Brief cessation advice, nicotine replacement therapy sampling and active referral (BANSAR) for smoking expectant fathers: study protocol for a multicentre, pragmatic randomised controlled trial

Tzu Tsun Luk[1], Chi Ju Hsieh[1], Wing-cheong Leung[2], Kwok-yin Leung[3], Ka Wang Cheung[4], Carina Kwa[5], Kar-hung Siong[6], Kwok-keung Tang[7], Kai-wan Lee[8], William Ho-cheung Li[1], Tai Hing Lam[9], Man Ping Wang[1]

[1]School of Nursing, The University of Hong Kong, Hong Kong SAR

[2]Department of Obstetrics & Gynecology, Kwong Wah Hospital, Hong Kong SAR

[3]Department of Obstetrics & Gynecology, Queen Elizabeth Hospital, Hong Kong SAR

[4]Department of Obstetrics & Gynecology, Queen Mary Hospital, Hong Kong SAR

[5]Department of Obstetrics & Gynecology, United Christian Hospital, Hong Kong SAR

[6]Department of Obstetrics & Gynecology, Tuen Mun Hospital, Hong Kong SAR

[7]Department of Obstetrics & Gynecology, Pamela Youde Nethersole Eastern Hospital, Hong Kong SAR

[8]Department of Obstetrics & Gynecology, Princess Margaret Hospital, Hong Kong SAR

[9]School of Public Health, The University of Hong Kong, Hong Kong SAR

Corresponding author:
Man Ping Wang
School of Nursing, The University of Hong Kong,
21 Sassoon Road, Pokfulam, Hong Kong SAR
Tel: +852-3917-6636
Email: mpwang@hku.hk

Declarations of competing interest: None.

ABSTRACT

Background: Pregnancy presents a teachable moment to engage male smokers whose partners are pregnant in smoking cessation. Evidence on how to approach and help these smokers quit smoking in antenatal settings has remained scarce. This paper presents the rationale and study design of a trial which aim to evaluate the effectiveness of a brief intervention model for promoting smoking cessation in expectant fathers.

Methods: BANSAR is a pragmatic randomised controlled trial conducted in antenatal clinic in seven public hospitals in Hong Kong, China. An estimated 1148 fathers who smoke at least one cigarette daily and whose partners are pregnant and non-smoking will be randomised (1:1) to receive brief advice combined with 1-week sample of nicotine replacement therapy (NRT) and active referral to smoking cessation services, or brief advice only (usual care). Outcome will be assessed at 3 and 6 months after treatment initiation. The primary outcome is carbon monoxide-verified (<4 part per million) abstinence at 6 months post-treatment initiation. Secondary outcomes include self-reported 7-day point-prevalence abstinence and 24-week continuous abstinence, use of smoking cessation service and NRT and quit attempt, and smoking reduction, change in nicotine dependence and intention to quit in continuing smokers.

Comment: This trial will provide real-world evidence on the effectiveness of a combined brief intervention model for smoking cessation in expectant fathers, an understudied population. The findings may be particularly relevant to low and middle-income countries, where male-to-female smoking ratios and birth rates tend to be higher than higher-income countries.

Trial registration: ClinicalTrials.gov, number NCT03671707.

Keywords: smoking cessation, brief intervention, nicotine replacement therapy, pregnancy, expectant father, Chinese

1. Introduction

Growing evidence suggests secondhand smoke exposure in non-smoking pregnant women may be associated with adverse foetal outcomes such as stillbirth and congenital abnormalities [1]. In low- and middle- income countries, where male-to-female smoking ratios are high, the disease burden posed by maternal passive smoking may even exceed that of maternal active smoking [2]. In Western Pacific region, only 1.2% women smoked during pregnancy [3], but over half non-smoking women were regularly exposed to secondhand smoke [4]. Reducing maternal passive smoking has substantial public health implications.

Pregnancy may present a teachable moment in which expectant fathers may be more receptive than usual to smoking cessation interventions [5]. Although the World Health Organization strongly advocates protecting pregnant women from secondhand smoke exposure by helping their partners quit smoking, no recommendation on how to engage these smokers in antenatal settings were made owing to low quality of evidence available [6]. Our literature search in October 2019 using the keywords "Smoking Cessation"[Mesh] and "Pregnancy"[Mesh] in PubMed plus hand-searching found only two trials that were directed at smoking expectant fathers. The first trial found similar effect between a multicomponent intervention (4 weeks of nicotine replacement therapy [NRT], a 18-minute ‘why quit’ video and print-based materials) and a self-help brochure on carbon monoxide-verified abstinence (N = 561; 7.9% vs 5.2%; P = 0.20) [7]. The second trial did not find an intensive, couple-based counselling increased cotinine-verified abstinence when added to 6 weeks of NRT and a self-help booklet (N = 348; 30% vs 31%) [8].

At any given time, a substantial portion of smokers are not motivated to quit. A survey of 17 mostly low- and middle-income countries found that most adult current smokers (79%) were not interested in quitting in the coming year [9]. Current guidelines of tobacco dependence treatment recommends providing motivational treatment to strengthen their motivation to quit [10]. However, such treatment (e.g., 5Rs, motivational interviewing) are too complex and time-consuming for healthcare practitioners to deliver in busy clinical settings. A systematic review has found brief (< 10 mins) physician intervention can improve cessation outcomes regardless of the smokers' motivation [11]. By adapting the 5As, we developed a brief proactive intervention model "AWARD" (Ask, Warn, Advise, Referral, Do-it-again) that can be delivered by trained lay counsellors. The AWARD model has been found effective in increasing abstinence in unselected smokers [12, 13], especially when combined with active referral to community-based smoking cessation services (active referral) [14, 15]. Sampling of 1 or 2 weeks supply of NRT is another increasingly studied, low-cost and brief intervention for engaging unmotivated smokers in quitting [16-19]. Randomised trials have found NRT sampling is effective in increasing quit attempt and their success in unmotivated smokers [16, 17], primarily by increasing their motivation and self-efficacy to quit [20]. Our pilot trial has also shown the beneficial effect of 1-week NRT sample on increased quit attempt in Chinese smokers [21].

Despite being a westernised and developed city, Hong Kong has a similar predominance of male smokers (18.1% in male vs 2.7% in female) to mainland China and other Asian countries. Most current smokers (63.5%) had no previous quit attempt and were not willing to quit; very few (4.4%) had tried to quit by seeking help from smoking cessation services or using medications [22]. In local public hospitals, the smoking status of pregnant women are routinely assessed

during their first antenatal check-up. However, few practices assess the smoking status of their partners and offered assistances to quit, and nearly 30% partners of mothers with newborns were smokers [23]. This likely represents a missed opportunity to engage expectant father in smoking cessation and to protect pregnant women and children from tobacco smoke exposure. We developed an intervention model by combining brief cessation advice, NRT sampling and active referral (BANSAR) and evaluate its effectiveness for smoking cessation in expectant fathers.

2. Methods

2.1. Study design

This study is a population-based, multicentre, two-arm, pragmatic randomised controlled trial. Participants will be recruited from antenatal clinics in 7 of the 8 public hospitals that provide obstetric services in Hong Kong. These include Kwong Wah Hospital (KWH), Queen Elizabeth Hospital (QEH), Queen Mary Hospital (QMH), United Christian Hospital (UCH), Tuen Mun Hospital (TMH), Pamela Youde Nethersole Eastern Hospital (PYNEH), and Princess Margaret Hospital (PMH) (Figure 1). The catchment area of these hospitals covers about 82% (about 6.0 of 7.3 million) of the Hong Kong population.

(Please insert Figure 1 here)

2.2. Setting and participants

A researcher (a research nurse or an experienced research assistant) will proactively approach all male partners of pregnant women present in the waiting room of the antenatal clinics and screen for their eligibility. Pregnant women who are not accompanied by their spouse will also be approached and asked if their spouses were smokers. If so, the women will be given a flyer describing the study with contacts of the research team and encouraged to motivate their male partners to join the trial. Posters advertising for the study will also be put up in the waiting rooms for passive recruitment of participants.

Both the expectant father and pregnant women need to be Hong Kong residents aged 18 years or older, able to communicate in Chinese and are living together in the past 7 days to be eligible for the trial. Inclusion criteria for the expectant fathers include having smoked at least one cigarette daily in the past 3 months and owning a telephone or mobile phone for contact. Expectant fathers having any history of severe angina, arrhythmia, or acute myocardial infarction; psychiatric disorders or on regular psychotropic medications; or used smoking cessation aids or participated in an alternative smoking cessation programmes in the past 3 months will be excluded. Expectant fathers whose partners have smoked a cigarette in the past 30 days will also be excluded. There is no restriction on the gestational age and parity of the pregnant women in this pragmatic trial. Although pregnant women who smoke will not be eligible for the trial, they will also receive brief advise to quit smoking and information about the smoking cessation services in Hong Kong.

2.3. Allocation and masking

Participants will be individually randomised to the intervention or control groups (1:1). The allocation sequence was generated by a biostatistician who is not involved in the study using an online tool (https://www.sealedenvelope.com/simple-randomiser/v1/lists). Random permuted block size of two, four or six were used to ensure a similar number of participants in both study groups. The allocation sequence will be concealed by using sequentially numbered, opaque, sealed envelope (SNOSE) prepared by TTL, who is not involved in participant recruitment. Masking of the interventionist and the participants is not possible due to the nature of the interventions. To avoid intervention contamination, the researcher will ensure that no other expectant father (potential subjects or participants) is near when delivering the assigned treatment to a participant. An investigator will withhold the coding of the treatment group status from the statistical analysts until data cleaning and major analyses are completed. Data entry will be done independent of the statistical analysts.

2.4. Interventions

Participants in both groups will receive face-to-face smoking cessation advice at baseline before being randomised to receive the allocated treatment. Researchers will approach all potential participants present in the antenatal clinics and begin the conversation by asking about the smoking behaviours of the expectant father (*Ask*). Those who reported current smoking will be warned about the health hazards of tobacco smoke exposure to pregnant women, foeti and children (*Warn*) and advised to quit or reduce smoking by joining the study (*Advise*). Specifically, the expectant fathers will be warned that maternal and foetal exposure to tobacco smoke may increase the risk of miscarriage, preterm birth, small for gestational age, and respiratory diseases. Expectant father who are willing to participate will undergo further

screening for eligibility. After obtaining informed consents and collecting baseline data, the researcher will open a SNOSE to determine and deliver the allocated treatment to the participants.

2.4.1. Intervention group

Participant in the intervention group will be given 1-week supply (either seven patches or 84 gums) of NRT in the original packing (Nicotinell; GlaxoSmithKline, Brentford, London, UK). Similar to our previous studies [21, 24], the dose and formulation of the NRT mainly depends on the daily cigarette consumption of the participants. Participants who smoked < 10, 10–20 and > 20 cigarettes per day without preference on the formulation will be given 2 mg gums, 14 mg patch and 21 mg patch, respectively. Since 4 mg NRT gum is not available on the market in Hong Kong, participants who smoked 10 or more cigarettes per day are encouraged to use patch. The researcher will briefly instruct the participants on how to use the NRT and provide an A6-sized instruction card, which covers information on the proper way of using the NRT patch or gum, management of common side effects, and a hotline to a research nurse.

Following the AWARD model, participants in the intervention group will be offered referral to an external, community-based smoking cessation service in Hong Kong (*Refer*) [14]. These services are free-of-charge to Hong Kong residents and provide evidence-based treatment, including telephone and face-to-face behavioural support, NRT, smoking cessation medications, and acupuncture. The researcher will briefly describe the smoking cessation service providers and their treatment modalities to the participants and encourage the participants to select a service provider. Contacts of participants who are willing to be referred will be sent to their

choice of a service provider. The service providers will then contact the participants through telephone and arrange further treatment. Participants will also receive up to two telephone boosters delivered by a research nurse within a month after treatment initiation (*Do-it-again*), through which they will be asked about their use of NRT sample (e.g., adherence, side effect) and smoking cessation services. Those who refused referral at baseline will also be encouraged to select a service provider and offered referral during the telephone boosters and at the 3-month follow-up. Participant will also be given a leaflet developed by the study team, which covers information about the harm of secondhand smoke exposure to foeti, infant and the mothers, motivational quotes, tips on how to manage craving, and brief descriptions and contacts of smoking cessation services in Hong Kong . The first version of the leaflet was revised and finalised according to the comments by 21 pregnant women with a smoking partner.

2.4.2. Control group

Given the pragmatic design of BANSAR, participants in the control group will receive a slightly enhanced treatment that expectant fathers visiting antenatal clinics in Hong Kong could get under usual circumstances (i.e., no treatment). Participants in the control group received very brief advice to quit (*Ask*, *Warn* and *Advise* and tips on how to manage nicotine withdrawal, e.g., "you may take a deep breath and drink water when you have urges to smoke") and a standard leaflet designed by the Department of Health, Government of Hong Kong SAR (https://www.fhs.gov.hk/tc_chi/health_info/child/14819.pdf). The leaflet contains information about the health hazards of tobacco smoke exposure to foeti and children and the numbers of a statutory integrated smoking cessation quitline. Participants in the control group can access the

same smoking cessation services to which participants in the intervention group are actively referred through the quitline.

All researchers involved in participant recruitment were trained and supervised by a master's level research nurse (CJH) and are required to complete a checklist during recruitment of each participants to ensure delivery of all intervention components. Apart from receiving the same information about the health hazards of secondhand smoke exposure to pregnant women, foeti, and young children as their partners, the pregnant women in both study groups will not be intervened. Pregnant women will be given an access to a hotline handled by a nurse for potential psychological burden and family issues (e.g., quarrels) related to their partners' smoking. After initial contact at baseline, there will be no further face-to-face contacts between the researchers and the participants throughout the entire intervention period.

2.5. Measures

Data will be collected at baseline before randomisation and during telephone follow-up at 3 and 6 months after randomisation (Figure 2). The baseline questionnaires will cover measures of cigarette smoking behaviours, previous smoking cessation attempts, perceptions of quitting (importance, difficulty and confidence, each measured on a scale of 0 to 10), prior exposures to smoking cessation treatment and sociodemographic.

(Please insert Figure 2 here)

The primary outcome will be 7-day point-prevalence tobacco abstinence (PPA) at 6 months post-treatment initiation (3 months after the end of treatment) [25], verified by an exhaled carbon monoxide level of less than 4 part per million [26]. Participants who reported having quitted for 7 days or longer will be invited to participate in the face-to-face exhaled carbon monoxide test with a small cash incentive of HK$300 (about US$38).

Secondary outcomes will include self-reported 7-day PPA, quit attempt (abstinence for 24 hours or longer), use of smoking cessation services (defined by answering "yes" to the question "have you ever used a smoking cessation service since joining the study") and use of NRT (defined by answering "yes" to the question "have you ever used any NRT products since joining the study?") at 3- and 6-month follow-up, and 24-week continuous abstinence for participants who reported planning to quit within 7 days at baseline. The amount of NRT consumed in both groups will also be recorded. Additional secondary outcomes in continuing smokers at 3- and 6-month follow-up include smoking reduction (defined by at least 50% decrease in baseline number of cigarettes per day; change in nicotine dependence (measured by Heaviness of Smoking Index); and change in readiness to quit from baseline.

To assess potential discord between expectant father and the pregnant women as a result of the intervention [6], we will measure change in perceived family harmony/ happiness scores (each measured on a scale from 0 to 10 [27]) at 6 months from baseline. Data on use of alternative tobacco products, including heated tobacco products, will also be collected at baseline and during follow-up. Process measures include perceived usefulness of the health warning information delivered by the researchers at baseline, leaflets, NRT sample (in the intervention

group) and smoking cessation service. For process evaluation of the recruitment activities, we will record the number of potential subjects identified, approached, screened for eligibility and enrolled in the trial. The number of participants recruited proactively and recruited through passive means (e.g., through the pregnant women) will also be recorded. Qualitative evaluations will be done by individual interviews with participants after the end of the study.

2.6. Data analyses

2.6.1. Sample size calculation

The required sample was calculated based on the findings in our prior randomised controlled trial of brief advice and active referral, which found, in the intention-to-treat population, a validated abstinence rate of 5.0% in the control group and an intervention effect of 1.85 (odds ratio) at 6 month after treatment initiation [14]. With an allocation ratio of 1:1 and power of 0.80, 1148 participants (574 per group) will be needed to detect a significance difference at two-sided 5% level of significance.

2.6.2. Main analyses

The primary analysis will be by intention-to-treat and participants with missing outcome will be considered having no change in smoking behaviours from baseline [28]. Logistic regressions will be used to compare the primary and secondary binary outcomes between the intervention and control groups. Descriptive statistics will be used to compare changes in nicotine dependence and intention to quit.

Four sensitivity analyse of the intervention effect on abstinence outcomes will be conducted. First, multivariable logistic regression models will be used to control for potential imbalances in baseline characteristics. Second, generalised estimation equation models using a logit link and an exchangeable correlation structure will be used to account for potential clustering effect within each of the 7 study centres. The analyses of variance methods will be used to calculate the intra-cluster correlation coefficients. Third, we will use multiple imputation by chained equation models to impute missing data in abstinence outcomes [29]. Study group membership and baseline factors predictive of abstinence outcome, including nicotine dependence, previous quit attempt and readiness to quit [30], will be included in the imputation model. Inference will be drawn from at least 50 imputed datasets created. Fourth, complete case analyses, wherein participants with missing abstinence outcomes are excluded, will be conducted.

2.6.3. Secondary analyses

Subgroup analyses by the following baseline characteristics of the participants will be done: cigarette dependence (Heaviness of smoking index score < 3 vs ≥ 3); readiness to quit within 30 days (yes vs no); any previous quit attempt (yes vs no), the trimester during which the participants were recruited (1^{st} trimester vs others); living with a smoker (yes vs no); and ever smoking status of the pregnant women (yes vs no). The corresponding multiplicative interaction terms will be included in logistic regression models to calculate the P value for interaction, adjusting for multiplicity. Note that the study is not powered to examine interaction.

To assess the generalisability of the findings, some smoking characteristics (e.g., heaviness of smoking, past quit attempt) will be compared between the participants and eligible subjects who

refused to join the study. In the intervention group, we shall examine the associations of use of NRT sample and smoking cessation service with abstinence outcomes, adjusting for established predictors of cessation outcomes [30]. The predictive or mediation effects of perceived maternal support for quitting, quit attempt and change in intention to quit on abstinence outcome will also be examined.

2.7 Ethnics and dissemination

The study protocol has been approved by the Research Ethics Committee or Institutional Research Board (REC/ IRB) in the University of Hong Kong/ Hospital Authority Hong Kong West Cluster (UW 18-030); Hong Kong East Cluster (HKECREC-2017-099); Kowloon Central and East Clusters (KC/KE-19-0005/ER-2); New Territories West Cluster (NTWC/CREC/17128); and Kowloon West Cluster (KW/EX-18-038[120-68]). Reports on the main results of the trial shall be submitted to the REC/ IRB, funder of the study, and published in academic journals.

3. DISCUSSION

The BANSAR trial is designed to examine a brief intervention model combining cessation advice, 1-week sample of NRT and active referral for promoting quitting in expectant fathers. Participant recruitment has begun since October 10, 2018 and is projected to end by fall of 2020. Follow-up of the last participant is projected to complete by early 2021. This study shall be the largest of all existing trials on smoking cessation interventions directed at partners of pregnant women—an understudied population—and may contribute to the literature by providing real-

world evidence of a brief and scalable intervention model that can be readily implemented in antenatal settings.

This trial has some notable features. First, the trial is pragmatic and dose not aim to examine the effectiveness of the individual components of the intervention (brief advice, NRT sample and active referral), all of which has been found effective in randomised trials conducted in heterogenous cohorts of smokers in Hong Kong [13, 14, 21]. We have imposed minimal exclusion criteria to recruit smokers that are similar to the intended target of the intervention model. Participants' use of NRT sample and smoking cessation services might be expectedly lower than more selective subjects, such as those who are willing to make a quit attempt in the short-term. This approach could provide real-world evidence on the effectiveness of the intervention to inform clinical practice but may underestimate its true effect in optimal conditions. A planned sensitivity analysis of the use of NRT sample and smoking cessation service in the intervention group shall provide some data on their relative effect on the outcomes. Second, both proactive and passive means (posters in clinics) will be used to recruit participants. The number of the participants recruited in either ways could provide some information about the utility of both recruitment strategies. Third, recruitment of the participants and delivery of baseline intervention will take place in the waiting room of the antenatal clinics. This approach takes advantage of the waiting time from registration to seeing a clinician (typically one hour in public hospitals in Hong Kong) and could avoid interruption of the routine services in the antenatal clinics.

We have selected 7-day PPA as the primary outcome because BANSAR is a cessation-induction trial and would likely recruit a sizable fraction of smokers who are not ready to quit in the short term. Continuous abstinence (24-week), which has to be anchored to a target quit date [28], could only be accessed in study participants who are willing to quit in 7 days at baseline. Nevertheless, a systematic review has found that the relative effect sizes of PPA and prolonged abstinence are highly correlated [31]. Furthermore, although study participant will be recruited in a clinical setting, BANSAR should be regarded as a population-based, low-intensity trial because partners of pregnant women are not treated as users of the antenatal service and there will be no further face-to-face interaction between the investigators and study participants after baseline. Therefore, based on our experiences, we expect that a substantial portion of self-reported abstainers would not participate in biochemical validation of their quitting [32]. They will be regarded as continuing smokers, and the use of intention-to-treat analyses shall give conservative estimates of the treatment effect. Nevertheless, we plan to apply multiple imputation to impute the biochemical validated abstinence status for self-reported abstainers who did not participate in biochemical validation of their quitting, which could improve the precision of estimates and reduce selection bias, while preserving the uncertainties of missingness.

Emerging research suggests mother exposed to household smoking may have other untoward effects apart from maternal and foetal health hazards, such as shortened breastfeeding duration [23]. Growing literature also suggests children exposed to household smoking are more likely to display behavioural problems [33], have poor perceived family happiness [34], and initiate smoking [35]. Subject to additional funding, our study may also provide experimental data on the potential effect of paternal smoking cessation on these outcomes.

Declaration of interests

None.

Acknowledgements

This study is funded by Health and Medical Research Fund, Food and Health Bureau, Government of the Hong Kong Special Administrative Region. The funding body has no role in the design of the study and collection, analysis, and interpretation of data and in writing of the manuscript.

References

1. Leonardi-Bee J, Britton J, Venn A. Secondhand smoke and adverse fetal outcomes in nonsmoking pregnant women: a meta-analysis. Pediatrics. 2011;127(4):734-41.
2. Reece S, Morgan C, Parascandola M, Siddiqi K. Secondhand smoke exposure during pregnancy: a cross-sectional analysis of data from Demographic and Health Survey from 30 low-income and middle-income countries. Tob Control. 2019;28(4):420-6.
3. Lange S, Probst C, Rehm J, Popova S. National, regional, and global prevalence of smoking during pregnancy in the general population: a systematic review and meta-analysis. Lancet Glob Health. 2018;6(7):e769-e76.
4. Oberg M, Jaakkola MS, Woodward A, Peruga A, Pruss-Ustun A. Worldwide burden of disease from exposure to second-hand smoke: a retrospective analysis of data from 192 countries. Lancet. 2011;377(9760):139-46.
5. Yin H, Chen X, Zheng P, Kegler M, Shen Q, Xu B. A neglected opportunity for China's tobacco control? Shift in smoking behavior during and after wives' pregnancy. Tob Induc Dis. 2016;14(1):39.
6. World Health Organization. WHO Recommendations for the prevention and management of tobacco use and second-hand smoke exposure in pregnancy. Geneva: World Health Organization; 2013.
7. Stanton WR, Lowe JB, Moffatt J, Del Mar CB. Randomised control trial of a smoking cessation intervention directed at men whose partners are pregnant. Prev Med. 2004;38(1):6-9.
8. Pollak KI, Lyna P, Bilheimer AK, Gordon KC, Peterson BL, Gao X, et al. Efficacy of a couple-based randomized controlled trial to help Latino fathers quit smoking during pregnancy and postpartum: the Parejas trial. Cancer Epidemiol Biomarkers Prev. 2015;24(2):379-85.
9. Centers for Disease Control and Prevention. Antismoking messages and intention to quit - 17 countries, 2008-2011. MMWR Morb Mortal Wkly Rep. 2013;62(21):417-22.
10. Fiore MC, Jaen CR, Baker T, Bailey W, Benowitz N, Curry Se, et al. Treating tobacco use and dependence: 2008 update. Rockville, MD: US Department of Health and Human Services. Public Health Service; 2008.

11. Aveyard P, Begh R, Parsons A, West R. Brief opportunistic smoking cessation interventions: a systematic review and meta-analysis to compare advice to quit and offer of assistance. Addiction. 2012;107(6):1066-73.
12. Chan SS, Cheung YTD, Wong YMB, Kwong A, Lai V, Lam TH. A brief smoking cessation advice by youth counselors for the smokers in the Hong Kong Quit to Win contest 2010: a cluster randomized controlled trial. Prev Sci. 2018;19(2):209-19.
13. Li WHC, Ho KY, Wang MP, Cheung DYT, Lam KKW, Xia W, et al. Effectiveness of a Brief Self-determination Theory–Based Smoking Cessation Intervention for Smokers at Emergency Departments in Hong Kong: A Randomized Clinical Trial. JAMA Intern Med. 2019 (in press).
14. Wang MP, Suen YN, Li WH-c, Lam CO-b, Yong-da Wu S, Kwong AC-s, et al. Intervention With Brief Cessation Advice Plus Active Referral for Proactively Recruited Community Smokers: A Pragmatic Cluster Randomized Clinical Trial. JAMA Intern Med. 2017;177(12):1790-7.
15. Wang MP, Luk TT, Wu Y, Li WH, Cheung DYT, Kwong A, et al. Chat-based instant messaging support integrated with brief intervention for smoking cessation: a community-based, pragmatic, cluster-randomized controlled trial. Lancet Digital Health. 2019;1(4):e183-e92.
16. Carpenter MJ, Hughes JR, Gray KM, Wahlquist AE, Saladin ME, Alberg AJ. Nicotine therapy sampling to induce quit attempts among smokers unmotivated to quit: a randomized clinical trial. Arch Intern Med. 2011;171(21):1901-7.
17. Jardin BF, Cropsey KL, Wahlquist AE, Gray KM, Silvestri GA, Cummings KM, et al. Evaluating the effect of access to free medication to quit smoking: a clinical trial testing the role of motivation. Nicotine Tob Res. 2014;16(7):992-9.
18. Cheung YTD, Leung JPK, Cheung CKC, Li WHC, Wang MP, Lam TH. Motivating smokers at outdoor public smoking hotspots to have a quit attempt with a nicotine replacement therapy sample: study protocol for a randomized controlled trial. Trials. 2016;17(1):355.
19. Dahne J, Wahlquist AE, Boatright AS, Garrett-Mayer E, Fleming DO, Davis R, et al. Nicotine replacement therapy sampling via primary care: Methods from a pragmatic cluster randomized clinical trial. Contemp Clin Trials. 2018;72:1-7.
20. Burris JL, Heckman BW, Mathew AR, Carpenter MJ. A mechanistic test of nicotine replacement therapy sampling for smoking cessation induction. Psychol Addict Behav. 2015;29(2):392-9.
21. Cheung YTD, Li HCW, Wang MP, Lam TH. Delivery of a nicotine replacement therapy sample at outdoor smoking hotspots for promoting quit attempts: a pilot randomized controlled trial. Nicotine Tob Res. 2019.
22. Census and Statistics Department. Thematic household survey report no. 64: Pattern of smoking and personal computer and internet penetration Hong Kong Special Administrative Region: Census and Statistics Department; 2018 [Available from: https://www.statistics.gov.hk/pub/B11302642018XXXXB0100.pdf.
23. Lok KYW, Wang MP, Chan VHS, Tarrant M. Effect of Secondary Cigarette Smoke from Household Members on Breastfeeding Duration: A Prospective Cohort Study. Breastfeed Med. 2018;13(6):412-7.
24. Chan SS, Leung DY, Abdullah AS, Wong VT, Hedley AJ, Lam TH. A randomized controlled trial of a smoking reduction plus nicotine replacement therapy intervention for smokers not willing to quit smoking. Addiction. 2011;106(6):1155-63.
25. Piper ME, Bullen C, Krishnan-Sarin S, Rigotti NA, Steinberg ML, Streck JM, et al. Defining and measuring abstinence in clinical trials of smoking cessation interventions: An updated review. Nicotine Tob Res. 2019:ntz110, https://doi.org/10.1093/ntr/ntz110.
26. Cropsey KL, Trent LR, Clark CB, Stevens EN, Lahti AC, Hendricks PS. How low should you go? Determining the optimal cutoff for exhaled carbon monoxide to confirm smoking abstinence when using cotinine as reference. Nicotine Tob Res. 2014;16(10):1348-55.

27. Shen C, Wang MP, Ho HCY, Wan A, Stewart SM, Viswanath K, et al. Test–retest reliability and validity of a single-item Self-reported Family Happiness Scale in Hong Kong Chinese: findings from Hong Kong Jockey Club FAMILY Project. Qual Life Res. 2019;28(2):535-43.
28. West R, Hajek P, Stead L, Stapleton J. Outcome criteria in smoking cessation trials: proposal for a common standard. Addiction. 2005;100(3):299-303.
29. White IR, Royston P, Wood AM. Multiple imputation using chained equations: Issues and guidance for practice. Stat Med. 2011;30(4):377-99.
30. Vangeli E, Stapleton J, Smit ES, Borland R, West R. Predictors of attempts to stop smoking and their success in adult general population samples: a systematic review. Addiction. 2011;106(12):2110-21.
31. Hughes JR, Carpenter MJ, Naud S. Do point prevalence and prolonged abstinence measures produce similar results in smoking cessation studies? A systematic review. Nicotine Tob Res. 2010;12(7):756-62.
32. SRNT Subcommittee on Biochemical Verification. Biochemical verification of tobacco use and cessation. Nicotine Tob Res. 2002;4(2):149-59.
33. Luk TT, Wang MP, Suen YN, Koh DS-q, Lam TH, Chan SS-c. Early childhood exposure to secondhand smoke and behavioural problems in preschoolers. Sci Rep. 2018;8(1):15434.
34. Chen J, Ho S, Au W, Wang M, Lam T. Family smoking, exposure to secondhand smoke at home and family unhappiness in children. Int J Environ Res Public Health. 2015;12(11):14557-70.
35. Wang MP, Ho SY, Lam TH. Parental smoking, exposure to secondhand smoke at home, and smoking initiation among young children. Nicotine Tob Res. 2011;13(9):827-32.

Figure 1. The locations of study centres in Hong Kong, China.

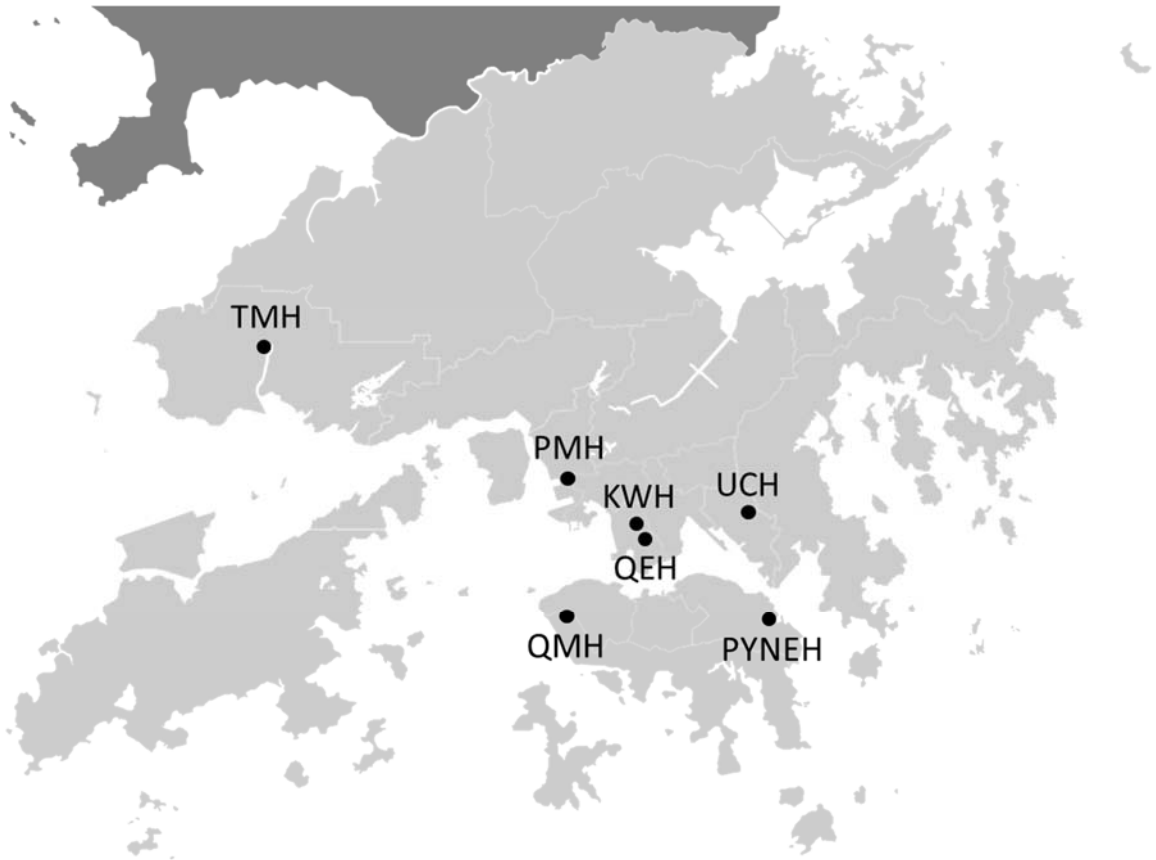

Figure 2. The schedule of enrollment, interventions, and assessments

	Study period			
	Enrolment	Allocation	Post-allocation	
TIMEPOINT	-1	0	3 months	6 months
ENROLMENT:				
Eligibility screen	X			
Informed consent	X			
Allocation		X		
INTERVENTIONS				
Intervention group		X		
Control group		X		
ASSESSMENTS				
Sociodemographic	X			
Smoking status and behaviours	X		X	X
Biochemical validated abstinence				X
Use of alternative tobacco products	X		X	X
Quit attempt	X		X	X
Readiness to quit	X		X	X
Perception of quitting	X		X	X
Use of smoking cessation service	X		X	X
Use of NRT	X		X	X
Perceived usefulness of the interventions			X	X
Perceived family happiness and harmony	X			X