjects. We are uncertain whether it was subverted by the counsellors or due to a chance. However, we have adjusted the outcome for the variables, which differed between the intervention and the control group. Third, we tried to limit our counselling within the planned timetable (20–30 min for the initial counselling and 10–15 min for the follow up). A longer counselling session and more frequent contact might strengthen the intervention effect. Fourth, the intervention was given at a time when parents may have been concerned about the effects of smoking on their child's health and thus been primed to accept the counsellor's advice on quitting. Therefore, these results might not generalize to other populations where such a particular factor does not apply. Finally, the quit rates reported are based on the follow up at 6 months. However, it is not certain what proportion will continue quitting for a longer duration.

CONCLUSIONS

Proactive telephone counselling has been shown to be a useful strategy to promote smoking cessation among the parents of young children. Our result should have important implication for the promotion of smoking cessation among parents of young children in Hong Kong, mainland China and elsewhere. This trial is the first in Hong Kong and in the East to report telephone based smoking cessation counselling in a proactive manner targeting a group who should be more receptive. The validity of the result was strengthened by the low dropout rate and comparable quit rates, both in the intervention and control groups, with other intensive programmes elsewhere [31,32]. However, about 70% of the parents were precontemplators and only 5% were in the action stage. As quitting outcome was higher among those who were in the action stage than those who were not in action stage, a comprehensive tobacco control programme is needed in the community to move more smokers into the action stage, so that individual proactive counselling can have a greater impact.

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