BMJ Open

Assessment of beliefs and risk perception about smoking and smoking cessation in Mandarin and Cantonese speaking adult smokers: Implications for intervention model

Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2014-006435
Article Type:	Research
Date Submitted by the Author:	21-Aug-2014
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Primary Subject Heading:	Smoking and tobacco
Secondary Subject Heading:	Smoking and tobacco
Keywords:	Change management < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Risk management < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

Title: Assessment of beliefs and risk perception about smoking and smoking cessation in Mandarin and Cantonese speaking adult smokers: Implications for intervention model

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Keywords: smoking, Chinese communities, beliefs, risk perceptions, smoking cessation

Word count: 3255

What this paper adds:

1. Understanding the beliefs, perceptions, and practice of Chinese Mandarin and Cantonese communities about smoking and smoking cessation creates opportunities to tailor smoking cessation interventions according to the needs of these communities.
2. Previously, most studies have applied an identical risk perception model on smoking behaviour assessments among young vs. old and male vs. female smokers. However, our study identified that risk perception about smoking and smoking consequences differ in the smoking population group based on their age and gender. Therefore, a different model of risk perception should be designed and applied considering the age and gender of participants.
3. Despite existing knowledge that Chinese communities are heterogeneous, our study found that smoking habit, perceptions, beliefs, and practice differ in Mandarin speaking compared to Cantonese speaking Chinese.

ABSTRACT

Objectives: We explored cultural and belief contexts for smoking habits within Mandarin and Cantonese speaking communities. The aim was to identify their perceived barriers and facilitators to successful cessation. We attempted to translate existing knowledge and our previous experience in designing a conceptual framework to conduct culturally-based participatory research.

Methods: A mixed qualitative and quantitative approach was applied, involving community members, key-informants, and professionals in the design and implementation of the cross-sectional research. Three focus groups were conducted with 16 smokers from the target communities to assess their viewpoints on study framework and measurement tool.

Results: Participants were 167 current smokers, (137 males and 30 females) recruited with the help of community agencies and collaborating physicians. We assessed smoking patterns, beliefs, and perceptions and found a majority believed that smoking was harmful on their health. Younger smokers (<35 years of age) were more likely to not mind smoking in front of young children compared to older smokers (≥35 years of age) ($p<0.001$). People with high school or lower levels of education believed that they would benefit more from smoking than suffering from withdrawal symptoms compared to the higher educated smokers ($p<0.05$). Mandarin speaking smokers were significantly more likely to encourage others to quit than Cantonese speaking smokers ($p<0.05$). In addition, many indicated not receiving adequate support from their care providers and lack of access to culturally and linguistically appropriate cessation programs preventing their attempt to quit smoking.

Conclusion: Our study highlighted the importance of tobacco control regulations for Mandarin and Cantonese speaking immigrants with limited access to healthcare information and for younger smokers whose attention to health consequences of smoking may be limited as well. Participants of this study were generally aware of the health risks and were willing to quit. Access to appropriate cessation programs would fulfill their willingness.

Article Summary

Strengths and Limitations of this study

- We undertook a community-based participatory approach, with community key-informants and healthcare providers were heavily involved in all aspects of the study such as design, instrument development, implementation, community outreach, and dissemination. These key-stakeholders are important allies in developing culturally and linguistically appropriate smoking cessation interventions.

- Our study provides evidence that attitudes and beliefs of cigarette smoking differ between language, age, and gender groups. The differences with regards to tobacco smoking appear to be related to attitudes or knowledge.

- The results build a window of opportunity to promote tailored cessation interventions incorporating cultural beliefs, perceptions, and practices for Chinese immigrant communities.

- We used a convenience sampling method, which may not reflect the actual smoking prevalence and patterns of Chinese Mandarin and Cantonese immigrants in the Greater Vancouver Area.

- All responses were by self-report and validation of smoking behaviour or reasons to quit or continue smoking was not possible with a cross-sectional design.

BACKGROUND

Tobacco use remains the leading cause of preventable morbidity and mortality in the world.[1-3] In Canada, its use has been declining slower than expected in spite of increased taxation on cigarettes and more stringent tobacco policies put into place.[3] In order to accomplish the goal of reducing the rate of smokers among Canadian adults, smoking has to be addressed among all sub-populations, especially those with a higher smoking prevalence than the general population. Global studies have shown that those who stop smoking greatly reduce their risk of developing cardio pulmonary disease and that in general the longer the period of cessation, the greater is the reduction in risk.[4,5] Minority and immigrant communities in Canada may be at greater risk of smoking-related illnesses.[6] Reasons include lack of knowledge and awareness about the link between smoking and lung disease;[7] limited access to smoking cessation programs due to cultural, language, and systemic barriers; [8] and smoking behaviour.[9,10] In addition, many immigrants from low-and-middle-income countries have significant exposure to biomass and bio-fuel as well as smoking which further increases their risk.[11] This is particularly true among immigrants from Mandarin and Cantonese speaking communities (the largest immigrant minority groups living in the BC and Canada)[12,13] where smoking rates remains high.[9,10] Such extensive tobacco use among immigrants may be due to the fact that smoking is a largely integrated into the Chinese male culture.[14] Nearly two of every three adult men in China are smokers.[15,16] It is, therefore, empirically relevant to try to understand this immigrant group's smoking knowledge, behaviour, and habits and develop culturally appropriate educational and counselling services to improve tobacco prevention attempts and promote cessation. Maximizing tobacco control for newcomers requires a special understanding of smoking pattern and beliefs of new immigrant populations. The purpose of this study was to explore smoking use patterns,

including beliefs, attitudes and behaviour among Mandarin and Cantonese speaking communities living in the Greater Vancouver Area (GVA). We aimed to specifically identify and differentiate the smoking perspectives between males and females, Mandarin and Cantonese, and between age and education level groups. The identification of tobacco use and other related patterns that would be identified here may help facilitate the development of community-based culturally appropriate interventions targeting tobacco use and would be sensitive for Chinese immigrants in future research.

METHODS

Project Design

This multi-stage mixed methods study employed both qualitative and quantitative components within an over-arching community-based participatory framework. The first stage comprised the development and testing of a measurement instrument for the survey study. The second stage was a quantitative study assessing smokers' knowledge, attitudes, beliefs, and smoking pattern. The study was conducted between January 2013 and June 2014, allowing for participation and collaboration between members of the Mandarin and Cantonese communities and other key-stakeholders such as professionals and researchers in the research process.[17-19] Connections and networking were built with community key-informants and community agencies (e.g., SUCCESS (United Chinese Community Enrichment Services Society), Vancouver Coastal Health community organizations, etc.) supporting active involvement and contribution in study design, development and implementation. Community collaborators provided assistance with recruitment of Mandarin and Cantonese smokers as well as input and suggestions on the development of focus group and interview questions. They recruited two males and two females

who were members of the community, fluent in Mandarin and Cantonese, to work in alliance with 4 female bilingual Chinese research assistants. All community facilitators and research assistants received necessary training prior the study. The training included approaches on how to best recruit study participants, understanding of the project's aims and objectives, how to conduct focus groups and individual interviews with smokers from their own communities, and ideas on how the team could work together effectively in collection of the best information possible on Chinese smokers' beliefs, attitudes, and perspectives regarding smoking and smoking cessation. The community researchers transcribed and translated focus group and interview discussions and we applied the collected information in the development of a study measurement tool and conceptual framework. In addition, findings from our previous qualitative smoking study (conducted with smokers from the same communities) were used in the development of the study design and measurement tool.[20]

Ethics

Ethics approval was obtained for this study from the University of British Columbia Research Ethics Board. All participants signed a written consent form in their preferred written language (Chinese Simplified, Chinese Traditional, or English) translated by the bilingual researchers which clearly explained study information, aims, and involvement prior to the study.

Study Measurement Tool

We initially developed the study measurement tool by determining whether any English or Chinese language questionnaires were currently in use to assess attitudes and beliefs re smoking in Chinese community. A literature search and an informal survey of immigrant-serving

community agencies did not find any such instrument. Given the absence of a validated assessment questionnaire in the target languages, a new measurement tool was developed over a 4-month period. Development of the study measurement tool began with information collected from initial focus group sessions (n=3) and individual interviews (n=2), review of relevant literature that addressed knowledge of, attitudes to, and behaviors in relation to tobacco use, and also our previous smoking-related qualitative studies with Mandarin and Cantonese current and ex-smokers.[20,21] Moreover, a professional measurement tool developer (a PhD in the research and evaluation field from University of British Columbia) with expertise in developing mixed open-ended and closed-format questionnaires was involved in the face and content validation and finalization of the measurement tool.

The final questionnaire covered current smoking knowledge, beliefs, and attitudes about cigarettes, and exposure to smoking cessation aids. The tool included 70 questions covering demographics and concepts on smoking onset, smoking characteristics, perceptions, experience in quitting, social relationships, and cultural and environmental influences and were in the format of yes/no, true/false, multiple choice, and open-ended questions (The study measurement tool may be found in the Appendix). The questionnaire was also reviewed by a number of key-informants and health practitioners (n=9) from the target communities who provided feedback and comments re the questionnaire and checked its face and content validity. The bilingual Chinese research assistants translated the study measurement tool to Chinese Simplified and Traditional formats and it was then pilot tested with selected smokers and ex-smokers from the Chinese communities (n=5) to further validate the measurement tool and for cultural relevance and clarification, as well as

translation purposes including understandability, acceptability, and applicability, and suggestions were revised accordingly.

Participant Recruitment

Eligibility criteria for participants were adults (≥21 years old) who were current smokers (defined by having smoked at least 5 cigarettes per day during the past 30 days), Chinese descent (either Mandarin or Cantonese speaking) and be immigrants to Canada or children of immigrants. Participants were recruited from within the communities using a variety of outreach methods such as posting flyers and referral applied from previous studies and through network with community agency collaborators.[17,22,23] In total, 16 Chinese smokers participated in initial focus groups and interviews and 167 (137 males and 30 females) were interviewed, from which 93 were Mandarin speaking and 73 were Cantonese speaking. 90 participants were <35 years of age and 76 were ≥35 years of age. Our targeted goal and objective was to assess variations in 150 Chinese smokers' knowledge, beliefs, attitudes, and practices related to smoking and experience in smoking cessation and we exceeded this aim.

Data Collection

Data was collected through administration of study questionnaire and individual interviews. Interview sessions were conducted at places and times of convenience for participants: e.g., participants' homes, community centres, and our research centre. Printed consent forms were explained and signed preceding the interview. Data were collected from May 2013 through April 2014. Modest honoraria were paid to cover time, travel, and parking expenses. Community research assistants conducted the interviews in Mandarin, Cantonese, or English and the

participants filled in a self reported Chinese Simplified, Chinese Traditional, or English questionnaire while the research assistant was available to answer any questions that they would have had. In some instances (e.g., old smokers or low literate people), the research assistants administered the study questionnaire verbally while taking notes throughout the entire interview.

Data analysis

SPSS v20 was used for all statistical tests. Descriptive statistical tests were used and the results were presented in tables and graphs. Relevant inferential statistics were calculated for the entire sample and stratified according to age, gender, level of education, language of origin, and smoking patterns. The data were not normally distributed, and non-parametric tests were therefore used (chi-square) test for nominal data, Mann–Whitney test for ordinal data with two groups, and Kruskal–Wallis test for more than two groups with ordinal data. Binary logistic regression was used to determine the effects of demographic variables on beliefs, attitudes, knowledge and behaviour. All data were examined regarding distributions and trends in the data, and the level of significance was set at the $P< 0.05$ level.

Sample Size Calculation

With a total sample size of 167 subjects for the cross-sectional study, we estimated that we could identify mean differences between different age, gender, language and education level groups and with an effect size of 0.45 with 80% statistical power and a two-sided significance level of $P<0.05$.

FINDINGS

We recruited and enrolled 167 current smokers in the GVA. **Table 1** describes characteristics of the study sample for both Mandarin (55.7%, n=93) and Cantonese (44.3%, n=74). The participants included predominately males (82%, n=137). The median age was 35 and we used this cut off point for younger/older groups, as used previously from our qualitative studies conducted with Chinese community smokers,[20] allowing us to identify these differences in perspective. 90 participants on the study were <35 years of age and 76 were 35 and older.

Table 1. Participant characteristics

	N	%
Gender		
Male	137	82
Female	30	18
Language		
Mandarin	93	55.7
Cantonese	74	44.3
Age		
<35	90	54
≥35	76	46
Education Level		
High school under	87	52
University degree and above	80	48

Smoking beliefs, perceptions, and attitudes

When asked the question of whether '*most people in my culture smoke*', there was a significant difference at $p<0.05$ level between male and female participants; more males believed that smoking was a cultural habit in their community than females did. Similar findings were observed between Mandarin and Cantonese at $p<0.05$; more Mandarin said answered yes to the

question. Younger smokers (<35 years of age) were more likely to mention that they *'did not mind smoking in front of non-smokers'* compared to older smokers (≥35 years of age). The mean difference was significant at p<0.05. When asked whether they minded smoking in front of young children, similarly, younger smokers (<35 years of age) mentioned that they *'did not mind smoking in front of young children'* and the significant difference was at p=0.005. When we asked whether *'second and third hand smoke was as harmful as first hand smoke'*, again, relatively more younger smokers (<35 years of age) compared to older smokers said no when compared to older smokers (≥35 years of age). The difference was significant at p<0.05. We also asked whether participants '*had a smoking routine/pattern*' and found that people with high school or lower education mentioned they didn't have a routine/pattern compared to people with higher education level at p<0.05.

Feeling when smoking

We asked if '*there is a different feeling when comparing times I smoke and don't smoke*', and found a statistically significant difference between male and female participants ($\chi^2 = 4.237$; df = 1, $P<0.05$). Significantly more males mentioned experiencing a different feeling when they smoked compared to not smoking. In addition, younger smokers (<35 years of age) as well claimed to have a different feeling when comparing times smoking and not smoking. The differences between younger (<35 years of age) and older (≥35 years of age) was statistically significant ($\chi^2 = 3.889$, df = 1, $P<0.05$). No significant differences in this regard were identified between Mandarin and Cantonese and highly educated (college/university and above) and lower educated (high school or lower).

Smoking cessation

More Mandarin speaking smokers answered yes to whether they *'would encourage others to quit'*, than Cantonese speaking smokers and the difference was significant at $p<0.05$. As well, more Mandarin speaking smokers also mentioned that *'living in Canada influenced their smoking habits or desire to quit*', compared to Cantonese speaking smokers at $p<0.05$.

In addition, more people with high school or lower education agreed with the statement *'I would benefit more from smoking than suffering from withdrawal symptoms due to quitting'*, compared to the higher educated at $p<0.05$. When asked whether they *'tried nicotine replacement therapy to quit smoking'*, more Mandarin speaking smokers mentioned that they had tried this aid to quit smoking compared to Cantonese speaking smokers and the difference was statistically significant at $p=0.008$.

Many older participants mentioned that they had limited exposure to public sources of information on cessation services, developed in their native language. A few older smokers had received advice and information about the health issues attributed to smoking from their physicians. In general, participants indicated that they were not getting adequate support from their community, nor were aware of the resources that could have helped them quit, therefore lacked the decision making tools helping them to succeed their attempt.

DISCUSSION

The main aim of this study was to gain insight into the psychosocial factors and the perceptions associated with smoking and smoking cessation among Chinese Cantonese and Mandarin speaking current smokers, taking into account culturally specific beliefs and practices. The

results have implications for the development of smoking cessation programs and educational interventions for these immigrant groups.

Several participants in this study indicated their desire to quit and attempted to do so many times, many of which did it relying on their own willpower and a few tried to quit due to health related issues, mainly among older smokers. They mentioned that a better communication with primary care providers and ease of access to culturally and linguistically appropriate smoking cessation resources would promote smoking cessation in their communities. Similar findings were reported in many immigrant communities in Canada who tried to quit smoking, as shown in different local studies.[24-26] In addition to elucidating these barriers to smoking cessation and despite continued smoking, participants showed being knowledgeable in health related and other negative aspects of smoking. Firstly, most participants were not ignorant of the dangers of smoking, with the vast majority recognizing that smoking posed risks to their own health and the health of those around them. This knowledge is much higher than that of Chinese smokers who were surveyed in China back to 2011, where only 36% of participants believed smoking can cause lung cancer and only 4% of whom associated cigarettes with heart disease.[27] Secondly, many of the smokers in our study already accepted limitations on the use of cigarettes in Canada, and many supported restrictions on indoor smoking and also mentioned not smoking at home or where children are presented. This practice is extremely important to reduce the risk of second-hand and third-hand smoking and related health issues among young children and other non-smoker family members.

In terms of reasons to continue smoking, perceived advantages of smoking such as 'smoking does make me feel more comfortable' and 'smoking helps me to be stress-free when I have problems' appeared to be more important factors to promote smoking continuation among our study participants than perceived disadvantages around 'health issues' and 'money' which shown to be strong motivators in quitting smoking in some studies.[28-30] For instance, health consequences and costs of smoking were not perceived as strong motivators to quit smoking among young participants. The disadvantages of quitting were perceived to outweigh its advantages were the main motives for continuing to smoke among older smokers, most of which showed low self-efficacy on being able to quit. Some reasons mentioned by older participants were: the addiction aspect of nicotine, being too late to quit, and their body needed nicotine. In other studies among mainstream populations, self-efficacy expectations and advantages of smoking cessation appeared to be the most important associates of quitting smoking among older smokers.[31,32] Therefore, this issue should be revisited in future studies with ethno-cultural communities. The results of this study suggest that understanding health beliefs and perceptions around smoking and improving self-efficacy are useful tools in promoting smoking cessation among smokers in Chinese immigrant communities.

Limitations

Some limitations need to be considered. First, this study used a convenience sample, so it may not reflect the actual smoking prevalence and patterns among Mandarin and Cantonese immigrants in the GVA. We could not explore the effect of acculturation on smoking habit and pattern. There was no previous data on smoking pattern among Chinese immigrants in Canada, and attempting a community based assessment would have been inherently difficult for an

exploratory study. Therefore the findings of this study cannot be generalized to larger Mandarin and Cantonese speaking communities residing in the GVA. The main aim was to explore the links to smoking cessation among Mandarin and Cantonese populations in order to gain insight into the need to adapt smoking cessation programs in these groups. In future research, a longitudinal design in which our results can be tested is recommended. A second limitation is the fact that all responses were by self-report and validation of smoking behaviour or reasons to quit or continue smoking was not possible with a cross-sectional design. A third limitation is the absence of a native mainstream (English-speaking) reference group, due to lack of resources. This could be a problem for interpreting the additional 'culturally specific' beliefs, because these were not elicited from mainstream population group. Nevertheless, to assess whether the beliefs we identified in this study are really 'culturally specific', a cohort study with all significant beliefs for main ethnic groups in the GVA, including mainstream population, might be useful.

CONCLUSION

The results of our study suggest that an effective anti-smoking campaign in the Chinese community should go beyond traditional English language efforts, utilize Chinese resources, and build upon existing cultural attitudes (such as the belief that smoking is inappropriate for young people) and knowledge (such as health risks) about smoking. Particular attention should be paid to differences between female and male smokers, an important issue that our sample size was not large enough to address. Also, future interventions can prove the applicability of a risk perception model on smoking cessation among Mandarin and Cantonese speaking smokers. Community key-informants and healthcare providers are important allies in developing culturally and linguistically appropriate smoking cessation promotional programs and reinforcing to their

clients the importance of smoking prevention and cessation. Our study provides evidence that attitudes and beliefs of cigarette smoking differ between language, age, and gender groups. The differences with regard to tobacco smoking appear to be related to attitudes or knowledge. The findings build a window of opportunity to promote tailored cessation interventions incorporating cultural beliefs, perceptions, and practices for Chinese immigrant communities.

Practical Implications

Despite the above mentioned limitations, the study has great significance in attracting the attention to the health disparities that Chinese immigrants in the GVA that have been in terms of higher prevalence of tobacco use in their homeland and diminished access to culturally and linguistically appropriate cessation aids. Interventions should take into consideration the specific profiles that Mandarin and Cantonese immigrants have in terms of the knowledge, attitudes, and beliefs on their smoking habits and patterns. Given the results of this study, we can conduct further research to assess the applicability of a risk perception model to the smoking behavior of routine smokers in the target immigrant communities. The model has been shown effective in terms of modifying risk-taking behaviours, promoting positive perceptions, and improving self-efficacy that have been applied for changing smoking habits/behaviour among participants in different studies.[33-35]

ACKNOWLEDGEMENTS

We would like to thank the community members, facilitators, ethno-cultural serving agencies (SUCCESS), and key-informants from the Mandarin and Cantonese communities in the Greater Vancouver Area who helped us since the initial steps of this research.

FUNDING

This project was funded by a community grant from The Vancouver Foundation, Vancouver, Canada.

COMPETING INTERESTS

We declare that there is no conflict of interest in terms of ownership of shares, consultancy, speaker's honoraria or research grants from commercial companies or professional or governmental organizations with an interest in the topic of the paper (the ICMJE form for Disclosure of Potential Conflicts of Interest from the Corresponding Author is also attached to this submission).

CONTRIBUTOR STATEMENT

JMF and IP planned the conception and study design. IP prepared the proposal draft to the funding agency and applied for the ethics approval. JS coordinated the study, recruited participants, and facilitated the community involvement. IP analyzed and interpreted the study data. IP and JS drafted the manuscript for important intellectual content.

DATA SHARING STATEMENT

No additional data available.

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The effect of a multi-dimensional smoking cessation intervention on Mandarin and Cantonese-speaking immigrants residing in the Greater Vancouver Area: A community-based program

Please respond to the following questions:

A. All about you

1. **What is your gender?**
   □ Male □ Female

2. **What is your age?**
   □ 21-25 years old
   □ 26-35 years old
   □ 36-45 years old
   □ 46-55 years old
   □ 56 years old and above

3. **Which language(s) do you speak most with your friends, family, or co-workers?**
   □ Mandarin
   □ Cantonese
   □ English
   □ Others, please specify_____

4. **What is your marital status?**
   □ Single, never married
   □ Married
   □ Living under common-law
   □ Divorced
   □ Widowed/Living alone

5. **What is your highest level of education?**
   □ Never attended school
   □ Elementary school
   □ High school
   □ University degree
   □ University degree and above
   □ Others, please specify_____

6. **What is your current employment status?**
   □ I am a student
   □ I am employed
   □ I am self-employed
   □ I am unemployed
   □ I am retired

B. Smoking onset questions

1. **At what age did you start smoking?**
   - □ Under 18 years old
   - □ 19-25 years old
   - □ 26-39 years old
   - □ 40 years old and older

2. **Why did you start smoking? (Choose all that are applicable to you and explain)**
   - □ Social factors, please specify
     _____
   - □ Emotional factors, please specify
     _____
   - □ Environmental factors, please specify
     _____
   - □ Others, please specify
     _____

3. **At the time you started smoking, did somebody in your social network smoke?**
   (Choose all that are applicable to you)
   - □ None or Not applicable
   - □ Family, who, please specify_____
   - □ Colleagues, from where, please specify _____
   - □ Friends
   - □ Classmates, at what age, please specify_____
   - □ Others, please specify_____

4. **At the time you started smoking, did somebody tell you about the health problems smoking a cigarette can cause?**
   (Choose all that are applicable to you)
   - □ None or Not applicable
   - □ Family, who, please specify_____
   - □ Colleagues
   - □ Friends
   - □ Classmates, at what age, please specify_____
   - □ Media
   - □ Health professionals
   - □ Others, please specify_____

5. **At the time you started smoking, did you know the side effects of smoking?**
   - □ Yes □ No

   If yes, which one(s) did you know?
   - □ Makes teeth yellow
   - □ Causes wrinkles

□ Makes smokers smell bad
□ Causes more phlegm
□ Shortness of breath
□ Causes bad breath
□ Cough
□ Increased risk of lung cancer
□ Greater risk of heart disease
□ Others, please specify_____

6. **Why did you become a regular smoker?**
(Choose all that are applicable to you)
□ I have never been a regular smoker **(After choosing, please skip to question 7)**
□ I craved cigarettes if I didn't smoke regularly
□ I was around smokers a lot of time
□ I found smoking pleasurable
□ I enjoy the taste
□ Smoking relaxed me
□ Smoking helped me focus and concentrate better
□ Smoking helped me feel less stressed
□ I smoke to fit in with other people
□ I like the image of a smoker
□ Smoking helped me control my weight
□ Since others in my family smoked, it was easy to see myself as a smoker too
□ Others, please specify_____

7. **If you are not a regular smoker, why didn't you become a regular smoker?**
(Choose all that are applicable to you)
□ I did not enjoy smoking
□ Smoking cigarettes made me feel sick
□ I did not like the taste and/ or the smell of cigarettes
□ I did not want to become addicted to cigarettes
□ I was concerned about the effects of smoking on my health
□ I was concerned about the effects of smoking on the health of the people around me
□ I don't hang out with people who are smokers that often
□ I was encouraged to stop smoking by my friends
□ I was encouraged to stop smoking by an adult such as my parents/ guardians, a teacher, or a doctor
□ I did not like the image of being a smoker
□ It was hard for me to obtain cigarettes
□ Cigarettes are expensive
□ I had trouble finding places to smoke
□ Since I grew up in a non-smoking family, I just could not see myself as a smoker
□ I don't want people to know that I smoke
□ Others, please specify_____

C. Which characteristic best describes you as a smoker?

1. **How much do you smoke now per day?**
   # Packs_____ or # Cigarettes_____

2. **How much do you spend weekly on buying cigarettes?**
   □ Under $25/week
   □ $25-50/week
   □ $50-75/week
   □ $75-100/week
   □ $101+/week

3. **I have a smoking routine/pattern.**
   □ True □ False □ Not sure

4. **I smoke**
   (Choose all that are applicable to you)
   □ When I am bored
   □ When I am upset
   □ When I am having a break
   □ When I am partying
   □ When I am driving
   □ When I am under stress
   □ When I am with friends
   □ When I am alone
   □ When I am in a social gathering
   □ Mostly at home
   □ At work or at school
   □ When I have alcohol
   □ First thing when I wake up
   □ Mostly in the morning
   □ Mostly in the afternoon
   □ At night before I head to bed
   □ After every meal
   □ After every tea or coffee
   □ During every phone conversation
   □ Before I go to the washroom
   □ Before I head to work on an assignment/task
   □ After I finish an assignment/task
   □ When I want to relax
   □ Others, please specify_____

5. **There is a different feeling when comparing times I smoke and don't smoke.**
   □ True □ False □ Not sure □ Depends on the situation, please explain_____

6. **What are the things you like about smoking?**
(Choose all that are applicable to you)
□ It helps me to relax
□ It helps to break up my working time
□ It helps me to cope with stress
□ It keeps me busy when I am bored
□ I just enjoy it
□ It is something I have in common with my friends or family
□ It stops me from putting on weight

7. **What are the things you don't like about your smoking?**
□ I don't have anything that I dislike about smoking
□ It is expensive
□ It affects my health
□ I don't like feeling dependent on cigarettes
□ It makes my clothes and breath smell
□ It is a bad example for children
□ It is unpleasant for people near me
□ It makes me less fit
□ People put a negative image on me
□ It is bad for the health of people near me

8. **Certain situations trigger me to smoke**
□ True □ False □ Not sure
If true, what are the situations?
□ Happiness/ Joy
□ Relaxed
□ Social gathering
□ Receive bad news
□ Receive good news
□ Stress
□ Frustration
□ Boredom
□ Loneliness
□ Anger
□ Sadness
□ Lost concentration
□ Wanting to be like others (e.g., friends, members of my group)
□ Other, please specify_____

9. **Where do you smoke mostly?**
□ Indoors
□ Porch/outside of home
□ Outside
□ Workplace
□ In the car
□ Others, please specify_____

D. Your perception about the following statement

1. **Smoking kills germs and bacteria.**
   □ True □ False □ Not sure

2. **My body needs nicotine.**
   □ True □ False □ Not sure

3. **Smoking is an addiction.**
   □ True □ False □ Not sure

4. **Smoking is cool.**
   □ True □ False □ Not sure

5. **Smoking has changed my daily routine (work, study, exercise, food intake, and sleep).**
   □ True □ False □ Not sure
   If true, how has it changed your daily routine?
   _____

6. **Smoking has affected my health (i.e., lung disease, coughing, phlegm, cancer, shortness of breath, heart disease, blood pressure, energy, wrinkles, asthma)?**
   □ True □ False □ Not sure
   If true, how has it affected your health?
   _____

7. **There are health-related problems I'm worried about while I smoke.**
   □ True □ False □ Not sure
   If true, what are they?
   □ Lung disease
   □ Shortness of breath
   □ Cough
   □ Cancer
   □ Heart disease
   □ Change in blood pressure
   □ Less energized
   □ Dependence on medication intake
   □ Decrease in oxygen intake
   □ Wrinkles
   □ Early death
   □ Others, please specify_____

8. **What do you think are the advantages of you smoking cigarettes?**
   _____

9. **What do you think are the disadvantages of you smoking cigarettes?**
   _____

10. Do you have any other feelings about you smoking cigarettes?

_____

E. Your experience and thoughts on quitting and quitting methods

1. **I was nagged by someone to quit smoking.**
   □ True □ False
   If true, who nagged you?
   _____
2. **I have gone to the doctor for symptoms related to my lungs.**
   □ True □ False □ Not related to my smoking
3. **I have had a lung examination at the physician's office or hospital.**
   □ True □ False □ Not related to my smoking
4. **I have tried to quit before.**
   □ True □ False
   If true, how many times have you tried? _____
   What methods did you try?
   _____
   What was the longest duration you were able to quit for?
   _____
   Why couldn't you quit?
   _____
5. **Where have you received or heard of smoking cessation methods?**
   (Choose all that are applicable to you)
   □ I never heard about or received any information
   □ Family or friends
   □ Hospitals/clinics
   □ Pharmacy
   □ Media
   □ Others, please specify_____
6. **I have thought about cutting down my cigarette intake before.**
   □ True □ False □ Not sure
   If true, what was your reason to cut down?
   _____
   If true, has your intake of cigarettes cut down now? □ Yes □ No
7. **I have tried nicotine replacement therapy.**
   □ True □ False □ Not sure what nicotine is

   If true, did it work? Why or why not?
   _____
   _____

8. **I have thought about (intention) quitting before.**
   □ True □ False □ Not sure
   If true, what was your reason for quitting?
   _____
   If false, what was the reason for not quitting?
   _____

9. **I have met difficulty in quitting before.**
   □ True □ False □ Not applicable
   If true, what was your difficulty?
   □ I enjoy smoking too much
   □ I don't think I have enough willpower
   □ I think I would put on weight
   □ I would be too stressed
   □ I think I am too addicted to cigarettes
   □ My partner smokes
   □ My best friend smoke
   □ I would miss smoking with friends
   □ I don't really want to stop
   □ I would be bored
   □ I would miss smoking breaks at work
   □ Others, please specify_____

10. **In your opinion, what are the withdrawal symptoms due to quitting?**
    _____
    □ I don't know what the withdrawal symptoms are.

11. **I would benefit more from smoking than suffering from withdrawal symptoms due to quitting.**
    □ True □ False □ Not sure
    If true, why is it?
    _____

12. **There are people that support me for quitting.**
    □ True □ False □ Not sure □ Not applicable
    If true, who supports you?
    _____
    If true, what kinds of support did they provide you?
    _____

13. **I would consider quitting in the future.**
    □ True □ False □ Not sure
    If true, what would be your reason for quitting in the future?
    _____
    If true, what immediate reward would you like to get?
    _____

14. I would quit smoking if people I spend time with quit also.
□ True □ False □ Not sure
If true, why?
_____

15. I will be able to quit whenever I want.
□ True □ False □ Not sure

16. If you were to quit, what would be the most influential motivation?
_____

17. What positive feelings would most help you in becoming a non-smoker? (Choose all that are applicable to you)
□ Confidence
□ Determination
□ Calm
□ Relaxation
□ Caring about myself
□ Caring about others
□ Others, please specify_____

18. Imagine that you are now a former smoker:
a) What could you do with the money you save?
_____
b) How would your medication be different, if you are currently taking medication?
_____
c) What would be your energy level?
_____
d) What would be the quality of your life?
_____
e) How would you be feeling physically as a non-smoker?
_____

F. Your relationship with others

1. **My smoking behaviour has changed my relationship with others. (Family, co-workers, classmates, and friends)**
□ True □ False □ Not sure
If true, how has it changed your relationship with others?
_____

2. **Which people, or organization that you know, would approve of you smoking cigarettes?**
_____

3. **Which people, or organization that you know, would disapprove of you smoking cigarettes?**

_____

4. **I would encourage others (Family, co-workers, classmates, and friends) to smoke.**
   □ True □ False □ Not sure
   If true, why would you encourage others to smoke?
   _____
   If false, why would you not encourage others to smoke?
   _____

5. **I would encourage others to quit.**
   □ True □ False □ Not sure
   If true, what do you think is the best model to encourage people in your age group to quit?
   _____

6. **I mind smoking in front of non-smokers.**
   □ True □ False □ Not sure
   If true, why would you not smoke in front of non-smokers?
   _____

7. **I mind smoking in front of young children.**
   □ True □ False □ Not sure
   If true, why would you not smoke in front of young children?
   _____

8. **I think second and third hand smoke is not as harmful as first hand smoke.**
   □ True □ False □ I don't know what third hand smoke is

G. Cultural and environmental influences for your desire to smoke or to quit

1. **Media such as visual warnings on cigarette packages has influenced me to quit smoking.**
   □ True □ False □ Not sure □ Not applicable

2. **Living in Canada has influenced my smoking habits or desire to quit.**
   □ True □ False □ Not sure
   If true, how has it influenced your smoking habits or desire to quit?
   _____

3. **The different social norms in Canada have influenced my smoking behaviour in comparison to my native country.**
   □ True □ False □ Not sure
   If true, how has it influenced your smoking behaviour in comparison to your native country?

   _____

4. **In your culture, smoking is a behaviour that one gender engages in more than other.**
   □ True □ False □ Not sure
   If true, which gender?
   □ Male □ Female

5. **In your culture, smoking is a behaviour that a certain career profession engages in more than other.**
   □ True □ False □ Not sure
   If true, which career profession?

   _____

6. **People do not accept the smoking habit in my culture.**
   □ True □ False □ Not sure
   If true, why do they not accept the smoking habit?

   _____

7. **Most people in my culture smoke.**
   □ True □ False □ Not sure

8. **What is your image of a smoker? Do you think it is a positive or negative image?**
   □ Positive image □ Negative image □ Not sure
   Why? Please explain.

   _____

9. **In your opinion, how can a smoker harm or benefit the society?**

   _____

10. **In your opinion, what would be a good enforcement to stop the younger generation from smoking?**

    _____

11. **In your opinion, what should be the role of mass media?**

    _____

12. **What do you know about a cigarette? What does it do to the human body?**

    _____

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding
		(*b*) Describe any methods used to examine subgroups and interactions
		(*c*) Explain how missing data were addressed
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
		(*e*) Describe any sensitivity analyses

Continued on next page

Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time
		Case-control study—Report numbers in each exposure category, or summary measures of exposure
		Cross-sectional study—Report numbers of outcome events or summary measures
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Assessing beliefs and risk perceptions on smoking and smoking cessation in immigrant Chinese adult smokers residing in Vancouver, Canada: a cross-sectional study

Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2014-006435.R1
Article Type:	Research
Date Submitted by the Author:	26-Nov-2014
Complete List of Authors:	Poureslami, Iraj; University of British Columbia, Respiratory Medicine Division Shum, Jessica; University of British Columbia, Respiratory Medicine Division FitzGerald, J Mark; University of British Columbia, Respiratory Medicine Division
Primary Subject Heading:	Smoking and tobacco
Secondary Subject Heading:	Smoking and tobacco
Keywords:	Change management < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Risk management < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

Title: Assessing beliefs and risk perceptions on smoking and smoking cessation in immigrant Chinese adult smokers residing in Vancouver, Canada: a cross-sectional study

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Keywords: smoking, Chinese communities, beliefs, risk perceptions, smoking cessation

Word count: 4722
Abstract: 299

What this paper adds:

1. Understanding the beliefs, perceptions, and practice of Chinese Mandarin and Cantonese communities about smoking and smoking cessation creates opportunities to tailor smoking cessation interventions according to the needs of these communities.
2. Previously, most studies have applied an identical risk perception model on smoking behaviour assessments among young vs. old and male vs. female smokers. However, our study identified that risk perception about smoking and smoking consequences differ in the smoking population group based on their age and gender. Therefore, a different model of risk perception should be designed and applied considering the age and gender of participants.
3. Despite existing knowledge that Chinese communities are heterogeneous, our study found that smoking habit, perceptions, beliefs, and practice differ in Mandarin speaking compared to Cantonese speaking Chinese.

ABSTRACT

Objectives: We aimed to conduct culturally based participatory research to assess cultural and belief contexts for smoking behaviours within Mandarin and Cantonese communities. Outcome variables were smoking-related knowledge, smoking patterns, attitudes and beliefs, and perceived barriers and facilitators to successful cessation.

Design: A community-based approach was applied involving smokers, community key-informants, and professionals in study design and implementation. Initially, focus groups were conducted and findings were used to develop study instrument. Participants responded once to study questionnaire after informed consent.

Setting: Community based in the Greater Vancouver Area, Canada.

Participants: 16 Chinese smokers participated in focus groups and subsequently, 167 current Chinese immigrant (137 males and 30 females) smokers from Mandarin and Cantonese communities, recruited with the help of community agencies and collaborating physicians, were enrolled in a cross-sectional study.

Results: We found that a majority believed smoking was harmful on their health. Younger smokers (<35 years of age) did not mind smoking in front of young children compared to older smokers (≥35 years of age) ($p<0.001$). People with high school or lower levels of education believed that they would benefit more from smoking than suffering from withdrawal symptoms compared to better educated smokers ($p<0.05$). Mandarin smokers were significantly more likely to encourage others to quit than Cantonese smokers ($p<0.05$). Many indicated not receiving adequate support from care providers and lack of access to culturally and linguistically appropriate cessation programs impacted on their ability to quit smoking.

Conclusion: Our study highlighted the importance of tobacco beliefs among Mandarin and Cantonese speaking immigrants with limited access to healthcare information and for younger smokers whose attention to health consequences of smoking may be limited as well. Study participants were generally aware of the health risks and were willing to quit. Access to appropriate cessation programs would fulfill their willingness.

Article Summary

Strengths and Limitations of this study

- We undertook a community-based participatory approach, with community key-informants and healthcare providers were heavily involved in all aspects of the study such as design, instrument development, implementation, community outreach, and dissemination. These key-stakeholders are important allies in developing culturally and linguistically appropriate smoking cessation interventions.

- Our study provides evidence that attitudes and beliefs of cigarette smoking differ between language, age, and gender groups. The differences with regards to tobacco smoking appear to be related to attitudes or knowledge.

- The results build a window of opportunity to promote tailored cessation interventions incorporating cultural beliefs, perceptions, and practices for Chinese immigrant communities.

- We used a convenience sampling method, which may not reflect the actual smoking prevalence and patterns of Chinese Mandarin and Cantonese immigrants in the Greater Vancouver Area.

- All responses were by self-report and validation of smoking behaviour or reasons to quit or continue smoking was not possible with a cross-sectional design.

BACKGROUND

Tobacco use remains the leading cause of preventable morbidity and mortality in the world.[1-3] In Canada, its use has been declining slower than expected in spite of increased taxation on cigarettes and more stringent tobacco policies put into place.[3] In order to accomplish the goal of reducing the rate of smokers among Canadian adults, smoking has to be addressed among all sub-populations, especially those with a higher smoking prevalence than the general population. Global studies have shown that those who stop smoking greatly reduce their risk of developing cardio pulmonary disease and that in general the longer the period of cessation, the greater is the reduction in risk.[4,5] Minority and immigrant communities in Canada may be at greater risk of smoking-related illnesses.[6] Reasons include lack of knowledge and awareness about the link between smoking and lung disease;[7] limited access to smoking cessation programs due to cultural, language, and systemic barriers; [8] and smoking behaviour.[9,10] In addition, many immigrants from low-and-middle-income countries have had prior significant exposure to biomass and bio-fuel as well as smoking which further increases their risk.[11] This is particularly true among immigrants from Mandarin and Cantonese speaking communities (the largest immigrant minority groups living in the BC and Canada)[12,13] where smoking rates remains high.[9,10] Such extensive tobacco use among immigrants may be due to the fact that smoking is a largely integrated into the Chinese male culture.[14] Nearly two of every three adult men in China are smokers.[15,16] It is, therefore, empirically relevant to try to understand this immigrant group's smoking knowledge, behaviours, and habits and develop culturally appropriate educational and counselling services to improve tobacco prevention attempts and promote cessation. Maximizing tobacco control for newcomers requires a special understanding of smoking pattern and beliefs of new immigrant populations. The objectives of this study were:

1) to explore smoking use patterns, smoking-related knowledge, beliefs and attitudes, and perceived barriers and facilitators to smoking cessation among Mandarin and Cantonese speaking communities living in the Greater Vancouver Area (GVA), and 2) to assess the effectiveness of socio-cultural and environmental factors which influenced the onset of smoking and smoking habits (continued smoking) among the study participants. We were also interested to identify differences in above mentioned variables between males and females, Mandarin and Cantonese, and between age and education level groups. The identification of tobacco use and other related patterns may help facilitate the development of community-based culturally appropriate interventions targeting tobacco use and would be helpful for Chinese immigrants in future research.

METHODS

Project Design

This multi-stage cross-sectional study employed both qualitative and quantitative components within an over-arching community-based participatory framework. The first stage comprised the development and testing of a measurement instrument for the survey study. The second stage was a quantitative study assessing the outcome variables including smokers' awareness of smoking and its cessation, attitudes and beliefs about smoking harms and benefits, and cultural norms of smoking in their community.

The study was conducted between January 2013 and June 2014, allowing for participation and collaboration between members of the Mandarin and Cantonese communities and other key-stakeholders such as professionals and researchers in the research process.[17-19] Connections and networking were built with community key-informants and community agencies (e.g.,

SUCCESS (United Chinese Community Enrichment Services Society), Vancouver Coastal Health community organizations, etc.) supporting active involvement and contribution in study design, development and implementation. Community collaborators provided assistance with recruitment of Mandarin and Cantonese smokers as well as input and suggestions on the development of focus group and interview questions. They recruited two males and two females who were members of the community, fluent in Mandarin and Cantonese, to work in alliance with 4 female bilingual Chinese research assistants. All community facilitators and research assistants received necessary training prior the study. The training included approaches on how to best recruit study participants, understanding of the project's aims and objectives, how to conduct focus groups and individual interviews with smokers from their own communities, and ideas on how the team could work together effectively in collection of the best information possible on Chinese smokers' knowledge, beliefs and attitudes about harms and benefits of smoking, and socio-cultural and environmental factors affecting smoking and smoking cessation. The community researchers transcribed and translated focus group and interview discussions and we applied the collected information in the development of a study measurement tool and conceptual framework. In addition, findings from our previous qualitative smoking study (conducted with smokers from the same communities) were used in the development of the study design and measurement tool.[20]

Ethics

Ethics approval was obtained for this study from the University of British Columbia Research Ethics Board. All participants signed a written consent form in their preferred written language (Chinese Simplified, Chinese Traditional, or English) translated by the bilingual researchers who

clearly explained the study rationale, goals and objectives, and how their involvement would be like prior to the study.

Study Measurement Tool

We initially developed the study measurement tool by determining whether any English or Chinese language questionnaires were currently in use to assess attitudes and beliefs re smoking in Chinese community. A literature search and an informal survey of immigrant-serving community agencies did not find any such instrument. Given the absence of a validated assessment questionnaire in the target languages, a new measurement tool was developed over a 4-month period. Development of the study measurement tool began with information collected from initial focus group session participants (n=14) and individual interviews (n=2), review of relevant literature that addressed knowledge of, attitudes to, and behaviors in relation to tobacco use, and also our previous smoking-related qualitative studies with Mandarin and Cantonese current and ex-smokers.[20,21] Moreover, a professional measurement tool developer (a PhD in the socio-psychology research and evaluation field from University of British Columbia) with expertise in developing mixed open-ended and closed-format questionnaires was involved in the face and content validation and finalization of the measurement tool. The team and the measurement developer have the expertise to identify and differentiate between beliefs, attitudes and perceptions, as well as the socio-cultural and environmental aspects of smoking and its cessation. Each set of variables were identified and separated by heading-title in the questionnaire. The internal consistency of the data was checked by test-retesting reliability, where the study questionnaire was administered to 5 smokers and tested again a week after and

the results of the initial assessment and retest were compared. Also, more advanced process was applied by calculating Cronbach Alpha and a coefficient was (.89).

The final questionnaire covered current smoking knowledge, beliefs, and attitudes about smoking and its cessation, and socio-cultural and environmental factors that promote or prevent smoking onset and continuation. The tool included 70 questions covering demographics and concepts on smoking onset, smoking characteristics, perceptions, experience in quitting, social relationships, and cultural and environmental influences and were in the format of yes/no, true/false, multiple choice, and open-ended questions (The study measurement tool can be found as Supplmentary File 1). The questionnaire was also reviewed by a number of key-informants and health practitioners (n=9) from the target communities who provided feedback and comments re the questionnaire and checked its face and content validity. The bilingual Chinese research assistants worked collaboratively together translating the study measurement tool to Chinese Simplified and Traditional formats. The translations were reviewed by secondary (back-up) translators from the target communities who were introduced by the collaborating immigrant agencies for accuracy and correctness. The tool was then reviewed by the community key-informants and professionals for further crosschecking. Finally we pilot tested the questionnaire with selected smokers and ex-smokers from the Chinese communities (n=5) to confirm validation of the measurement tool and for cultural relevance and clarification, as well as translation purposes including understandability, acceptability, and applicability. Suggestions were integrated into a revised version.

Participant Recruitment

Eligibility criteria for participants were adults (≥21 years old) who were current smokers (defined by having smoked at least 5 cigarettes per day during the past 30 days), Chinese descent (either Mandarin or Cantonese speaking) and be immigrants to Canada or children of Chinese immigrants. Participants were recruited from within the communities using a variety of outreach methods such as posting flyers and referral applied from previous studies and through network with community agency collaborators.[17,22,23] In total, 16 Chinese smokers participated in initial focus groups and interviews and subsequently 167 (137 males and 30 females) were interviewed, from which 93 were Mandarin speaking and 74 were Cantonese speaking.
In terms of age category, 90 participants were <35 years of age and 76 were ≥35 years of age. Our intended sample size was 150 Chinese smokers aiming to identify mean differences in knowledge, beliefs, attitudes, and practices related to smoking and experience in smoking cessation between age, gender, education, and ethnicity groups.

Data Collection

Data was collected through administration of study questionnaire and individual interviews. Interview sessions were conducted at places and times of convenience for participants: e.g., participants' homes, community centres, and our research centre. Printed consent forms were explained and signed preceding the interview. Modest honoraria were paid to cover time, travel, and parking expenses. Community research assistants conducted the interviews in Mandarin or Cantonese and the participants filled in a self reported Chinese Simplified or Chinese Traditional questionnaire while the research assistant were available to answer any questions that they would have had, or ask the responders to elaborate the given information in the open-ended questions.

Each interview was conducted by two interviewers: one with an academic perspective (a research assistant), and one from community who acted as a facilitator. The two interviewers took notes during interviews including verbal and non-verbal communication by the participants and reviewed their notes at the end of each interview aiming to improve the accuracy of the information, capturing smokers' smoking beliefs, perceptions, and also their comments about cultural images of smoking and its cessation. In some instances (e.g., old smokers or low literate people), the research assistants assisted by administered the study questionnaire verbally while taking notes throughout the entire interview.

Data analysis

SPSS v20 (2012) was used for all statistical tests. Descriptive statistical tests were used and the results were presented in tables and graphs. Relevant inferential statistics were calculated for the entire sample and stratified according to age, gender, level of education, language of origin, and smoking patterns. The data were not normally distributed, and non-parametric tests were therefore used; e.g.,chi-square test for nominal data, Mann–Whitney test for ordinal data with two groups, and Kruskal–Wallis test for more than two groups with ordinal data. Binary logistic regression was used to determine the effects of demographics on the outcome variables. All data were examined regarding distributions and trends in the data, and the level of significance was set at the $P< 0.05$ level.

Sample Size Calculation

With a total sample size of 167 subjects for the cross-sectional study, we estimated that we could identify mean differences between different age, gender, language and education level groups

and with an effect size of 0.45 with 80% statistical power and a two-sided significance level of $P<0.05$.

FINDINGS

Between May 2013 and April 2014, we recruited and enrolled 167 current smokers.**Table 1** describes characteristics of the study sample for both Mandarin (55.7%, n=93) and Cantonese (44.3%, n=74). The participants included predominately males (82%, n=137). The median age was 35 and we used this cut off point for younger/older groups, as used previously from our qualitative studies conducted with Chinese community smokers,[20] allowing us to identify these differences in perspective.

Table 1. Participant characteristics

	N	%
Gender		
Male	137	82
Female	30	18
Language		
Mandarin	93	55.7
Cantonese	74	44.3
Age		
<35	105	63
≥35	62	37
Education Level		
High school under	87	52
University degree and above	80	48

Smoking-related knowledge and reasons for starting smoking

Knowledge of smoking consequences is an important factor to consider when designing smoking cessation programs or implementing health promotion interventions, especially to prevent onset of smoking among young people.[2,8] Almost an equal number (23%) of Mandarin and Cantonese smokers indicated that they were not aware of smoking side effects when they started smoking. Table 2 provides the breakdown of smoking-related knowledge by gender, age, and education level.

Table 2. *'At the time you started smoking, did you know the side effects of smoking?'*

	Yes		**No**	
	N	%	N	%
Gender				
Male	105	77	32	23
Female	22	73	8	27
Age				
<35	90	86	15	14
≥35	38	62	24	39
Education Level				
High school under	61	70	26	30
University degree and above	67	84	13	16

We also aimed to determine the *socio-cultural and environmental* factors which influenced the onset of smoking among the study participants.[24] In this study, we defined social factors as smoking during the gatherings, being offered cigarettes by peers (a cultural norm in this community), smoking to feel being accepted, etc. On average for 45% (n=75) of participants, 'social factors' were a trigger to start smoking, while it was the number one trigger for male smokers and smokers with who were 35 years or over with an equal rate of 53%. Although 50% of females mentioned 'emotional factors' as a contributor to starting smoking, only 22% (on average) of males cited these as factors for them. Likewise, 'environmental factors' were considered by only 20% of participants as a factor in starting to smoke, while 50% of Mandarin smokers mentioned environmental factors as a major trigger for them to start smoking. A

smoking friend was mentioned by most of participants (66.3%) as someone in their social network when starting smoking, compared to classmate (48.5%), family (29%), and work-related colleagues (28%). An interesting observation was that 50% of female smokers in the study identified having a family member who smoked when they first started smoking.

Smoking beliefs, perceptions, and attitudes

For more than 60% of smokers, the main reasons to smoke regularly were the beliefs that smoking *'relaxed them*' and '*helped them feel less stress'*: while 59% (n=81) of male smokers selected these factors, only 47% (n=14) of female smokers said so. Multiple factors affected males to become regular smokers. Mandarin and Cantonese speaking smokers equally chose relaxation (54%), with more Mandarin believing that smoking helped them to cope with stress (67%) compared to Cantonese smokers (54%), the differences were not statistically significant. Moreover, over 60% of the participants said they smoke when they 'are having a break' and finally, less than 12% of the participants believed that smoking helped them to '*fit in with other people*'. This rate was 20% among females (n=6) and 19% (n=15) among highly educated smokers. Table 3 provides the breakdown of the triggers to smoke.

Table 3. *'Smoking relaxes me and makes me feel less stress.'*

	Relaxation		**Less stress**	
	N	%	N	%
Gender				
Female	22	73	21	70
Male	82	60	81	59
Age				
<35	73	70	71	68
≥35	31	51	31	51
Education Level				
High school under	50	58	45	52
University degree and above	55	69	50	62.5

We were also interested to identify the *social and cultural* aspects of smoking habits (continued smoking). When asked the question of whether '*most people in my culture smoke*' to assess participants' perceived commonality of smoking in their communities, there was a significant difference between male and female participants ($\chi^2 = 5.424$, df = 1, $P<0.05$) ; more males (n=46, 34%) believed that smoking was a cultural habit in their community than females (n=17, 57%) did. Similar findings were observed between Mandarin and Cantonese ($\chi^2 = 5.182$, df = 1, $P<0.05$); more Mandarin (n=65) answered yes to the question than Cantonese smokers (n=39). Many participants (61%) indicated they normally smoked when they were 'with friends'; with the highest proportion reported among the <35 years old participants (82%) and male participants (70%). Remarkably, 70% of the <35 years old participants indicated they smoked when they had alcohol. The rate was 60% among female participants, 57% among males, and 57% among both Mandarin and Cantonese smokers. In terms of attitudes towards exposing others to second or third-hand smoke, we asked participants *'do you mind smoking in front of non-smokers'* ? Younger smokers (<35 years of age) were more likely (n=72) to mention that they did not mind smoking in front of non-smokers compared to older smokers (≥35 years of age) (n=52). The mean difference was significant ($\chi^2 = 7.133$, df = 1, $P<0.01$). Also, when the participants were asked whether they minded smoking in front of young children, similarly, more younger smokers (<35 years of age) (n=97) mentioned that they *'did not mind smoking in front of young children'* than the older smokers (n=55) and the difference was significant ($\chi^2 = 5.123$, df = 1, $P<0.05$). We also aimed to assess smokers' viewpoints regarding second hand smoking and its harm. We asked whether *'second and third hand smoke was as harmful as first hand smoke'*, again, relatively more males said 'no' when compared to female smokers (n= 40 and n=

10, respectively) and the difference was significant ($\chi^2 = 4.736$, df = 1, $P<0.05$). Finally, we assessed smokers' beliefs about their own smoking pattern with a self-reported question of '*I have a smoking routine/pattern*'. No significant differences were identified between gender, age, and language groups. However, we found that more people with high school education or less mentioned they didn't have a routine/pattern (n=30) compared to people with higher education (n=12) and the difference was significant ($\chi^2 = 7.156$, df = 1, $P<0.01$).

Perceptions about smoking

We assessed smokers' perceived *enjoyable feeling* that they may have due to smoking by asking whether '*there is a different feeling when comparing times I smoke and don't smoke*' and found a statistically significant difference between male and female participants ($\chi^2 = 4.237$; df = 1, $P<0.05$). Significantly more males (n=47) mentioned experiencing a different feeling when they smoked compared to not smoking than female smokers (n=15). In addition, younger smokers (<35 years of age) as well claimed to have a different feeling when comparing times smoking and not smoking (n=46) compared to older smokers (n=16), and the differences were statistically significant ($\chi^2 = 3.889$, df = 1, $P<0.05$). Likewise, more Mandarin smokers (n=41) than Cantonese smokers (n=20) reported having a different feeling when they smoke compared to when they were not smoking ($\chi^2 = 5.188$, df = 1, $P<0.05$). For this outcome there was no significant differences between highly educated (college/university and above) and lower educated (high school or lower).

Additionally, we assessed smokers' perceptions about *helpfulness* of smoking to alleviate their anxiety and stress. We noticed that 77% of female smokers, 69% of younger smokers (aged 34 years or younger), and 52% of older smokers (age 35 or older) smoked to reduce their sense of

helpfulness. Male smokers perceived that smoking helped them to minimize the feeling of being bored (80%) and made them more connected to their group of friends (69%).

Smoking cessation

We aimed to identify willingness to quit smoking and *perceived barriers and facilitators* to cessation. The majority of participants, in particular young male and female smokers, mentioned their desire to quit and attempted to several times, before giving up and smoking again. A few people mentioned using medications or seeking professional advice to quit smoking but mainly relied on their own willpower to quit. Also, older participants indicated trying to quit due to health related issues such as heart disease or cancer. We were also interested to find out whether participants were under pressure by someone close to them to quit smoking. When asked *'I was nagged by someone to quit smoking'*, no statistically significant differences were identified in different gender, age, language, and education groups. However, when we asked whether they *'would encourage others to quit',* more Mandarin speaking smokers answered yes to (n=45) than Cantonese speaking smokers (n=23) (χ^2 = 5.172, df = 1, P<0.05). No significant differences were identified based on age, gender, and level of education. In addition, most participants (87%) said "No" to the question: "*Would you encourage non-smokers to smoke?"* Furthermore, we also asked whether living in a smoking restricted society like Canada would encourage smokers to quit or cut down on their smoking. More Mandarin speaking smokers (n=56, 60%) mentioned that '*living in Canada influenced their smoking habits or desire to quit*', compared to Cantonese speaking smokers (n=30, 41%) (χ^2 = 6.424, df = 1, P =0.011).

More people with high school or lower education (n=34) agreed with the statement *'I would benefit more from smoking than suffering from withdrawal symptoms due to quitting'*, compared to the more educated smokers (n=12) ($\chi^2 = 6.102$, df = 1, $P<0.05$). When asked whether they *'tried nicotine replacement therapy to quit smoking'*, more Mandarin speaking smokers (n=32) mentioned that they had tried this aid to quit smoking compared to Cantonese speaking smokers (n=12 ($\chi^2 = 7.275$, df = 1, $P = 0.007$).

In general, participants identified language and literacy issues as barriers to accessing smoking cessation information as well as lack of useful information in a social media format. For instance, older participants mentioned that they had limited exposure to public sources of information on cessation services that were developed in their native language. A small minority of these smokers had received advice and information about the health issues attributed to smoking from their physicians. Younger smokers mentioned the lack of disseminating smoking cessation messages through social media such as text messaging to promote quitting services in their native language.

Our synthesis of the interview data identified seven barriers to the participants' cessation which are summarized in Table 4.

Table 4. *Barriers to Smoking Cessation identified by the participants*

Barriers
(a) the problems of managing their lives in a highly stressful environment
(b) their isolation and the limited support systems in their community or work/school environments

(c) the availability of smoking as a social-connection to their peers and limited resources for pleasure

(d) perceived minimal health risks of smoking, (e) the commonality of smoking in their community

(e) the commonality of smoking in their community

(f) the scarce or non-existent information about how to stop smoking

(g) the belief that all they can quit on their own whenever they decide to

DISCUSSION

The main goal of this study was to gain insight on the beliefs and perceptions associated with smoking behaviours and smoking cessation among Chinese Cantonese and Mandarin speaking current smokers, taking into account culturally specific knowledge and practices. The results have implications for the development of appropriate smoking cessation programs and educational interventions to prevent and control tobacco-related health issues among the target communities. Such interventions may have policy implications in health promotion programs to prevent smoking onset among younger population groups in the immigrant communities.

Several participants in this study indicated their desire to quit and attempted to do so many times, many of whom did it relying on their own willpower. Only a few, mainly among older smokers, tried to quit due to health related issues. They mentioned that a better communication with primary care providers and ease of access to culturally and linguistically appropriate smoking cessation resources would promote smoking cessation in their communities. Similar findings have been reported in studies done in other countries as well as among many immigrant

communities in Canada who tried to quit smoking.[25-28] In addition to elucidating these barriers to smoking cessation and despite continued smoking, participants showed being knowledgeable in health related and other negative aspects of smoking as on average, 70% of the participants indicated they were aware of the health consequences of smoking. This finding has been confirmed in other studies. [28] In our study, we found that higher education, better knowledge, and smoking regulations contributed to having a greater intent to quit smoking. For instance, we found that most participants were not ignorant of the dangers of smoking, with the vast majority recognizing that smoking posed risks to their own health and the health of those around them. This knowledge is much higher than that of Chinese smokers who were previously surveyed in China back to 2011, where only 36% of participants believed smoking can cause lung cancer and only 4% were aware of the relationship of smoking to heart disease.[29] In addition, many of the smokers in our study already accepted limitations on the use of cigarettes in Canada, and many, mostly younger smokers, supported restrictions on indoor smoking and also mentioned not smoking at home or where children are present. This could be attributed to the smoking restriction rules as well as the strong anti-smoking educational campaigns in Canada. For example, since 2001, Health Canada has spent more than $480 million for a 5-year program to encourage tobacco cessation programs for all Canadians.[30] These regulations might be important to reduce the risk of second-hand and third-hand smoking and related health issues among young children and other non-smoker family members.

In terms of reasons to continue smoking, perceived advantages of smoking such as ‘smoking does make me feel more comfortable’ and ‘smoking helps me to be stress-free when I have problems’ appeared to be more important factors to promote smoking continuation among our

study participants than perceived disadvantages around 'health issues' and 'money' which shown to be strong motivators in quitting smoking in some studies. Some studies found that smokers may not be aware of the diseases caused by smoking and therefore, they may perceive themselves less susceptible to the risks of smoking.[30-34] For instance, health consequences and costs of smoking were not perceived as strong motivators to quit smoking among young participants. They reported the stimulating and anti-stress effects of smoking (smoking may actually made them feel happier, more alert, etc), the feelings that may reinforce their tobacco use and have associated these feelings with being around other smokers. In older smokers, most of which showed low self-efficacy on being able to quit, the rationale for continuing to smoke was different. For instance, for over 16% of smokers in this age group the disadvantages of quitting were perceived to outweigh its advantages. Some reasons mentioned by older participants were: the addiction aspect of nicotine, being too late to quit, and their body needed nicotine. In other studies among mainstream populations, self-efficacy expectations and advantages of smoking cessation appeared to be the most important associates of quitting smoking among older smokers.[35,36] Therefore, this issue should be revisited in future studies with ethno-cultural communities. The results of this study suggest that understanding health beliefs and perceptions around smoking and improving self-efficacy are useful tools in promoting smoking cessation among smokers in Chinese immigrant communities.

Limitations

Some limitations need to be considered. First, this study used a convenience sample, so it may not reflect the actual smoking prevalence and patterns among Mandarin and Cantonese immigrants in the GVA. We could not explore the effect of acculturation on smoking habit and

pattern. There was no previous data on smoking pattern among Chinese immigrants in Canada, and attempting a community based assessment would have been inherently difficult for an exploratory study. Therefore the findings of this study cannot be generalized to larger Mandarin and Cantonese speaking communities residing in the GVA. The goal was to explore the links to smoking cessation among Mandarin and Cantonese populations in order to gain insight into the need to adapt smoking cessation programs in these groups. In future research, a longitudinal design in which our results can be tested is recommended. A second limitation is the fact that all responses were by self-report and validation of smoking behaviour or reasons to quit or continue smoking was not possible with a cross-sectional design. A third limitation is the absence of a native mainstream (English-speaking) reference group, due to lack of resources. This could be a problem for interpreting the additional 'culturally specific' beliefs, because these were not elicited from mainstream population group. Nevertheless, to assess whether the beliefs we identified in this study are really 'culturally specific', a cohort study with all significant beliefs for main ethnic groups in the GVA, including mainstream population, might be useful.

CONCLUSION

The results of our study suggest that an effective anti-smoking campaign in the Chinese community should go beyond traditional English language efforts, utilize Chinese resources, and build upon existing cultural attitudes (such as the belief that smoking is inappropriate for young people) and knowledge (such as health risks) about smoking. Particular attention should be paid to differences between female and male smokers, and between younger and older smokers related to their knowledge, beliefs and attitudes about smoking, and perceived barriers and facilitators to smoking cessation. We also identified different beliefs and perceptions about the

harms and benefits of smoking, based on language, age, and gender group. The findings indicate the importance of addressing risk perceptions about the immediate and long-term consequences of smoking. Therefore, future interventions can prove the applicability of a risk perception model on smoking cessation among Mandarin and Cantonese speaking smokers. Despite finding significant differences between the genders, educational level, ethnicity and age groups in our study, we believe a larger sample size is needed to address this issue. The findings build a window of opportunity to promote tailored cessation interventions incorporating cultural beliefs, perceptions, and practices for Chinese immigrant communities.

Practical Implications

Our study identified the health beliefs and perceptions about smoking and its cessation among Mandarin and Cantonese immigrants that could be considered by healthcare decision makers to develop health promotion programs preventing smoking onset among younger population groups in Chinese community. Interventions should take account of the specific profiles that Mandarin and Cantonese immigrants in terms of knowledge, attitudes, beliefs and perceptions on their smoking habits and patterns. Given the results of this study, we plan to conduct further research to assess the applicability of a risk perception model to the smoking behavior of routine smokers in the target immigrant communities. The model has been shown effective in terms of modifying risk-taking behaviors, promoting positive perceptions, and improving self-efficacy that have been applied for changing smoking habits/behavior .[37-39]

ACKNOWLEDGEMENTS

We would like to thank the community members, facilitators, ethno-cultural serving agencies (SUCCESS), and key-informants from the Mandarin and Cantonese communities in the Greater Vancouver Area who helped us since the initial steps of this research.

FUNDING

This project was funded by a community grant from The Vancouver Foundation, Vancouver, Canada.

COMPETING INTERESTS

We declare that there is no conflict of interest in terms of ownership of shares, consultancy, speaker's honoraria or research grants from commercial companies or professional or governmental organizations with an interest in the topic of the paper (the ICMJE form for Disclosure of Potential Conflicts of Interest from the Corresponding Author is also attached to this submission).

CONTRIBUTOR STATEMENT

JMF and IP planned the conception and study design. IP prepared the proposal draft to the funding agency and applied for the ethics approval. JS coordinated the study, recruited participants, and facilitated the community involvement. IP analyzed and interpreted the study data. IP and JS drafted the manuscript for important intellectual content.

DATA SHARING STATEMENT

No additional data available.

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Title: Assessing~~ment of~~ beliefs and risk perceptions on~~about~~ smoking and smoking cessation in ~~Mandarin and Cantonese~~immigrant Chinese~~speaking~~ adult smokers residing in Vancouver, Canada: ~~Implications for intervention model~~a cross-sectional study

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Keywords: smoking, Chinese communities, beliefs, risk perceptions, smoking cessation

Word count: 4722
Abstract: 299~~3255~~

What this paper adds:

1. Understanding the beliefs, perceptions, and practice of Chinese Mandarin and Cantonese communities about smoking and smoking cessation creates opportunities to tailor smoking cessation interventions according to the needs of these communities.
2. Previously, most studies have applied an identical risk perception model on smoking behaviour assessments among young vs. old and male vs. female smokers. However, our study identified that risk perception about smoking and smoking consequences differ in the smoking population group based on their age and gender. Therefore, a different model of risk perception should be designed and applied considering the age and gender of participants.
3. Despite existing knowledge that Chinese communities are heterogeneous, our study found that smoking habit, perceptions, beliefs, and practice differ in Mandarin speaking compared to Cantonese speaking Chinese.

ABSTRACT

Objectives: We aimed to conduct culturally based participatory research to assess cultural and belief contexts for smoking behaviours within Mandarin and Cantonese communities. Outcome variables were smoking-related knowledge, smoking patterns, attitudes and beliefs, and perceived barriers and facilitators to successful cessation. ~~We explored cultural and belief contexts for smoking habits within Mandarin and Cantonese speaking communities. The aim was to identify their perceived barriers and facilitators to successful cessation. We attempted to translate existing knowledge and our previous experience in designing a conceptual framework to conduct culturally based participatory research.~~

Design: A community-based approach was applied involving smokers, community key-informants, and professionals in study design and implementation. Initially, focus groups were conducted and findings were used to develop study instrument. Participants responded once to study questionnaire after informed consent.

~~**Methods:** A mixed qualitative and quantitative approach was applied, involving community members, key-informants, and professionals in the design and implementation of the cross-sectional research. Three focus groups were conducted with 16 smokers from the target communities to assess their viewpoints on study framework and measurement tool.~~

Setting: Community based in the Greater Vancouver Area, Canada.

Participants: 16 Chinese smokers participated in focus groups and subsequently, 167 current Chinese immigrant (137 males and 30 females) smokers from Mandarin and Cantonese communities, recruited with the help of community agencies and collaborating physicians, were enrolled in a cross-sectional study.

Results: -We found that a majority believed smoking was harmful on their health. Younger smokers (<35 years of age) did not mind smoking in front of young children compared to older smokers (≥35 years of age) (p<0.001). People with high school or lower levels of education believed that they would benefit more from smoking than suffering from withdrawal symptoms compared to better educated smokers (p<0.05). Mandarin smokers were significantly more likely to encourage others to quit than Cantonese smokers (p<0.05). Many indicated not receiving adequate support from care providers and lack of access to culturally and linguistically appropriate cessation programs impacted on their ability to quit smoking.

~~Participants were 167 current smokers, (137 males and 30 females) recruited with the help of community agencies and collaborating physicians. We assessed smoking patterns, beliefs, and perceptions and found a majority believed that smoking was harmful on their health. Younger smokers (<35 years of age) were more likely to not mind smoking in front of young children compared to older smokers (≥35 years of age) (p<0.001). People with high school or lower levels of education believed that they would benefit more from smoking than suffering from withdrawal symptoms compared to the higher educated smokers (p<0.05). Mandarin speaking smokers were significantly more likely to encourage others to quit than Cantonese speaking smokers (p<0.05). In addition, many indicated not receiving adequate support from their care providers and lack of access to culturally and linguistically appropriate cessation programs preventing their attempt to quit smoking.~~

Conclusion: Our study highlighted the importance of tobacco beliefs among~~control regulations for~~ Mandarin and Cantonese speaking immigrants with limited access to healthcare information and for younger smokers whose attention to health consequences of smoking may be limited as well. Study

~~P~~participants ~~of this study~~ were generally aware of the health risks and were willing to quit.

Access to appropriate cessation programs would fulfill their willingness.

Article Summary

Strengths and Limitations of this study

- We undertook a community-based participatory approach, with community key-informants and healthcare providers were heavily involved in all aspects of the study such as design, instrument development, implementation, community outreach, and dissemination. These key-stakeholders are important allies in developing culturally and linguistically appropriate smoking cessation interventions.

- Our study provides evidence that attitudes and beliefs of cigarette smoking differ between language, age, and gender groups. The differences with regards to tobacco smoking appear to be related to attitudes or knowledge.

- The results build a window of opportunity to promote tailored cessation interventions incorporating cultural beliefs, perceptions, and practices for Chinese immigrant communities.

- We used a convenience sampling method, which may not reflect the actual smoking prevalence and patterns of Chinese Mandarin and Cantonese immigrants in the Greater Vancouver Area.

- All responses were by self-report and validation of smoking behaviour or reasons to quit or continue smoking was not possible with a cross-sectional design.

BACKGROUND

Tobacco use remains the leading cause of preventable morbidity and mortality in the world.[1-3] In Canada, its use has been declining slower than expected in spite of increased taxation on cigarettes and more stringent tobacco policies put into place.[3] In order to accomplish the goal of reducing the rate of smokers among Canadian adults, smoking has to be addressed among all sub-populations, especially those with a higher smoking prevalence than the general population. Global studies have shown that those who stop smoking greatly reduce their risk of developing cardio pulmonary disease and that in general the longer the period of cessation, the greater is the reduction in risk.[4,5] Minority and immigrant communities in Canada may be at greater risk of smoking-related illnesses.[6] Reasons include lack of knowledge and awareness about the link between smoking and lung disease;[7] limited access to smoking cessation programs due to cultural, language, and systemic barriers; [8] and smoking behaviour.[9,10] In addition, many immigrants from low-and-middle-income countries have had prior significant exposure to biomass and bio-fuel as well as smoking which further increases their risk.[11] This is particularly true among immigrants from Mandarin and Cantonese speaking communities (the largest immigrant minority groups living in the BC and Canada)[12,13] where smoking rates remains high.[9,10] Such extensive tobacco use among immigrants may be due to the fact that smoking is a largely integrated into the Chinese male culture.[14] Nearly two of every three adult men in China are smokers.[15,16] It is, therefore, empirically relevant to try to understand this immigrant group's smoking knowledge, behaviours, and habits and develop culturally appropriate educational and counselling services to improve tobacco prevention attempts and promote cessation. Maximizing tobacco control for newcomers requires a special understanding of smoking pattern and beliefs of new immigrant populations. The objectives of this study were:

1) to explore smoking use patterns, smoking-related knowledge, beliefs and attitudes, and perceived barriers and facilitators to smoking cessation among Mandarin and Cantonese speaking communities living in the Greater Vancouver Area (GVA), and 2) to assess the effectiveness of socio-cultural and environmental factors which influenced the onset of smoking and smoking habits (continued smoking) among the study participants. We were also interested to identify differences in above mentioned variables between males and females, Mandarin and Cantonese, and between age and education level groups. ~~The purpose of this study was to explore smoking use patterns, including beliefs, attitudes and behaviour among Mandarin and Cantonese speaking communities living in the Greater Vancouver Area (GVA). We aimed to specifically identify and differentiate the smoking perspectives between males and females, Mandarin and Cantonese, and between age and education level groups.~~ The identification of tobacco use and other related patterns ~~that would be identified here~~ may help facilitate the development of community-based culturally appropriate interventions targeting tobacco use and would be ~~sensitive~~ helpful for Chinese immigrants in future research.

METHODS

Project Design

This multi-stage ~~mixed methods~~cross-sectional study employed both qualitative and quantitative components within an over-arching community-based participatory framework. The first stage comprised the development and testing of a measurement instrument for the survey study. The second stage was a quantitative study assessing the outcome variables including smokers' awareness of smoking and its cessation, attitudes and beliefs about smoking harms and benefits, and cultural norms of smoking in their community.

~~smokers' knowledge, attitudes, beliefs, and smoking pattern.~~

The study was conducted between January 2013 and June 2014, allowing for participation and collaboration between members of the Mandarin and Cantonese communities and other key-stakeholders such as professionals and researchers in the research process.[17-19] Connections and networking were built with community key-informants and community agencies (e.g., SUCCESS (United Chinese Community Enrichment Services Society), Vancouver Coastal Health community organizations, etc.) supporting active involvement and contribution in study design, development and implementation. Community collaborators provided assistance with recruitment of Mandarin and Cantonese smokers as well as input and suggestions on the development of focus group and interview questions. They recruited two males and two females who were members of the community, fluent in Mandarin and Cantonese, to work in alliance with 4 female bilingual Chinese research assistants. All community facilitators and research assistants received necessary training prior the study. The training included approaches on how to best recruit study participants, understanding of the project's aims and objectives, how to conduct focus groups and individual interviews with smokers from their own communities, and ideas on how the team could work together effectively in collection of the best information possible on Chinese smokers' knowledge, beliefs and attitudes about harms and benefits of smoking, and socio-cultural and environmental factors affecting smoking and smoking cessation. ~~beliefs, attitudes, and perspectives regarding smoking and smoking cessation.~~ The community researchers transcribed and translated focus group and interview discussions and we applied the collected information in the development of a study measurement tool and conceptual framework. In addition, findings from our previous qualitative smoking study (conducted with

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smokers from the same communities) were used in the development of the study design and measurement tool.[20]

Ethics

Ethics approval was obtained for this study from the University of British Columbia Research Ethics Board. All participants signed a written consent form in their preferred written language (Chinese Simplified, Chinese Traditional, or English) translated by the bilingual researchers whoich clearly explained the study informationrationale, aimgoals and objectivess, and how their involvement would be like prior to the study.

Study Measurement Tool

We initially developed the study measurement tool by determining whether any English or Chinese language questionnaires were currently in use to assess attitudes and beliefs re smoking in Chinese community. A literature search and an informal survey of immigrant-serving community agencies did not find any such instrument. Given the absence of a validated assessment questionnaire in the target languages, a new measurement tool was developed over a 4-month period. Development of the study measurement tool began with information collected from initial focus group session participantss (n=143) and individual interviews (n=2), review of relevant literature that addressed knowledge of, attitudes to, and behaviors in relation to tobacco use, and also our previous smoking-related qualitative studies with Mandarin and Cantonese current and ex-smokers.[20,21] Moreover, a professional measurement tool developer (a PhD in the socio-psychology -research and evaluation field from University of British Columbia) with expertise in developing mixed open-ended and closed-format questionnaires was involved in the

face and content validation and finalization of the measurement tool. The team and the measurement developer have the expertise to identify and differentiate between beliefs, attitudes and perceptions, as well as the socio-cultural and environmental aspects of smoking and its cessation. Each set of variables were identified and separated by heading-title in the questionnaire. The internal consistency of the data was checked by test-retesting reliability, where the study questionnaire was administered to 5 smokers and tested again a week after and the results of the initial assessment and retest were compared. Also, more advanced process was applied by calculating Cronbach Alpha and a coefficient was (.89).

The final questionnaire covered current smoking knowledge, beliefs, and attitudes about smoking and its cessation~~cigarettes~~, and ~~exposure to smoking cessation aids~~socio-cultural and environmental factors that promote or prevent smoking onset and continuation. The tool included 70 questions covering demographics and concepts on smoking onset, smoking characteristics, perceptions, experience in quitting, social relationships, and cultural and environmental influences and were in the format of yes/no, true/false, multiple choice, and open-ended questions (The study measurement tool can~~may~~ be found as Supplmentary File 1~~in the Appendix~~). The questionnaire was also reviewed by a number of key-informants and health practitioners (n=9) from the target communities who provided feedback and comments re the questionnaire and checked its face and content validity. The bilingual Chinese research assistants worked collaboratively together translating~~ed~~ the study measurement tool to Chinese Simplified and Traditional formats. The translations were reviewed by secondary (back-up) translators from the target communities who were introduced by the collaborating immigrant agencies for accuracy and correctness. The tool

was then reviewed by the community key-informants and professionals for further crosschecking. Finally we pilot tested the questionnaire with selected smokers and ex-smokers from the Chinese communities (n=5) to confirm validation of the measurement tool and for cultural relevance and clarification, as well as translation purposes including understandability, acceptability, and applicability. Suggestions were integrated into a revised version.

~~and it was then pilot tested with selected smokers and ex-smokers from the Chinese communities (n=5) to further validate the measurement tool and for cultural relevance and clarification, as well as translation purposes including understandability, acceptability, and applicability, and suggestions were revised accordingly.~~

Participant Recruitment

Eligibility criteria for participants were adults (≥21 years old) who were current smokers (defined by having smoked at least 5 cigarettes per day during the past 30 days), Chinese descent (either Mandarin or Cantonese speaking) and be immigrants to Canada or children of Chinese immigrants. Participants were recruited from within the communities using a variety of outreach methods such as posting flyers and referral applied from previous studies and through network with community agency collaborators.[17,22,23] In total, 16 Chinese smokers participated in initial focus groups and interviews and subsequently 167 (137 males and 30 females) were interviewed, from which 93 were Mandarin speaking and 74~~3~~ were Cantonese speaking. In terms of age category, 90 participants were <35 years of age and 76 were ≥35 years of age. Our intended sample size was 150 Chinese smokers aiming to identify mean differences in knowledge, beliefs, attitudes, and practices related to smoking and experience in smoking cessation between age, gender, education, and ethnicity groups.

~~90 participants were <35 years of age and 76 were ≥35 years of age. Our targeted goal and objective was to assess variations in 150 Chinese smokers' knowledge, beliefs, attitudes, and practices related to smoking and experience in smoking cessation and we exceeded this aim.~~

Data Collection

Data was collected through administration of study questionnaire and individual interviews. Interview sessions were conducted at places and times of convenience for participants: e.g., participants' homes, community centres, and our research centre. Printed consent forms were explained and signed preceding the interview. ~~Data were collected from May 2013 through April 2014.~~ Modest honoraria were paid to cover time, travel, and parking expenses. Community research assistants conducted the interviews in Mandarin, ~~Cantonese~~or Cantonese ~~, or English~~ and the participants filled in a self reported Chinese Simplified or ~~,~~Chinese ~~Traditional, or English questionnaire~~Traditional questionnaire while the research assistant were~~as~~ available to answer any questions that they would have had, or ask the responders to elaborate the given information in the open-ended questions. Each interview was conducted by two interviewers: one with an academic perspective (a research assistant), and one from community who acted as a facilitator. The two interviewers took notes during interviews including verbal and non-verbal communication by the participants and reviewed their notes at the end of each interview aiming to improve the accuracy of the information, capturing smokers' smoking beliefs, perceptions, and also their comments about cultural images of smoking and its cessation. In some instances (e.g., old smokers or low literate people), the research assistants assisted by administered the study questionnaire verbally while taking notes throughout the entire interview.

Data analysis

SPSS v20 (2012) was used for all statistical tests. Descriptive statistical tests were used and the results were presented in tables and graphs. Relevant inferential statistics were calculated for the entire sample and stratified according to age, gender, level of education, language of origin, and smoking patterns. The data were not normally distributed, and non-parametric tests were therefore used; e.g., ~~(~~chi-square~~)~~ test for nominal data, Mann–Whitney test for ordinal data with two groups, and Kruskal–Wallis test for more than two groups with ordinal data. Binary logistic regression was used to determine the effects of demographics ~~variables~~ on ~~beliefs, attitudes, knowledge and behaviour~~the outcome variables. All data were examined regarding distributions and trends in the data, and the level of significance was set at the $P< 0.05$ level.

Sample Size Calculation

With a total sample size of 167 subjects for the cross-sectional study, we estimated that we could identify mean differences between different age, gender, language and education level groups and with an effect size of 0.45 with 80% statistical power and a two-sided significance level of $P<0.05$.

FINDINGS

Between May 2013 and April 2014, w~~W~~e recruited and enrolled 167 current smokers~~ in the GVA.~~ **Table 1** describes characteristics of the study sample for both Mandarin (55.7%, n=93) and Cantonese (44.3%, n=74). The participants included predominately males (82%, n=137). The median age was 35 and we used this cut off point for younger/older groups, as used

previously from our qualitative studies conducted with Chinese community smokers,[20] allowing us to identify these differences in perspective. ~~90 participants on the study were <35 years of age and 76 were 35 and older.~~

Table 1. Participant characteristics

	N	%
Gender		
Male	137	82
Female	30	18
Language		
Mandarin	93	55.7
Cantonese	74	44.3
Age		
<35	105~~90~~	63~~54~~
≥35	62~~76~~	37~~46~~
Education Level		
High school under	87	52
University degree and above	80	48

Smoking-related knowledge and reasons for starting smoking

Knowledge of smoking consequences is an important factor to consider when designing smoking cessation programs or implementing health promotion interventions, especially to prevent onset of smoking among young people.[2,8] Almost an equal number (23%) of Mandarin and Cantonese smokers indicated that they were not aware of smoking side effects when they started smoking. Table 2 provides the breakdown of smoking-related knowledge by gender, age, and education level.

Table 2. *'At the time you started smoking, did you know the side effects of smoking?'*

	Yes N %	No N %
Gender		

Male	105 77	32 23
Female	22 73	8 27
Age		
<35	90 86	15 14
≥35	38 62	24 39
Education Level		
High school under	61 70	26 30
University degree and above	67 84	13 16

We also aimed to determine the *socio-cultural and environmental* factors which influenced the onset of smoking among the study participants.[24] In this study, we defined social factors as smoking during the gatherings, being offered cigarettes by peers (a cultural norm in this community), smoking to feel being accepted, etc. On average for 45% (n=75) of participants, 'social factors' were a trigger to start smoking, while it was the number one trigger for male smokers and smokers with who were 35 years or over with an equal rate of 53%. Although 50% of females mentioned 'emotional factors' as a contributor to starting smoking, only 22% (on average) of males cited these as factors for them. Likewise, 'environmental factors' were considered by only 20% of participants as a factor in starting to smoke, while 50% of Mandarin smokers mentioned environmental factors as a major trigger for them to start smoking. A smoking friend was mentioned by most of participants (66.3%) as someone in their social network when starting smoking, compared to classmate (48.5%), family (29%), and work-related colleagues (28%). An interesting observation was that 50% of female smokers in the study identified having a family member who smoked when they first started smoking.

Smoking beliefs, perceptions, and attitudes

For more than 60% of smokers, the main reasons to smoke regularly were the beliefs that smoking *'relaxed them*' and '*helped them feel less stress'*: while 59% (n=81) of male smokers

selected these factors, only 47% (n=14) of female smokers said so. Multiple factors affected males to become regular smokers. Mandarin and Cantonese speaking smokers equally chose relaxation (54%), with more Mandarin believing that smoking helped them to cope with stress (67%) compared to Cantonese smokers (54%), the differences were not statistically significant. Moreover, over 60% of the participants said they smoke when they 'are having a break' and finally, less than 12% of the participants believed that smoking helped them to '*fit in with other people*'. This rate was 20% among females (n=6) and 19% (n=15) among highly educated smokers. Table 3 provides the breakdown of the triggers to smoke.

Table 3. *'Smoking relaxes me and makes me feel less stress.'*

	Relaxation N	%	**Less stress** N	%
Gender				
Female	22	73	21	70
Male	82	60	81	59
Age				
<35	73	70	71	68
≥35	31	51	31	51
Education Level				
High school under	50	58	45	52
University degree and above	55	69	50	62.5

We were also interested to identify the *social and cultural* aspects of smoking habits (continued smoking). When asked the question of whether '*most people in my culture smoke*' to assess participants' perceived commonality of smoking in their communities, there was a significant difference between male and female participants ($\chi^2 = 5.424$, df = 1, $P<0.05$) ; more males (n=46, 34%) believed that smoking was a cultural habit in their community than females (n=17, 57%) did. Similar findings were observed between Mandarin and Cantonese ($\chi^2 = 5.182$, df = 1, $P<0.05$); more Mandarin (n=65) answered yes to the question than Cantonese smokers (n=39).

Many participants (61%) indicated they normally smoked when they were 'with friends'; with the highest proportion reported among the <35 years old participants (82%) and male participants (70%). Remarkably, 70% of the <35 years old participants indicated they smoked when they had alcohol. The rate was 60% among female participants, 57% among males, and 57% among both Mandarin and Cantonese smokers. In terms of attitudes towards exposing others to second or third-hand smoke, we asked participants *'do you mind smoking in front of non-smokers'* ? Younger smokers (<35 years of age) were more likely (n=72) to mention that they did not mind smoking in front of non-smokers compared to older smokers (≥35 years of age) (n=52). The mean difference was significant (χ^2 = 7.133, df = 1, P<0.01). Also, when the participants were asked whether they minded smoking in front of young children, similarly, more younger smokers (<35 years of age) (n=97) mentioned that they *'did not mind smoking in front of young children'* than the older smokers (n=55) and the difference was significant (χ^2 = 5.123, df = 1, P<0.05). We also aimed to assess smokers' viewpoints regarding second hand smoking and its harm. We asked whether *'second and third hand smoke was as harmful as first hand smoke'*, again, relatively more males said 'no' when compared to female smokers (n= 40 and n= 10, respectively) and the difference was significant (χ^2 = 4.736, df = 1, P<0.05). Finally, we assessed smokers' beliefs about their own smoking pattern with a self-reported question of '*I have a smoking routine/pattern*'. No significant differences were identified between gender, age, and language groups. However, we found that more people with high school education or less mentioned they didn't have a routine/pattern (n=30) compared to people with higher education (n=12) and the difference was significant (χ^2 = 7.156, df = 1, P<0.01).

~~When asked the question of whether '*most people in my culture smoke*', there was a significant difference at p<0.05 level between male and female participants; more males believed that~~

~~smoking was a cultural habit in their community than females did. Similar findings were observed between Mandarin and Cantonese at p<0.05; more Mandarin said answered yes to the question. Younger smokers (<35 years of age) were more likely to mention that they *'did not mind smoking in front of non-smokers'* compared to older smokers (≥35 years of age). The mean difference was significant at p<0.05. When asked whether they minded smoking in front of young children, similarly, younger smokers (<35 years of age) mentioned that they *'did not mind smoking in front of young children'* and the significant difference was at p=0.005. When we asked whether *'second and third hand smoke was as harmful as first hand smoke'*, again, relatively more younger smokers (<35 years of age) compared to older smokers said no when compared to older smokers (≥35 years of age). The difference was significant at p<0.05. We also asked whether participants '*had a smoking routine/pattern*' and found that people with high school or lower education mentioned they didn't have a routine/pattern compared to people with higher education level at p<0.05.~~

Perceptions about smoking

We assessed smokers' perceived *enjoyable feeling* that they may have due to smoking by asking whether '*there is a different feeling when comparing times I smoke and don't smoke*' and found a statistically significant difference between male and female participants ($\chi^2 = 4.237$; df = 1, $P<0.05$). Significantly more males (n=47) mentioned experiencing a different feeling when they smoked compared to not smoking than female smokers (n=15). In addition, younger smokers (<35 years of age) as well claimed to have a different feeling when comparing times smoking and not smoking (n=46) compared to older smokers (n=16), and the differences were statistically significant ($\chi^2 = 3.889$, df = 1, $P<0.05$). Likewise, more Mandarin smokers (n=41) than

Cantonese smokers (n=20) reported having a different feeling when they smoke compared to when they were not smoking (χ^2 = 5.188, df = 1, P<0.05). For this outcome there was no significant differences between highly educated (college/university and above) and lower educated (high school or lower).

Additionally, we assessed smokers' perceptions about *helpfulness* of smoking to alleviate their anxiety and stress. We noticed that 77% of female smokers, 69% of younger smokers (aged 34 years or younger), and 52% of older smokers (age 35 or older) smoked to reduce their sense of helpfulness. Male smokers perceived that smoking helped them to minimize the feeling of being bored (80%) and made them more connected to their group of friends (69%).

~~**Feeling when smoking**~~

~~We asked if '*there is a different feeling when comparing times I smoke and don't smoke*', and found a statistically significant difference between male and female participants (χ^2 = 4.237; df = 1, P<0.05). Significantly more males mentioned experiencing a different feeling when they smoked compared to not smoking. In addition, younger smokers (<35 years of age) as well claimed to have a different feeling when comparing times smoking and not smoking. The differences between younger (<35 years of age) and older (≥35 years of age) was statistically significant (χ^2 = 3.889, df = 1, P<0.05). No significant differences in this regard were identified between Mandarin and Cantonese and highly educated (college/university and above) and lower educated (high school or lower).~~

Smoking cessation

We aimed to identify willingness to quit smoking and *perceived barriers and facilitators* to cessation. The majority of participants, in particular young male and female smokers, mentioned their desire to quit and attempted to several times, before giving up and smoking again. A few people mentioned using medications or seeking professional advice to quit smoking but mainly relied on their own willpower to quit. Also, older participants indicated trying to quit due to health related issues such as heart disease or cancer. We were also interested to find out whether participants were under pressure by someone close to them to quit smoking. When asked *'I was nagged by someone to quit smoking'*, no statistically significant differences were identified in different gender, age, language, and education groups. However, when we asked whether they *'would encourage others to quit'*, more Mandarin speaking smokers answered yes to (n=45) than Cantonese speaking smokers (n=23) (χ^2 = 5.172, df = 1, P<0.05). No significant differences were identified based on age, gender, and level of education. In addition, most participants (87%) said "No" to the question: "*Would you encourage non-smokers to smoke?"* Furthermore, we also asked whether living in a smoking restricted society like Canada would encourage smokers to quit or cut down on their smoking. More Mandarin speaking smokers (n=56, 60%) mentioned that '*living in Canada influenced their smoking habits or desire to quit*', compared to Cantonese speaking smokers (n=30, 41%) (χ^2 = 6.424, df = 1, P =0.011).

More people with high school or lower education (n=34) agreed with the statement *'I would benefit more from smoking than suffering from withdrawal symptoms due to quitting'*, compared to the more educated smokers (n=12) (χ^2 = 6.102, df = 1, P<0.05). When asked whether they *'tried nicotine replacement therapy to quit smoking'*, more Mandarin speaking smokers (n=32)

mentioned that they had tried this aid to quit smoking compared to Cantonese speaking smokers (n=12 (χ^2 = 7.275, df = 1, *P* =0.007).

In general, participants identified language and literacy issues as barriers to accessing smoking cessation information as well as lack of useful information in a social media format. For instance, older participants mentioned that they had limited exposure to public sources of information on cessation services that were developed in their native language. A small minority of these smokers had received advice and information about the health issues attributed to smoking from their physicians. Younger smokers mentioned the lack of disseminating smoking cessation messages through social media such as text messaging to promote quitting services in their native language.

Our synthesis of the interview data identified seven barriers to the participants' cessation which are summarized in Table 4.

Table 4. *Barriers to Smoking Cessation identified by the participants*

Barriers
(a) the problems of managing their lives in a highly stressful environment
(b) their isolation and the limited support systems in their community or work/school environments
(c) the availability of smoking as a social-connection to their peers and limited resources for pleasure
(d) perceived minimal health risks of smoking, (e) the commonality of smoking in their community

(e) the commonality of smoking in their community

(f) the scarce or non-existent information about how to stop smoking

(g) the belief that all they can quit on their own whenever they decide to

~~More Mandarin speaking smokers answered yes to whether they *'would encourage others to quit'*, than Cantonese speaking smokers and the difference was significant at p<0.05. As well, more Mandarin speaking smokers also mentioned that *'living in Canada influenced their smoking habits or desire to quit'*, compared to Cantonese speaking smokers at p<0.05.~~

~~In addition, more people with high school or lower education agreed with the statement *'I would benefit more from smoking than suffering from withdrawal symptoms due to quitting'*, compared to the higher educated at p<0.05. When asked whether they *'tried nicotine replacement therapy to quit smoking'*, more Mandarin speaking smokers mentioned that they had tried this aid to quit smoking compared to Cantonese speaking smokers and the difference was statistically significant at p=0.008.~~

~~Many older participants mentioned that they had limited exposure to public sources of information on cessation services, developed in their native language. A few older smokers had received advice and information about the health issues attributed to smoking from their physicians. In general, participants indicated that they were not getting adequate support from their community, nor were aware of the resources that could have helped them quit, therefore lacked the decision-making tools helping them to succeed their attempt.~~

DISCUSSION

The main goal~~aim~~ of this study was to gain insight on the beliefs and perceptions ~~into the psychosocial factors and the perceptions~~ associated with smoking behaviours and smoking cessation among Chinese Cantonese and Mandarin speaking current smokers, taking into account culturally specific ~~beliefs~~ knowledge and practices. The results have implications for the development of appropriate smoking cessation programs and educational interventions to prevent and control tobacco-related health issues among the target communities. ~~for these immigrant groups.~~ Such interventions may have policy implications in health promotion programs to prevent smoking onset among younger population groups in the immigrant communities.

Several participants in this study indicated their desire to quit and attempted to do so many times, many of whom~~ich~~ did it relying on their own willpower. Only ~~and~~ a few, mainly among older smokers, tried to quit due to health related issues~~, mainly among older smokers~~. They mentioned that a better communication with primary care providers and ease of access to culturally and linguistically appropriate smoking cessation resources would promote smoking cessation in their communities. Similar findings have been~~were~~ reported in studies done in other countries as well as among many immigrant communities in Canada who tried to quit smoking~~, as shown in different local studies~~.[25~~4~~-28~~6~~] In addition to elucidating these barriers to smoking cessation and despite continued smoking, participants showed being knowledgeable in health related and other negative aspects of smoking as on average, 70% of the participants indicated they were aware of the health consequences of smoking. This finding has been confirmed in other studies. [28] In our study, we found that higher education, better knowledge, and smoking regulations contributed to having a greater intent to quit smoking. For instance, we found that most

participants were not ignorant of the dangers of smoking, with the vast majority recognizing that smoking posed risks to their own health and the health of those around them. ~~In addition to elucidating these barriers to smoking cessation and despite continued smoking, participants showed being knowledgeable in health related and other negative aspects of smoking. Firstly, most participants were not ignorant of the dangers of smoking, with the vast majority recognizing that smoking posed risks to their own health and the health of those around them.~~ This knowledge is much higher than that of Chinese smokers who were previously surveyed in China back to 2011, where only 36% of participants believed smoking can cause lung cancer and only 4% were aware of the relationship of smoking to~~of whom associated cigarettes with~~ heart disease.[2~~7~~9] ~~Secondly~~In addition, many of the smokers in our study already accepted limitations on the use of cigarettes in Canada, and many, mostly younger smokers, supported restrictions on indoor smoking and also mentioned not smoking at home or where children are present~~ed~~. This could be attributed to the smoking restriction rules as well as the strong anti-smoking educational campaigns in Canada. For example, since 2001, Health Canada has spent more than $480 million for a 5-year program to encourage tobacco cessation programs for all Canadians.[30] These regulations might be important to reduce the risk of second-hand and third-hand smoking and related health issues among young children and other non-smoker family members. ~~This practice is extremely important to reduce the risk of second-hand and third-hand smoking and related health issues among young children and other non-smoker family members.~~

In terms of reasons to continue smoking, perceived advantages of smoking such as ‘smoking does make me feel more comfortable’ and ‘smoking helps me to be stress-free when I have problems’ appeared to be more important factors to promote smoking continuation among our

study participants than perceived disadvantages around 'health issues' and 'money' which shown to be strong motivators in quitting smoking in some studies. Some studies found that smokers may not be aware of the diseases caused by smoking and therefore, they may perceive themselves less susceptible to the risks of smoking.[30-34] ~~[28-30]~~ For instance, health consequences and costs of smoking were not perceived as strong motivators to quit smoking among young participants. They reported the stimulating and anti-stress effects of smoking (smoking may actually made them feel happier, more alert, etc), the feelings that may reinforce their tobacco use and have associated these feelings with being around other smokers. In older smokers, most of which showed low self-efficacy on being able to quit, the rationale for continuing to smoke was different. For instance, for over 16% of smokers in this age group the disadvantages of quitting were perceived to outweigh its advantages. ~~The disadvantages of quitting were perceived to outweigh its advantages were the main motives for continuing to smoke among older smokers, most of which showed low self-efficacy on being able to quit.~~ Some reasons mentioned by older participants were: the addiction aspect of nicotine, being too late to quit, and their body needed nicotine. In other studies among mainstream populations, self-efficacy expectations and advantages of smoking cessation appeared to be the most important associates of quitting smoking among older smokers.[35~~1~~,36~~2~~] Therefore, this issue should be revisited in future studies with ethno-cultural communities. The results of this study suggest that understanding health beliefs and perceptions around smoking and improving self-efficacy are useful tools in promoting smoking cessation among smokers in Chinese immigrant communities.

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Limitations

Some limitations need to be considered. First, this study used a convenience sample, so it may not reflect the actual smoking prevalence and patterns among Mandarin and Cantonese immigrants in the GVA. We could not explore the effect of acculturation on smoking habit and pattern. There was no previous data on smoking pattern among Chinese immigrants in Canada, and attempting a community based assessment would have been inherently difficult for an exploratory study. Therefore the findings of this study cannot be generalized to larger Mandarin and Cantonese speaking communities residing in the GVA. The goal~~main aim~~ was to explore the links to smoking cessation among Mandarin and Cantonese populations in order to gain insight into the need to adapt smoking cessation programs in these groups. In future research, a longitudinal design in which our results can be tested is recommended. A second limitation is the fact that all responses were by self-report and validation of smoking behaviour or reasons to quit or continue smoking was not possible with a cross-sectional design. A third limitation is the absence of a native mainstream (English-speaking) reference group, due to lack of resources. This could be a problem for interpreting the additional 'culturally specific' beliefs, because these were not elicited from mainstream population group. Nevertheless, to assess whether the beliefs we identified in this study are really 'culturally specific', a cohort study with all significant beliefs for main ethnic groups in the GVA, including mainstream population, might be useful.

CONCLUSION

The results of our study suggest that an effective anti-smoking campaign in the Chinese community should go beyond traditional English language efforts, utilize Chinese resources, and build upon existing cultural attitudes (such as the belief that smoking is inappropriate for young people) and knowledge (such as health risks) about smoking. Particular attention should be paid

to differences between female and male smokers, and between younger and older smokers related to their knowledge, beliefs and attitudes about smoking, and perceived barriers and facilitators to smoking cessation. -We also identified different beliefs and perceptions about the harms and benefits of smoking, based on language, age, and gender group. The findings indicate the importance of addressing risk perceptions about the immediate and long-term consequences of smoking. Therefore, future interventions can prove the applicability of a risk perception model on smoking cessation among Mandarin and Cantonese speaking smokers. Despite finding significant differences between the genders, educational level, ethnicity and age groups in our study, we believe a larger sample size is needed to address this issue. The findings build a window of opportunity to promote tailored cessation interventions incorporating cultural beliefs, perceptions, and practices for Chinese immigrant communities.

~~an important issue that our sample size was not large enough to address. Also, future interventions can prove the applicability of a risk perception model on smoking cessation among Mandarin and Cantonese speaking smokers. Community key informants and healthcare providers are important allies in developing culturally and linguistically appropriate smoking cessation promotional programs and reinforcing to their clients the importance of smoking prevention and cessation. Our study provides evidence that attitudes and beliefs of cigarette smoking differ between language, age, and gender groups. The differences with regard to tobacco smoking appear to be related to attitudes or knowledge. The findings build a window of opportunity to promote tailored cessation interventions incorporating cultural beliefs, perceptions, and practices for Chinese immigrant communities.~~

Practical Implications

Our study identified the health beliefs and perceptions about smoking and its cessation among Mandarin and Cantonese immigrants that could be considered by healthcare decision makers to develop health promotion programs preventing smoking onset among younger population groups in Chinese community. Interventions should take account of the specific profiles that Mandarin and Cantonese immigrants in terms of knowledge, attitudes, beliefs and perceptions on their smoking habits and patterns. Given the results of this study, we plan to conduct further research to assess the applicability of a risk perception model to the smoking behavior of routine smokers in the target immigrant communities. The model has been shown effective in terms of modifying risk-taking behaviors, promoting positive perceptions, and improving self-efficacy that have been applied for changing smoking habits/behavior .[37-39]

~~Despite the above mentioned limitations, the study has great significance in attracting the attention to the health disparities that Chinese immigrants in the GVA that have been in terms of higher prevalence of tobacco use in their homeland and diminished access to culturally and linguistically appropriate cessation aids. Interventions should take into consideration the specific profiles that Mandarin and Cantonese immigrants have in terms of the knowledge, attitudes, and beliefs on their smoking habits and patterns. Given the results of this study, we can conduct further research to assess the applicability of a risk perception model to the smoking behavior of routine smokers in the target immigrant communities. The model has been shown effective in terms of modifying risk-taking behaviours, promoting positive perceptions, and improving self-efficacy that have been applied for changing smoking habits/behaviour among participants in different studies.[33-35]~~

ACKNOWLEDGEMENTS

We would like to thank the community members, facilitators, ethno-cultural serving agencies (SUCCESS), and key-informants from the Mandarin and Cantonese communities in the Greater Vancouver Area who helped us since the initial steps of this research.

FUNDING

This project was funded by a community grant from The Vancouver Foundation, Vancouver, Canada.

COMPETING INTERESTS

We declare that there is no conflict of interest in terms of ownership of shares, consultancy, speaker's honoraria or research grants from commercial companies or professional or governmental organizations with an interest in the topic of the paper (the ICMJE form for Disclosure of Potential Conflicts of Interest from the Corresponding Author is also attached to this submission).

CONTRIBUTOR STATEMENT

JMF and IP planned the conception and study design. IP prepared the proposal draft to the funding agency and applied for the ethics approval. JS coordinated the study, recruited participants, and facilitated the community involvement. IP analyzed and interpreted the study data. IP and JS drafted the manuscript for important intellectual content.

DATA SHARING STATEMENT

No additional data available.

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The effect of a multi-dimensional smoking cessation intervention on Mandarin and Cantonese-speaking immigrants residing in the Greater Vancouver Area: A community-based program

Please respond to the following questions:

A. All about you

1. **What is your gender?**
   □ Male □ Female

2. **What is your age?**
   □ 21-25 years old
   □ 26-35 years old
   □ 36-45 years old
   □ 46-55 years old
   □ 56 years old and above

3. **Which language(s) do you speak most with your friends, family, or co-workers?**
   □ Mandarin
   □ Cantonese
   □ English
   □ Others, please specify_____

4. **What is your marital status?**
   □ Single, never married
   □ Married
   □ Living under common-law
   □ Divorced
   □ Widowed/Living alone

5. **What is your highest level of education?**
   □ Never attended school
   □ Elementary school
   □ High school
   □ University degree
   □ University degree and above
   □ Others, please specify_____

6. **What is your current employment status?**
   □ I am a student
   □ I am employed
   □ I am self-employed
   □ I am unemployed
   □ I am retired

B. Smoking onset questions

1. **At what age did you start smoking?**
   □ Under 18 years old
   □ 19-25 years old
   □ 26-39 years old
   □ 40 years old and older

2. **Why did you start smoking? (Choose all that are applicable to you and explain)**
   □ Social factors, please specify
   _____
   □ Emotional factors, please specify
   _____
   □ Environmental factors, please specify
   _____
   □ Others, please specify
   _____

3. **At the time you started smoking, did somebody in your social network smoke?**
   (Choose all that are applicable to you)
   □ None or Not applicable
   □ Family, who, please specify_____
   □ Colleagues, from where, please specify _____
   □ Friends
   □ Classmates, at what age, please specify_____
   □ Others, please specify_____

4. **At the time you started smoking, did somebody tell you about the health problems smoking a cigarette can cause?**
   (Choose all that are applicable to you)
   □ None or Not applicable
   □ Family, who, please specify_____
   □ Colleagues
   □ Friends
   □ Classmates, at what age, please specify_____
   □ Media
   □ Health professionals
   □ Others, please specify_____

5. **At the time you started smoking, did you know the side effects of smoking?**
   □ Yes □ No
   If yes, which one(s) did you know?
   □ Makes teeth yellow
   □ Causes wrinkles

□ Makes smokers smell bad
□ Causes more phlegm
□ Shortness of breath
□ Causes bad breath
□ Cough
□ Increased risk of lung cancer
□ Greater risk of heart disease
□ Others, please specify_____

6. **Why did you become a regular smoker?**
(Choose all that are applicable to you)
□ I have never been a regular smoker **(After choosing, please skip to question 7)**
□ I craved cigarettes if I didn't smoke regularly
□ I was around smokers a lot of time
□ I found smoking pleasurable
□ I enjoy the taste
□ Smoking relaxed me
□ Smoking helped me focus and concentrate better
□ Smoking helped me feel less stressed
□ I smoke to fit in with other people
□ I like the image of a smoker
□ Smoking helped me control my weight
□ Since others in my family smoked, it was easy to see myself as a smoker too
□ Others, please specify_____

7. **If you are not a regular smoker, why didn't you become a regular smoker?**
(Choose all that are applicable to you)
□ I did not enjoy smoking
□ Smoking cigarettes made me feel sick
□ I did not like the taste and/ or the smell of cigarettes
□ I did not want to become addicted to cigarettes
□ I was concerned about the effects of smoking on my health
□ I was concerned about the effects of smoking on the health of the people around me
□ I don't hang out with people who are smokers that often
□ I was encouraged to stop smoking by my friends
□ I was encouraged to stop smoking by an adult such as my parents/ guardians, a teacher, or a doctor
□ I did not like the image of being a smoker
□ It was hard for me to obtain cigarettes
□ Cigarettes are expensive
□ I had trouble finding places to smoke
□ Since I grew up in a non-smoking family, I just could not see myself as a smoker
□ I don't want people to know that I smoke
□ Others, please specify_____

C. Which characteristic best describes you as a smoker?

1. **How much do you smoke now per day?**
   # Packs_____ or # Cigarettes_____

2. **How much do you spend weekly on buying cigarettes?**
   □ Under $25/week
   □ $25-50/week
   □ $50-75/week
   □ $75-100/week
   □ $101+/week

3. **I have a smoking routine/pattern.**
   □ True □ False □ Not sure

4. **I smoke**
   (Choose all that are applicable to you)
   □ When I am bored
   □ When I am upset
   □ When I am having a break
   □ When I am partying
   □ When I am driving
   □ When I am under stress
   □ When I am with friends
   □ When I am alone
   □ When I am in a social gathering
   □ Mostly at home
   □ At work or at school
   □ When I have alcohol
   □ First thing when I wake up
   □ Mostly in the morning
   □ Mostly in the afternoon
   □ At night before I head to bed
   □ After every meal
   □ After every tea or coffee
   □ During every phone conversation
   □ Before I go to the washroom
   □ Before I head to work on an assignment/task
   □ After I finish an assignment/task
   □ When I want to relax
   □ Others, please specify_____

5. **There is a different feeling when comparing times I smoke and don't smoke.**
   □ True □ False □ Not sure □ Depends on the situation, please explain_____

6. **What are the things you like about smoking?**
(Choose all that are applicable to you)
□ It helps me to relax
□ It helps to break up my working time
□ It helps me to cope with stress
□ It keeps me busy when I am bored
□ I just enjoy it
□ It is something I have in common with my friends or family
□ It stops me from putting on weight

7. **What are the things you don't like about your smoking?**
□ I don't have anything that I dislike about smoking
□ It is expensive
□ It affects my health
□ I don't like feeling dependent on cigarettes
□ It makes my clothes and breath smell
□ It is a bad example for children
□ It is unpleasant for people near me
□ It makes me less fit
□ People put a negative image on me
□ It is bad for the health of people near me

8. **Certain situations trigger me to smoke**
□ True □ False □ Not sure
If true, what are the situations?
□ Happiness/ Joy
□ Relaxed
□ Social gathering
□ Receive bad news
□ Receive good news
□ Stress
□ Frustration
□ Boredom
□ Loneliness
□ Anger
□ Sadness
□ Lost concentration
□ Wanting to be like others (e.g., friends, members of my group)
□ Other, please specify_____

9. **Where do you smoke mostly?**
□ Indoors
□ Porch/outside of home
□ Outside
□ Workplace
□ In the car
□ Others, please specify_____

D. Your perception about the following statement

1. **Smoking kills germs and bacteria.**
   □ True □ False □ Not sure

2. **My body needs nicotine.**
   □ True □ False □ Not sure

3. **Smoking is an addiction.**
   □ True □ False □ Not sure

4. **Smoking is cool.**
   □ True □ False □ Not sure

5. **Smoking has changed my daily routine (work, study, exercise, food intake, and sleep).**
   □ True □ False □ Not sure
   If true, how has it changed your daily routine?
   _____

6. **Smoking has affected my health (i.e., lung disease, coughing, phlegm, cancer, shortness of breath, heart disease, blood pressure, energy, wrinkles, asthma)?**
   □ True □ False □ Not sure
   If true, how has it affected your health?
   _____

7. **There are health-related problems I'm worried about while I smoke.**
   □ True □ False □ Not sure
   If true, what are they?
   □ Lung disease
   □ Shortness of breath
   □ Cough
   □ Cancer
   □ Heart disease
   □ Change in blood pressure
   □ Less energized
   □ Dependence on medication intake
   □ Decrease in oxygen intake
   □ Wrinkles
   □ Early death
   □ Others, please specify_____

8. **What do you think are the advantages of you smoking cigarettes?**
   _____

9. **What do you think are the disadvantages of you smoking cigarettes?**
   _____

10. Do you have any other feelings about you smoking cigarettes?

_____

E. Your experience and thoughts on quitting and quitting methods

1. I was nagged by someone to quit smoking.
□ True □ False
If true, who nagged you?
_____

2. I have gone to the doctor for symptoms related to my lungs.
□ True □ False □ Not related to my smoking

3. I have had a lung examination at the physician's office or hospital.
□ True □ False □ Not related to my smoking

4. I have tried to quit before.
□ True □ False
If true, how many times have you tried? _____
What methods did you try?
_____
What was the longest duration you were able to quit for?
_____
Why couldn't you quit?
_____

5. Where have you received or heard of smoking cessation methods?
(Choose all that are applicable to you)
□ I never heard about or received any information
□ Family or friends
□ Hospitals/clinics
□ Pharmacy
□ Media
□ Others, please specify_____

6. I have thought about cutting down my cigarette intake before.
□ True □ False □ Not sure
If true, what was your reason to cut down?
_____
If true, has your intake of cigarettes cut down now? □ Yes □ No

7. I have tried nicotine replacement therapy.
□ True □ False □ Not sure what nicotine is

If true, did it work? Why or why not?
_____
_____

8. **I have thought about (intention) quitting before.**
   □ True □ False □ Not sure
   If true, what was your reason for quitting?
   _____
   If false, what was the reason for not quitting?
   _____

9. **I have met difficulty in quitting before.**
   □ True □ False □ Not applicable
   If true, what was your difficulty?
   □ I enjoy smoking too much
   □ I don't think I have enough willpower
   □ I think I would put on weight
   □ I would be too stressed
   □ I think I am too addicted to cigarettes
   □ My partner smokes
   □ My best friend smoke
   □ I would miss smoking with friends
   □ I don't really want to stop
   □ I would be bored
   □ I would miss smoking breaks at work
   □ Others, please specify_____

10. **In your opinion, what are the withdrawal symptoms due to quitting?**
    _____
    □ I don't know what the withdrawal symptoms are.

11. **I would benefit more from smoking than suffering from withdrawal symptoms due to quitting.**
    □ True □ False □ Not sure
    If true, why is it?
    _____

12. **There are people that support me for quitting.**
    □ True □ False □ Not sure □ Not applicable
    If true, who supports you?
    _____
    If true, what kinds of support did they provide you?
    _____

13. **I would consider quitting in the future.**
    □ True □ False □ Not sure
    If true, what would be your reason for quitting in the future?
    _____
    If true, what immediate reward would you like to get?
    _____

14. I would quit smoking if people I spend time with quit also.
□ True □ False □ Not sure
If true, why?
_____

15. I will be able to quit whenever I want.
□ True □ False □ Not sure

16. If you were to quit, what would be the most influential motivation?
_____

17. What positive feelings would most help you in becoming a non-smoker? (Choose all that are applicable to you)
□ Confidence
□ Determination
□ Calm
□ Relaxation
□ Caring about myself
□ Caring about others
□ Others, please specify_____

18. Imagine that you are now a former smoker:
a) What could you do with the money you save?
_____
b) How would your medication be different, if you are currently taking medication?
_____
c) What would be your energy level?
_____
d) What would be the quality of your life?
_____
e) How would you be feeling physically as a non-smoker?
_____

F. Your relationship with others

1. **My smoking behaviour has changed my relationship with others. (Family, co-workers, classmates, and friends)**
□ True □ False □ Not sure
If true, how has it changed your relationship with others?
_____

2. **Which people, or organization that you know, would approve of you smoking cigarettes?**
_____

3. **Which people, or organization that you know, would disapprove of you smoking cigarettes?**

_____

4. **I would encourage others (Family, co-workers, classmates, and friends) to smoke.**
   □ True □ False □ Not sure
   If true, why would you encourage others to smoke?
   _____
   If false, why would you not encourage others to smoke?
   _____

5. **I would encourage others to quit.**
   □ True □ False □ Not sure
   If true, what do you think is the best model to encourage people in your age group to quit?
   _____

6. **I mind smoking in front of non-smokers.**
   □ True □ False □ Not sure
   If true, why would you not smoke in front of non-smokers?
   _____

7. **I mind smoking in front of young children.**
   □ True □ False □ Not sure
   If true, why would you not smoke in front of young children?
   _____

8. **I think second and third hand smoke is not as harmful as first hand smoke.**
   □ True □ False □ I don't know what third hand smoke is

G. Cultural and environmental influences for your desire to smoke or to quit

1. **Media such as visual warnings on cigarette packages has influenced me to quit smoking.**
   □ True □ False □ Not sure □ Not applicable

2. **Living in Canada has influenced my smoking habits or desire to quit.**
   □ True □ False □ Not sure
   If true, how has it influenced your smoking habits or desire to quit?
   _____

3. **The different social norms in Canada have influenced my smoking behaviour in comparison to my native country.**
   □ True □ False □ Not sure
   If true, how has it influenced your smoking behaviour in comparison to your native country?

   _____

4. **In your culture, smoking is a behaviour that one gender engages in more than other.**
   □ True □ False □ Not sure
   If true, which gender?
   □ Male □ Female

5. **In your culture, smoking is a behaviour that a certain career profession engages in more than other.**
   □ True □ False □ Not sure
   If true, which career profession?

   _____

6. **People do not accept the smoking habit in my culture.**
   □ True □ False □ Not sure
   If true, why do they not accept the smoking habit?

   _____

7. **Most people in my culture smoke.**
   □ True □ False □ Not sure

8. **What is your image of a smoker? Do you think it is a positive or negative image?**
   □ Positive image □ Negative image □ Not sure
   Why? Please explain.

   _____

9. **In your opinion, how can a smoker harm or benefit the society?**

   _____

10. **In your opinion, what would be a good enforcement to stop the younger generation from smoking?**

    _____

11. **In your opinion, what should be the role of mass media?**

    _____

12. **What do you know about a cigarette? What does it do to the human body?**

    _____

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding
		(*b*) Describe any methods used to examine subgroups and interactions
		(*c*) Explain how missing data were addressed
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
		(*e*) Describe any sensitivity analyses

Continued on next page

Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time
		Case-control study—Report numbers in each exposure category, or summary measures of exposure
		Cross-sectional study—Report numbers of outcome events or summary measures
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Assessing beliefs and risk perceptions on smoking and smoking cessation in immigrant Chinese adult smokers residing in Vancouver, Canada: a cross-sectional study

Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2014-006435.R2
Article Type:	Research
Date Submitted by the Author:	28-Dec-2014
Complete List of Authors:	FitzGerald, J Mark; University of British Columbia, Respiratory Medicine Division Poureslami, Iraj; University of British Columbia, Respiratory Medicine Division Shum, Jessica; University of British Columbia, Respiratory Medicine Division
Primary Subject Heading:	Smoking and tobacco
Secondary Subject Heading:	Smoking and tobacco
Keywords:	Change management < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Risk management < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

Title: Assessing beliefs and risk perceptions on smoking and smoking cessation in immigrant Chinese adult smokers residing in Vancouver, Canada: a cross-sectional study

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Keywords: smoking, Chinese communities, beliefs, risk perceptions, smoking cessation

Word count: 4724
Abstract: 299

What this paper adds:

1. Understanding the beliefs, perceptions, and practice of Chinese Mandarin and Cantonese communities about smoking and smoking cessation creates opportunities to tailor smoking cessation interventions according to the needs of these communities.
2. Previously, most studies have applied an identical risk perception model on smoking behavior assessments among young vs. old and male vs. female smokers. However, our study identified that risk perceptions about smoking and smoking consequences differ in the smoking population group based on their age and gender. Therefore, a different model of risk perception should be designed and applied considering the age and gender of participants.
3. Despite existing knowledge that Chinese communities are heterogeneous, our study found that smoking habits, perceptions, beliefs, and practices differ in Mandarin speaking compared to Cantonese speaking Chinese.

ABSTRACT

Objectives: We aimed to conduct culturally based participatory research to assess cultural and belief contexts for smoking behaviours within Mandarin and Cantonese communities. Outcome variables were smoking-related knowledge, smoking patterns, attitudes and beliefs, and perceived barriers and facilitators to successful cessation.

Design: A community-based approach was applied involving smokers, community key-informants, and professionals in study design and implementation. Initially, focus groups were conducted and findings were used to develop study instrument. Participants responded once to study questionnaire after informed consent.

Setting: Community based in the Greater Vancouver Area, Canada.

Participants: 16 Chinese smokers participated in focus groups and subsequently, 167 current Chinese immigrant (137 males and 30 females) smokers from Mandarin and Cantonese communities, recruited with the help of community agencies and collaborating physicians, were enrolled in a cross-sectional study.

Results: We found that a majority believed smoking was harmful on their health. Younger smokers (<35 years of age) did not mind smoking in front of young children compared to older smokers (≥35 years of age) ($p<0.001$). People with high school or lower levels of education believed that they would benefit more from smoking than suffering from withdrawal symptoms compared to better educated smokers ($p<0.05$). Mandarin smokers were significantly more likely to encourage others to quit than Cantonese smokers ($p<0.05$). Many indicated not receiving adequate support from care providers and lack of access to culturally and linguistically appropriate cessation programs impacted on their ability to quit smoking.

Conclusions: Our study highlighted the importance of tobacco beliefs and perceptions among Mandarin and Cantonese speaking immigrants with limited access to healthcare information and for younger smokers whose attention to health consequences of smoking may be limited as well. Study participants were generally aware of the health risks and were willing to quit. Access to appropriate cessation programs would fulfill their willingness.

Article Summary

Strengths and Limitations of this study

- We undertook a community-based participatory approach, with community key-informants and healthcare providers being heavily involved in all aspects of the study such as design, instrument development, implementation, community outreach, and dissemination. These key-stakeholders are important allies in developing culturally and linguistically appropriate smoking cessation interventions.

- Our study provides evidence that attitudes and beliefs towards cigarette smoking differ between groups based on language, age, and gender. The differences with regards to tobacco smoking appear to be related to attitudes or knowledge.

- The results build a window of opportunity to promote tailored cessation interventions incorporating cultural beliefs, perceptions, and practices for Chinese immigrant communities.

- We used a convenience sampling method, which may not reflect the actual smoking prevalence and patterns of Chinese Mandarin and Cantonese immigrants in the Greater Vancouver Area.

- All responses were by self-report and validation of smoking behaviours or reasons to quit or continue smoking was not possible with a cross-sectional design.

BACKGROUND

Tobacco use remains the leading cause of preventable morbidity and mortality in the world. [1-3] In Canada, its use has been declining slower than expected in spite of increased taxation on cigarettes and more stringent tobacco policies put into place. [3] In order to accomplish the goal of reducing the rate of smokers among Canadian adults, smoking has to be addressed among all sub-populations, especially those with a higher smoking prevalence than the general population. Global studies have shown that those who stop smoking greatly reduce their risk of developing cardio pulmonary disease and that in general the longer the period of cessation, the greater is the reduction in risk.[4,5] Minority and immigrant communities in Canada may be at greater risk of smoking-related illnesses.[6] Reasons include lack of knowledge and awareness about the link between smoking and lung disease;[7] limited access to smoking cessation programs due to cultural, language, and systemic barriers; [8] and smoking behaviours.[9,10] In addition, many immigrants from low-and-middle-income countries have had prior significant exposure to biomass and bio-fuel as well as smoking which further increases their risk.[11] This is particularly true among immigrants from Mandarin and Cantonese speaking communities (the largest immigrant minority groups living in the BC and Canada)[12,13] where smoking rates remains high.[9,10] Such extensive tobacco use among immigrants may be due to the fact that smoking is a largely integrated into the Chinese male culture.[14] Nearly two of every three adult men in China are smokers.[15,16] It is, therefore, empirically relevant to try to understand this immigrant group's smoking knowledge, behaviours, and habits and develop culturally appropriate educational and counselling services to improve tobacco prevention attempts and promote cessation. Maximizing tobacco control for newcomers requires a special understanding of smoking pattern and beliefs of new immigrant populations. The objectives of this study were:

1) to explore smoking use patterns, smoking-related knowledge, beliefs and attitudes, and perceived barriers and facilitators to smoking cessation among Mandarin and Cantonese speaking communities living in the Greater Vancouver Area (GVA), and 2) to assess the effectiveness of socio-cultural and environmental factors which influenced the onset of smoking and smoking habits (continued smoking) among the study participants. We were also interested to identify differences in above mentioned variables between males and females, Mandarin and Cantonese, and between age and education level groups. The identification of tobacco use and other related patterns may help facilitate the development of community-based culturally appropriate interventions targeting tobacco use and would be helpful for future research for Chinese immigrants in future research.

METHODS

Project Design

This multi-stage cross-sectional study employed both qualitative and quantitative components within an over-arching community-based participatory framework. The first stage comprised the development and testing of a measurement instrument for the survey study. The second stage was a quantitative study assessing the outcome variables including smokers' awareness of smoking and its cessation, attitudes and beliefs about smoking harms and benefits, and cultural norms of smoking in their community.

The study was conducted between January 2013 and June 2014, allowing for participation and collaboration between members of the Mandarin and Cantonese communities and other key-stakeholders such as professionals and researchers in the research process.[17-19] Connections and networking were built with community key-informants and community agencies (e.g.,

SUCCESS (United Chinese Community Enrichment Services Society), Vancouver Coastal Health community organizations, etc.) supporting active involvement and contribution in study design, development and implementation. Community collaborators provided assistance with recruitment of Mandarin and Cantonese smokers as well as input and suggestions on the development of focus group and interview questions. They recruited two males and two females who were members of the community, fluent in Mandarin and Cantonese, to work in alliance with 4 female bilingual Chinese research assistants. All community facilitators and research assistants received appropriate training prior the study. The training included approaches on how to best recruit study participants, understanding of the project's goals and objectives, how to conduct focus groups and individual interviews with smokers from their own communities, and ideas on how the team could work together effectively in collection of the best information possible on Chinese smokers' knowledge, beliefs and attitudes about harms and benefits of smoking, and socio-cultural and environmental factors affecting smoking and smoking cessation. The community researchers transcribed and translated focus group and interview discussions and we applied the collected information in the development of a study measurement tool and conceptual framework. In addition, findings from our previous qualitative smoking study (conducted with smokers from the same communities) were used in the development of the study design and measurement tool. [20]

Ethics

Ethics approval was obtained for this study from the University of British Columbia Research Ethics Board. All participants signed a written consent form in their preferred written language (Chinese Simplified, Chinese Traditional, or English) translated by the bilingual researchers who

clearly explained the study rationale, goals and objectives, and how their involvement would be like prior to the study.

Study Measurement Tool

We initially developed the study measurement tool by determining whether any English or Chinese language questionnaires were currently in use to assess attitudes and beliefs re smoking in the Chinese community. A literature search and an informal survey of immigrant-serving community agencies did not find any such instrument that has been developed in Canadian Chinese context. Given the absence of a validated assessment questionnaire in the target languages for Canadian Chinese, a new measurement tool was developed over a 4-month period. Development of the study measurement tool began with information collected from initial focus group session participants (n=14) and individual interviews (n=2), review of relevant literature that addressed knowledge of, attitudes to, and behaviors in relation to tobacco use, and also our previous smoking-related qualitative studies with Mandarin and Cantonese current and ex-smokers.[20,21] Moreover, a professional measurement tool developer (a PhD in the socio-psychology research and evaluation field from University of British Columbia) with expertise in developing mixed open-ended and closed-format questionnaires was involved in the face and content validation and finalization of the measurement tool. The team and the measurement developer have the expertise to identify and differentiate between beliefs, attitudes and perceptions, as well as the socio-cultural and environmental aspects of smoking and its cessation. Each set of variables were identified and separated by heading-title in the questionnaire. The internal consistency of the data was checked by test-retesting reliability, where the study questionnaire was administered to 5 smokers and tested again a week after and the results of the

initial assessment and retest were compared. Also, more advanced process was applied by calculating Cronbach Alpha and a coefficient was (.89).

The final questionnaire covered current smoking knowledge, beliefs and attitudes about smoking and its cessation, and socio-cultural and environmental factors that promote or prevent smoking onset and continuation. The tool included 70 questions covering demographics and concepts on smoking onset, smoking characteristics, perceptions, experience in quitting, social relationships, and cultural and environmental influences and were in the format of yes/no, true/false, multiple choice, and open-ended questions (The study measurement tool can be found as Supplementary File 1). The questionnaire was also reviewed by a number of key-informants and health practitioners (n=9) from the target communities who provided feedback and comments re the questionnaire and checked its face and content validity. The bilingual Chinese research assistants worked collaboratively together translating the study measurement tool to Chinese Simplified and Traditional formats. The translations were reviewed by secondary (back-up) translators from the target communities who were introduced by the collaborating immigrant agencies for accuracy and correctness. The tool was then reviewed by the community key-informants and professionals for further crosschecking. Finally we pilot tested the questionnaire with selected smokers and ex-smokers from the Chinese communities (n=5) to confirm validation of the measurement tool and for cultural relevance and clarification, as well as translation purposes including understandability, acceptability, and applicability. Suggestions were integrated into a revised version.

Participant Recruitment

Eligibility criteria for participants were adults (≥21 years old) who were current smokers (defined by having smoked at least 5 cigarettes per day during the past 30 days), Chinese descent

(either Mandarin or Cantonese speaking) and be immigrants to Canada or children of Chinese immigrants. Participants were recruited from within the communities using a variety of outreach methods such as posting flyers and referral applied from previous studies and through network with community agency collaborators. [17,22,23] In total, 16 Chinese smokers participated in initial focus groups and interviews and subsequently 167 (137 males and 30 females) were interviewed, from which 93 were Mandarin speaking and 73 were Cantonese speaking. In terms of age category, 90 participants were <35 years of age and 76 were ≥35 years of age. Our intended sample size was 150 Chinese smokers aiming to identify mean differences in knowledge, beliefs, attitudes, and practices related to smoking and experience in smoking cessation between age, gender, education, and ethnicity groups.

Data Collection

Data was collected through administration of study questionnaire via individual interviews. Interview sessions were conducted at places and times of convenience for participants: e.g., participants' homes, community centers, and our research centre. Printed consent forms were explained and signed preceding the interview. Modest honoraria were paid to cover time, travel, and parking expenses. Community research assistants conducted the interviews in Mandarin or Cantonese and the participants filled in a self reported Chinese Simplified and Chinese Traditional questionnaire while the research assistants were available to answer any questions that they would have had, or ask the responders to elaborate the given information in the open-ended questions. Each interview was conducted by two interviewers: one with an academic perspective (a research assistant), and one from community who acted as a facilitator. The two interviewers took notes during interviews including verbal and non-verbal communication by the

participants and reviewed their notes at the end of each interview aiming to improve the accuracy of the information, capturing smokers' smoking beliefs, perceptions, and also their comments about cultural images of smoking and its cessation. In some instances (e.g., old smokers or low literate people), the research assistants assisted by administered the study questionnaire verbally while taking notes throughout the entire interview.

Data analysis

SPSS v20 (2012) was used for all statistical tests. Descriptive statistical tests were used and the results were presented in tables and graphs. Relevant inferential statistics were calculated for the entire sample and stratified according to age, gender, level of education, language of origin, and smoking practices. The data were not normally distributed, and non-parametric tests were therefore used; e.g., chi-square test for nominal data, Mann–Whitney test for ordinal data with two groups, and Kruskal–Wallis test for more than two groups with ordinal data. Binary logistic regression was used to determine the effects of demographics on the outcome variables. All data were examined regarding distributions and trends in the data, and the level of significance was set at the $P< 0.05$ level.

Sample Size Calculation

With a total sample size of 167 subjects for the cross-sectional study, we estimated that we could identify mean differences between different age, gender, language and education level groups and with an effect size of 0.45 with 80% statistical power and a two-sided significance level of $P<0.05$.

FINDINGS

Between May 2013 and April 2014, we recruited and enrolled 167 current smokers. **Table 1** describes characteristics of the study sample for both Mandarin (55.7%, n=93) and Cantonese (44.3%, n=74). The participants included predominately males (82%, n=137). The median age was 35 and we used this cut off point for younger/older groups, as used previously from our qualitative studies conducted with Chinese community smokers, [20] allowing us to identify these differences in perspective.

Table 1. Participant characteristics

	N	%
Gender		
Male	137	82
Female	30	18
Language		
Mandarin	93	55.7
Cantonese	74	44.3
Age		
<35	105	63
≥35	62	37
Education Level		
High school and below	87	52
University degree and above	80	48

Smoking-related knowledge and reasons for starting smoking

Knowledge of smoking consequences is an important factor to consider when designing smoking cessation programs or implementing health promotion interventions, especially to prevent onset of smoking among young people.[2,8] Almost an equal number (23%) of Mandarin and Cantonese smokers indicated that they were not aware of smoking side effects when they started smoking. Table 2 provides the breakdown of smoking-related knowledge by gender, age,

language, and education level. As shown on table 2, knowledge about side effects of smoking was mixed among the participants of this study, with no statistically significant differences observed between the language, gender, age, and education groups in this regard.

Table 2. *'At the time you started smoking, did you know the side effects of smoking?'*

	Yes		**No**	
	N	%	N	%
Gender				
Male	105	77	32	23
Female	22	73	8	27
Age				
<35	90	86	15	14
≥35	38	62	24	39
Language				
Mandarin	72	77	21	23
Cantonese	56	76	18	24
Education Level				
High school under	61	70	26	30
University degree and above	67	84	13	16

We also aimed to determine the *socio-cultural and environmental* factors which influenced the onset of smoking among the study participants.[24] In this study, we defined social factors as smoking during the gatherings, being offered cigarettes by peers (a cultural norm in this community), smoking to feel being accepted, etc. On average for 45% (n=75) of participants, 'social factors' were a trigger to start smoking, while it was the number one trigger for male smokers and smokers with who were 35 years or over with an equal rate of 53%. Although 50% of females mentioned 'emotional factors' as a contributor to starting smoking, only 22% (on average) of males cited these as factors for them. Likewise, 'environmental factors' were considered by only 20% of participants as a factor in starting to smoke, while 50% of Mandarin smokers mentioned environmental factors as a major trigger for them to start smoking. A smoking friend was mentioned by most of participants (66.3%) as someone in their social

network when starting smoking, compared to classmate (48.5%), family (29%), and work-related colleagues (28%). An interesting observation was that 50% of female smokers in the study identified having a family member who smoked when they first started smoking.

Smoking beliefs, perceptions, and attitudes

Multiple factors affected participants to become regular smokers. For instance, for around 62% of smokers (between 100 to 104), the main reasons to smoke regularly were the beliefs that smoking '*relaxed them*' and '*helped them feel less stress*' as well as when '*they were having a break*' or when '*they were bored*'. The breakdown of the triggers to smoke based on smokers' gender, age, language, and education groups are shown on Table 3, with no statistically significant differences observed between the male and female smokers, and different age, language, and education groups in this regard.

Table 3. '*Reasons for becoming regular smokers*'

	Relaxation		**Less stress**		**Having break**		**Being bored**	
	N	%	N	%	N	%	N	%
Gender								
Female	22	73	14	47	17	57	16	53
Male	82	60	81	59	83	61	84	61
Age								
<35	73	70	62	59	69	66	68	65
≥35	31	51	33	53	31	50	34	55
Language								
Mandarin	50	54	57	61	53	57	54	58
Cantonese	40	54	38	51	47	64	48	65
Education Level								
High school under	51	59	45	52	52	60	55	63
University degree and above	53	66	50	62	48	60	47	59

We were also interested to identify the *social and cultural* aspects of smoking habits (continued smoking). When asked the question of whether '*most people in my culture smoke*' to assess participants' perceived commonality of smoking in their communities, there was a significant difference between male and female participants ($\chi^2 = 5.424$, df = 1, $P<0.05$) ; more males (n=46, 34%) believed that smoking was a cultural habit in their community than females (n=17, 57%) did. Similar findings were observed between Mandarin and Cantonese ($\chi^2 = 5.182$, df = 1, $P<0.05$); more Mandarin (n=65) answered yes to the question than Cantonese smokers (n=39). Many participants (61%) indicated they normally smoked when they were 'with friends'; with the highest proportion reported among the <35 years old participants (82%) and male participants (70%). Remarkably, 70% of the <35 years old participants indicated they smoked when they had alcohol. The rate was 60% among female participants, 57% among males, and 57% among both Mandarin and Cantonese smokers. In terms of attitudes towards exposing others to second or third-hand smoke, we asked participants *'do you mind smoking in front of non-smokers'* ? Younger smokers (<35 years of age) were more likely (n=72) to mention that they did not mind smoking in front of non-smokers compared to older smokers (≥35 years of age) (n=52). The mean difference was significant ($\chi^2 = 7.133$, df = 1, $P<0.01$). Also, when the participants were asked whether they minded smoking in front of young children, similarly, more younger smokers (<35 years of age) (n=97) mentioned that they *'did not mind smoking in front of young children'* than the older smokers (n=55) and the difference was significant ($\chi^2 = 5.123$, df = 1, $P<0.05$). We also aimed to assess smokers' viewpoints regarding second hand smoking and its harm. We asked whether *'second and third hand smoke was as harmful as first hand smoke'*, again, relatively more males said 'no' when compared to female smokers (n= 40 and n= 10, respectively) and the difference was significant ($\chi^2 = 4.736$, df = 1, $P<0.05$). Finally, we

assessed smokers' beliefs about their own smoking pattern with a self-reported question of '*I have a smoking routine/pattern*'. No significant differences were identified between gender, age, and language groups. However, we found that more people with high school education or less mentioned they didn't have a routine/pattern (n=30) compared to people with higher education (n=12) and the difference was significant (χ^2 = 7.156, df = 1, P<0.01).

Perceptions about smoking

We assessed smokers' perceived *enjoyable feeling* that they may have due to smoking by asking whether '*there is a different feeling when comparing times I smoke and don't smoke*' and found a statistically significant difference between male and female participants (χ^2 = 4.237; df = 1, P<0.05). Significantly more males (n=47) mentioned experiencing a different feeling when they smoked compared to not smoking than female smokers (n=15). In addition, younger smokers (<35 years of age) as well claimed to have a different feeling when comparing times smoking and not smoking (n=46) compared to older smokers (n=16), and the differences were statistically significant (χ^2 = 3.889, df = 1, P<0.05). Likewise, more Mandarin smokers (n=41) than Cantonese smokers (n=20) reported having a different feeling when they smoke compared to when they were not smoking (χ^2 = 5.188, df = 1, P<0.05). For this outcome there was no significant differences between highly educated (college/university and above) and lower educated (high school or lower).

Additionally, we assessed smokers' perceptions about *helpfulness* of smoking to alleviate their anxiety and stress. We noticed that 77% of female smokers, 69% of younger smokers (aged 34 years or younger), and 52% of older smokers (age 35 or older) smoked to reduce their sense of

helpfulness. Male smokers perceived that smoking helped them to minimize the feeling of being bored (80%) and made them more connected to their group of friends (69%).

Smoking cessation

We aimed to identify willingness to quit smoking and *perceived barriers and facilitators* to cessation. The majority of participants, in particular young male and female smokers, mentioned their desire to quit and attempted to several times, before giving up and smoking again. A few people mentioned using medications or seeking professional advice to quit smoking but mainly relied on their own willpower to quit. Also, older participants indicated trying to quit due to health related issues such as heart disease or cancer. We were also interested to find out whether participants were under pressure by someone close to them to quit smoking. When asked *'I was nagged by someone to quit smoking'*, no statistically significant differences were identified in different gender, age, language, and education groups. However, when we asked whether they *'would encourage others to quit',* more Mandarin speaking smokers answered yes to (n=45) than Cantonese speaking smokers (n=23) ($\chi^2 = 5.172$, df = 1, $P<0.05$). No significant differences were identified based on age, gender, and level of education. In addition, most participants (87%) said "No" to the question: "*Would you encourage non-smokers to smoke?"* Furthermore, we also asked whether living in a smoking restricted society like Canada would encourage smokers to quit or cut down on their smoking. More Mandarin speaking smokers (n=56, 60%) mentioned that '*living in Canada influenced their smoking habits or desire to quit*', compared to Cantonese speaking smokers (n=30, 41%) ($\chi^2 = 6.424$, df = 1, P =0.011).

More people with high school or lower education (n=34) agreed with the statement *'I would benefit more from smoking than suffering from withdrawal symptoms due to quitting'*, compared to the more educated smokers (n=12) ($\chi^2 = 6.102$, df = 1, $P<0.05$). When asked whether they *'tried nicotine replacement therapy to quit smoking'*, more Mandarin speaking smokers (n=32) mentioned that they had tried this aid to quit smoking compared to Cantonese speaking smokers (n=12 ($\chi^2 = 7.275$, df = 1, $P = 0.007$).

In general, participants identified language and literacy issues as barriers to accessing smoking cessation information as well as lack of useful information in a social media format. For instance, older participants mentioned that they had limited exposure to public sources of information on cessation services that were developed in their native language. A small minority of these smokers had received advice and information about the health issues attributed to smoking from their physicians. Younger smokers mentioned the lack of disseminating smoking cessation messages through social media such as text messaging to promote quitting services in their native language.

Our synthesis of the interview data identified seven barriers to the participants' cessation which are summarized in Table 4.

Table 4. *Barriers to Smoking Cessation identified by the participants*

Barriers
(a) the problems of managing their lives in a highly stressful environment
(b) their isolation and the limited support systems in their community or work/school environments

(c) the availability of smoking as a social-connection to their peers and limited resources for pleasure

(d) perceived minimal health risks of smoking, (e) the commonality of smoking in their community

(e) the commonality of smoking in their community

(f) the scarce or non-existent information about how to stop smoking

(g) the belief that all they can quit on their own whenever they decide to

DISCUSSION

The main goal of this study was to gain insights on the beliefs and perceptions associated with smoking behaviors and smoking cessation among Chinese Cantonese and Mandarin speaking current smokers, taking into account culturally specific knowledge and practices. The results have implications for the development of appropriate smoking cessation programs and educational interventions to prevent and control tobacco-related health issues among the target communities. Such interventions may have policy implications in health promotion programs to prevent smoking onset among younger population groups in the immigrant communities.

Several participants in this study indicated their desire to quit and attempted to do so many times, many of whom did it relying on their own willpower. Only a few, mainly among older smokers, tried to quit because of health related issues. They mentioned that a better communication with primary care providers and ease of access to culturally and linguistically appropriate smoking cessation resources would promote smoking cessation in their communities. Similar findings have been reported in studies done in other countries as well as among many immigrant

communities in Canada who tried to quit smoking.[25-28] In addition to elucidating these barriers to smoking cessation and despite continued smoking, participants showed being knowledgeable in health related and other negative aspects of smoking as on average, 70% of the participants indicated they were aware of the health consequences of smoking. This finding has been confirmed in other studies. [28] In our study, we found that higher education, better knowledge, and smoking regulations contributed to having a greater intent to quit smoking. For instance, we found that most participants were not ignorant of the dangers of smoking, with the vast majority recognizing that smoking posed risks to their own health and the health of those around them. This knowledge is much higher than that of Chinese smokers who were previously surveyed in China, where only 36% of participants believed smoking can cause lung cancer and only 4% were aware of the relationship of smoking to heart disease.[29] In addition, many of the smokers in our study already accepted limitations on the use of cigarettes in Canada, and many, mostly younger smokers, supported restrictions on indoor smoking and also mentioned not smoking at home or where children are present. This could be attributed to the smoking restriction rules as well as the strong anti-smoking educational campaigns in Canada. For example, since 2001, Health Canada has spent more than $480 million for a 5-year program to encourage tobacco cessation programs for all Canadians.[30] These regulations might be important to reduce the risk of second-hand and third-hand smoking and related health issues among young children and other non-smoker family members.

In terms of reasons to continue smoking, perceived advantages of smoking such as ‘smoking does make me feel more comfortable’ and ‘smoking helps me to be stress-free when I have problems’ appeared to be more important factors to promote smoking continuation among our

study participants than perceived disadvantages around 'health issues' and 'money' which shown to be strong motivators in quitting smoking in some studies. Some studies found that smokers may not be aware of the diseases caused by smoking and therefore, they may perceive themselves less susceptible to the risks of smoking.[30-34] For instance, health consequences and costs of smoking were not perceived as strong motivators to quit smoking among young participants. They reported the stimulating and anti-stress effects of smoking (smoking may actually made them feel happier, more alert, etc), the feelings that may reinforce their tobacco use and have associated these feelings with being around other smokers. In older smokers, most of which showed low self-efficacy on being able to quit, the rationale for continuing to smoke was different. For instance, for over 16% of smokers in this age group the disadvantages of quitting were perceived to outweigh its advantages. Some reasons mentioned by older participants were: the addiction of nicotine, being too late to quit, and that their body needed nicotine. In other studies among mainstream populations, self-efficacy expectations and advantages of smoking cessation appeared to be the most important associates of quitting smoking among older smokers.[35,36] Therefore, this issue should be revisited in future studies with ethno-cultural communities. The results of this study suggest that understanding health beliefs and perceptions around smoking and improving self-efficacy are useful tools in promoting smoking cessation among smokers in Chinese immigrant communities.

Limitations

Some limitations need to be considered. First, this study used a convenience sample, so it may not reflect the actual smoking prevalence and patterns among Mandarin and Cantonese

immigrants in the GVA. We could not explore the effect of acculturation on smoking habits and patterns. There was no previous data on smoking patterns among Chinese immigrants in Canada, and attempting a community based assessment would have been inherently difficult for an exploratory study. Therefore the findings of this study cannot be generalized to larger Mandarin and Cantonese speaking communities residing in the GVA. The goal was to explore the links to smoking cessation among Mandarin and Cantonese populations in order to gain insight into the need to adapt smoking cessation programs in these groups. In future research, a longitudinal design in which our results can be tested is recommended. A second limitation is the fact that all responses were by self-report and validation of smoking behaviors or reasons to quit or continue smoking was not possible with a cross-sectional design. A third limitation is the absence of a native mainstream (English-speaking) reference group, due to a lack of resources. This could be a problem for interpreting the additional 'culturally specific' beliefs, because these were not elicited from mainstream population group. Nevertheless, to assess whether the beliefs we identified in this study are really 'culturally specific', a cohort study with all significant beliefs for main ethnic groups in the GVA, including mainstream population, might be useful.

CONCLUSIONS

The results of our study suggest that an effective anti-smoking campaign in the Chinese community should go beyond traditional English language efforts, utilize Chinese resources, and build upon existing cultural attitudes (such as the belief that smoking is inappropriate for young people) and knowledge (such as health risks) about smoking. Particular attention should be paid to differences between female and male smokers and between younger and older smokers related to their knowledge, beliefs and attitudes about smoking, and perceived barriers and facilitators to

smoking cessation. We also identified different beliefs and perceptions about the harms and benefits of smoking, based on language, age, and gender group. The findings indicate the importance of addressing risk perceptions about the immediate and long-term consequences of smoking. Therefore, future interventions can prove the applicability of a risk perception model on smoking cessation among Mandarin and Cantonese speaking smokers. Despite finding significant differences between the genders, educational level, ethnicity and age groups in our study, we believe a larger sample size is needed to address this issue. The findings build a window of opportunity to promote tailored cessation interventions incorporating cultural beliefs, perceptions, and practices for Chinese immigrant communities.

Practical Implications

Our study identified the health beliefs and perceptions about smoking and its cessation among Mandarin and Cantonese immigrants that could be considered by healthcare decision makers to develop health promotion programs preventing smoking onset among younger population groups in Chinese community. Interventions should take account of the specific profiles that Mandarin and Cantonese immigrants in terms of knowledge, attitudes, beliefs and perceptions on their smoking habits and patterns. Given the results of this study, we plan to conduct further research to assess the applicability of a risk perception model to the smoking behavior of routine smokers in the target immigrant communities. The model has been shown effective in terms of modifying risk-taking behaviors, promoting positive perceptions, and improving self-efficacy that have been applied for changing smoking habits/behavior .[37-39]

ACKNOWLEDGEMENTS

We would like to thank the community members, facilitators, ethno-cultural serving agencies (SUCCESS), and key-informants from the Mandarin and Cantonese communities in the Greater Vancouver Area who helped us with all aspects of this research.

FUNDING

This project was funded by a community grant from The Vancouver Foundation, Vancouver, Canada.

COMPETING INTERESTS

We declare that there is no conflict of interest in terms of ownership of shares, consultancy, speaker's honoraria or research grants from commercial companies or professional or governmental organizations with an interest in the topic of the paper (the ICMJE form for Disclosure of Potential Conflicts of Interest from the Corresponding Author is also attached to this submission).

CONTRIBUTOR STATEMENT

JMF and IP planned the conception and study design. IP prepared the proposal draft to the funding agency and applied for the ethics approval. JS coordinated the study, recruited participants, and facilitated the community involvement. IP analyzed and interpreted the study data. IP and JS drafted the manuscript for important intellectual content.

DATA SHARING STATEMENT

No additional data available.

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Title: Assessing beliefs and risk perceptions on smoking and smoking cessation in immigrant Chinese adult smokers residing in Vancouver, Canada: a cross-sectional study

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Keywords: smoking, Chinese communities, beliefs, risk perceptions, smoking cessation

Word count: 4724
Abstract: 299

What this paper adds:

1. Understanding the beliefs, perceptions, and practice of Chinese Mandarin and Cantonese communities about smoking and smoking cessation creates opportunities to tailor smoking cessation interventions according to the needs of these communities.
2. Previously, most studies have applied an identical risk perception model on smoking behavior assessments among young vs. old and male vs. female smokers. However, our study identified that risk perceptions about smoking and smoking consequences differ in the smoking population group based on their age and gender. Therefore, a different model of risk perception should be designed and applied considering the age and gender of participants.
3. Despite existing knowledge that Chinese communities are heterogeneous, our study found that smoking habits, perceptions, beliefs, and practices differ in Mandarin speaking compared to Cantonese speaking Chinese.

ABSTRACT

Objectives: We aimed to conduct culturally based participatory research to assess cultural and belief contexts for smoking behaviours within Mandarin and Cantonese communities. Outcome variables were smoking-related knowledge, smoking patterns, attitudes and beliefs, and perceived barriers and facilitators to successful cessation.

Design: A community-based approach was applied involving smokers, community key-informants, and professionals in study design and implementation. Initially, focus groups were conducted and findings were used to develop study instrument. Participants responded once to study questionnaire after informed consent.

Setting: Community based in the Greater Vancouver Area, Canada.

Participants: 16 Chinese smokers participated in focus groups and subsequently, 167 current Chinese immigrant (137 males and 30 females) smokers from Mandarin and Cantonese communities, recruited with the help of community agencies and collaborating physicians, were enrolled in a cross-sectional study.

Results: We found that a majority believed smoking was harmful on their health. Younger smokers (<35 years of age) did not mind smoking in front of young children compared to older smokers (≥35 years of age) ($p<0.001$). People with high school or lower levels of education believed that they would benefit more from smoking than suffering from withdrawal symptoms compared to better educated smokers ($p<0.05$). Mandarin smokers were significantly more likely to encourage others to quit than Cantonese smokers ($p<0.05$). Many indicated not receiving adequate support from care providers and lack of access to culturally and linguistically appropriate cessation programs impacted on their ability to quit smoking.

Conclusions: Our study highlighted the importance of tobacco beliefs and perceptions among Mandarin and Cantonese speaking immigrants with limited access to healthcare information and for younger smokers whose attention to health consequences of smoking may be limited as well. Study participants were generally aware of the health risks and were willing to quit. Access to appropriate cessation programs would fulfill their willingness.

Article Summary

Strengths and Limitations of this study

- We undertook a community-based participatory approach, with community key-informants and healthcare providers being heavily involved in all aspects of the study such as design, instrument development, implementation, community outreach, and dissemination. These key-stakeholders are important allies in developing culturally and linguistically appropriate smoking cessation interventions.

- Our study provides evidence that attitudes and beliefs towards cigarette smoking differ between groups based on language, age, and gender. The differences with regards to tobacco smoking appear to be related to attitudes or knowledge.

- The results build a window of opportunity to promote tailored cessation interventions incorporating cultural beliefs, perceptions, and practices for Chinese immigrant communities.

- We used a convenience sampling method, which may not reflect the actual smoking prevalence and patterns of Chinese Mandarin and Cantonese immigrants in the Greater Vancouver Area.

- All responses were by self-report and validation of smoking behaviours or reasons to quit or continue smoking was not possible with a cross-sectional design.

BACKGROUND

Tobacco use remains the leading cause of preventable morbidity and mortality in the world. [1-3] In Canada, its use has been declining slower than expected in spite of increased taxation on cigarettes and more stringent tobacco policies put into place. [3] In order to accomplish the goal of reducing the rate of smokers among Canadian adults, smoking has to be addressed among all sub-populations, especially those with a higher smoking prevalence than the general population. Global studies have shown that those who stop smoking greatly reduce their risk of developing cardio pulmonary disease and that in general the longer the period of cessation, the greater is the reduction in risk.[4,5] Minority and immigrant communities in Canada may be at greater risk of smoking-related illnesses.[6] Reasons include lack of knowledge and awareness about the link between smoking and lung disease;[7] limited access to smoking cessation programs due to cultural, language, and systemic barriers; [8] and smoking behaviours.[9,10] In addition, many immigrants from low-and-middle-income countries have had prior significant exposure to biomass and bio-fuel as well as smoking which further increases their risk.[11] This is particularly true among immigrants from Mandarin and Cantonese speaking communities (the largest immigrant minority groups living in the BC and Canada)[12,13] where smoking rates remains high.[9,10] Such extensive tobacco use among immigrants may be due to the fact that smoking is a largely integrated into the Chinese male culture.[14] Nearly two of every three adult men in China are smokers.[15,16] It is, therefore, empirically relevant to try to understand this immigrant group's smoking knowledge, behaviours, and habits and develop culturally appropriate educational and counselling services to improve tobacco prevention attempts and promote cessation. Maximizing tobacco control for newcomers requires a special understanding of smoking pattern and beliefs of new immigrant populations. The objectives of this study were:

1) to explore smoking use patterns, smoking-related knowledge, beliefs and attitudes, and perceived barriers and facilitators to smoking cessation among Mandarin and Cantonese speaking communities living in the Greater Vancouver Area (GVA), and 2) to assess the effectiveness of socio-cultural and environmental factors which influenced the onset of smoking and smoking habits (continued smoking) among the study participants. We were also interested to identify differences in above mentioned variables between males and females, Mandarin and Cantonese, and between age and education level groups. The identification of tobacco use and other related patterns may help facilitate the development of community-based culturally appropriate interventions targeting tobacco use and would be helpful for future research for Chinese immigrants in future research.

METHODS

Project Design

This multi-stage cross-sectional study employed both qualitative and quantitative components within an over-arching community-based participatory framework. The first stage comprised the development and testing of a measurement instrument for the survey study. The second stage was a quantitative study assessing the outcome variables including smokers' awareness of smoking and its cessation, attitudes and beliefs about smoking harms and benefits, and cultural norms of smoking in their community.

The study was conducted between January 2013 and June 2014, allowing for participation and collaboration between members of the Mandarin and Cantonese communities and other key-stakeholders such as professionals and researchers in the research process.[17-19] Connections and networking were built with community key-informants and community agencies (e.g.,

SUCCESS (United Chinese Community Enrichment Services Society), Vancouver Coastal Health community organizations, etc.) supporting active involvement and contribution in study design, development and implementation. Community collaborators provided assistance with recruitment of Mandarin and Cantonese smokers as well as input and suggestions on the development of focus group and interview questions. They recruited two males and two females who were members of the community, fluent in Mandarin and Cantonese, to work in alliance with 4 female bilingual Chinese research assistants. All community facilitators and research assistants received appropriate training prior the study. The training included approaches on how to best recruit study participants, understanding of the project's goals and objectives, how to conduct focus groups and individual interviews with smokers from their own communities, and ideas on how the team could work together effectively in collection of the best information possible on Chinese smokers' knowledge, beliefs and attitudes about harms and benefits of smoking, and socio-cultural and environmental factors affecting smoking and smoking cessation. The community researchers transcribed and translated focus group and interview discussions and we applied the collected information in the development of a study measurement tool and conceptual framework. In addition, findings from our previous qualitative smoking study (conducted with smokers from the same communities) were used in the development of the study design and measurement tool. [20]

Ethics

Ethics approval was obtained for this study from the University of British Columbia Research Ethics Board. All participants signed a written consent form in their preferred written language (Chinese Simplified, Chinese Traditional, or English) translated by the bilingual researchers who

clearly explained the study rationale, goals and objectives, and how their involvement would be like prior to the study.

Study Measurement Tool

We initially developed the study measurement tool by determining whether any English or Chinese language questionnaires were currently in use to assess attitudes and beliefs re smoking in the Chinese community. A literature search and an informal survey of immigrant-serving community agencies did not find any such instrument that has been developed in Canadian Chinese context. Given the absence of a validated assessment questionnaire in the target languages for Canadian Chinese, a new measurement tool was developed over a 4-month period. Development of the study measurement tool began with information collected from initial focus group session participants (n=14) and individual interviews (n=2), review of relevant literature that addressed knowledge of, attitudes to, and behaviors in relation to tobacco use, and also our previous smoking-related qualitative studies with Mandarin and Cantonese current and ex-smokers.[20,21] Moreover, a professional measurement tool developer (a PhD in the socio-psychology research and evaluation field from University of British Columbia) with expertise in developing mixed open-ended and closed-format questionnaires was involved in the face and content validation and finalization of the measurement tool. The team and the measurement developer have the expertise to identify and differentiate between beliefs, attitudes and perceptions, as well as the socio-cultural and environmental aspects of smoking and its cessation. Each set of variables were identified and separated by heading-title in the questionnaire. The internal consistency of the data was checked by test-retesting reliability, where the study questionnaire was administered to 5 smokers and tested again a week after and the results of the

initial assessment and retest were compared. Also, more advanced process was applied by calculating Cronbach Alpha and a coefficient was (.89).

The final questionnaire covered current smoking knowledge, beliefs and attitudes about smoking and its cessation, and socio-cultural and environmental factors that promote or prevent smoking onset and continuation. The tool included 70 questions covering demographics and concepts on smoking onset, smoking characteristics, perceptions, experience in quitting, social relationships, and cultural and environmental influences and were in the format of yes/no, true/false, multiple choice, and open-ended questions (The study measurement tool can be found as Supplementary File 1). The questionnaire was also reviewed by a number of key-informants and health practitioners (n=9) from the target communities who provided feedback and comments re the questionnaire and checked its face and content validity. The bilingual Chinese research assistants worked collaboratively together translating the study measurement tool to Chinese Simplified and Traditional formats. The translations were reviewed by secondary (back-up) translators from the target communities who were introduced by the collaborating immigrant agencies for accuracy and correctness. The tool was then reviewed by the community key-informants and professionals for further crosschecking. Finally we pilot tested the questionnaire with selected smokers and ex-smokers from the Chinese communities (n=5) to confirm validation of the measurement tool and for cultural relevance and clarification, as well as translation purposes including understandability, acceptability, and applicability. Suggestions were integrated into a revised version.

Participant Recruitment

Eligibility criteria for participants were adults (≥21 years old) who were current smokers (defined by having smoked at least 5 cigarettes per day during the past 30 days), Chinese descent

(either Mandarin or Cantonese speaking) and be immigrants to Canada or children of Chinese immigrants. Participants were recruited from within the communities using a variety of outreach methods such as posting flyers and referral applied from previous studies and through network with community agency collaborators. [17,22,23] In total, 16 Chinese smokers participated in initial focus groups and interviews and subsequently 167 (137 males and 30 females) were interviewed, from which 93 were Mandarin speaking and 73 were Cantonese speaking. In terms of age category, 90 participants were <35 years of age and 76 were ≥35 years of age. Our intended sample size was 150 Chinese smokers aiming to identify mean differences in knowledge, beliefs, attitudes, and practices related to smoking and experience in smoking cessation between age, gender, education, and ethnicity groups.

Data Collection

Data was collected through administration of study questionnaire via individual interviews. Interview sessions were conducted at places and times of convenience for participants: e.g., participants' homes, community centers, and our research centre. Printed consent forms were explained and signed preceding the interview. Modest honoraria were paid to cover time, travel, and parking expenses. Community research assistants conducted the interviews in Mandarin or Cantonese and the participants filled in a self reported Chinese Simplified and Chinese Traditional questionnaire while the research assistants were available to answer any questions that they would have had, or ask the responders to elaborate the given information in the open-ended questions. Each interview was conducted by two interviewers: one with an academic perspective (a research assistant), and one from community who acted as a facilitator. The two interviewers took notes during interviews including verbal and non-verbal communication by the

participants and reviewed their notes at the end of each interview aiming to improve the accuracy of the information, capturing smokers' smoking beliefs, perceptions, and also their comments about cultural images of smoking and its cessation. In some instances (e.g., old smokers or low literate people), the research assistants assisted by administered the study questionnaire verbally while taking notes throughout the entire interview.

Data analysis

SPSS v20 (2012) was used for all statistical tests. Descriptive statistical tests were used and the results were presented in tables and graphs. Relevant inferential statistics were calculated for the entire sample and stratified according to age, gender, level of education, language of origin, and smoking practices. The data were not normally distributed, and non-parametric tests were therefore used; e.g., chi-square test for nominal data, Mann–Whitney test for ordinal data with two groups, and Kruskal–Wallis test for more than two groups with ordinal data. Binary logistic regression was used to determine the effects of demographics on the outcome variables. All data were examined regarding distributions and trends in the data, and the level of significance was set at the $P< 0.05$ level.

Sample Size Calculation

With a total sample size of 167 subjects for the cross-sectional study, we estimated that we could identify mean differences between different age, gender, language and education level groups and with an effect size of 0.45 with 80% statistical power and a two-sided significance level of $P<0.05$.

FINDINGS

Between May 2013 and April 2014, we recruited and enrolled 167 current smokers. **Table 1** describes characteristics of the study sample for both Mandarin (55.7%, n=93) and Cantonese (44.3%, n=74). The participants included predominately males (82%, n=137). The median age was 35 and we used this cut off point for younger/older groups, as used previously from our qualitative studies conducted with Chinese community smokers, [20] allowing us to identify these differences in perspective.

Table 1. Participant characteristics

	N	%
Gender		
Male	137	82
Female	30	18
Language		
Mandarin	93	55.7
Cantonese	74	44.3
Age		
<35	105	63
≥35	62	37
Education Level		
High school and below	87	52
University degree and above	80	48

Smoking-related knowledge and reasons for starting smoking

Knowledge of smoking consequences is an important factor to consider when designing smoking cessation programs or implementing health promotion interventions, especially to prevent onset of smoking among young people.[2,8] Almost an equal number (23%) of Mandarin and Cantonese smokers indicated that they were not aware of smoking side effects when they started smoking. Table 2 provides the breakdown of smoking-related knowledge by gender, age,

language, and education level. As shown on table 2, knowledge about side effects of smoking was mixed among the participants of this study, with no statistically significant differences observed between the language, gender, age, and education groups in this regard.

Table 2. *'At the time you started smoking, did you know the side effects of smoking?'*

	Yes		**No**	
	N	%	N	%
Gender				
Male	105	77	32	23
Female	22	73	8	27
Age				
<35	90	86	15	14
≥35	38	62	24	39
Language				
Mandarin	72	77	21	23
Cantonese	56	76	18	24
Education Level				
High school under	61	70	26	30
University degree and above	67	84	13	16

We also aimed to determine the *socio-cultural and environmental* factors which influenced the onset of smoking among the study participants.[24] In this study, we defined social factors as smoking during the gatherings, being offered cigarettes by peers (a cultural norm in this community), smoking to feel being accepted, etc. On average for 45% (n=75) of participants, 'social factors' were a trigger to start smoking, while it was the number one trigger for male smokers and smokers with who were 35 years or over with an equal rate of 53%. Although 50% of females mentioned 'emotional factors' as a contributor to starting smoking, only 22% (on average) of males cited these as factors for them. Likewise, 'environmental factors' were considered by only 20% of participants as a factor in starting to smoke, while 50% of Mandarin smokers mentioned environmental factors as a major trigger for them to start smoking. A smoking friend was mentioned by most of participants (66.3%) as someone in their social

network when starting smoking, compared to classmate (48.5%), family (29%), and work-related colleagues (28%). An interesting observation was that 50% of female smokers in the study identified having a family member who smoked when they first started smoking.

Smoking beliefs, perceptions, and attitudes

Multiple factors affected participants to become regular smokers. For instance, for around 62% of smokers (between 100 to 104), the main reasons to smoke regularly were the beliefs that smoking '*relaxed them*' and '*helped them feel less stress*' as well as when '*they were having a break*' or when *'they were bored'*. The breakdown of the triggers to smoke based on smokers' gender, age, language, and education groups are shown on Table 3, with no statistically significant differences observed between the male and female smokers, and different age, language, and education groups in this regard.

Table 3. *'Reasons for becoming regular smokers'*

	Relaxation		**Less stress**		**Having break**		**Being bored**	
	N	%	N	%	N	%	N	%
Gender								
Female	22	73	14	47	17	57	16	53
Male	82	60	81	59	83	61	84	61
Age								
<35	73	70	62	59	69	66	68	65
≥35	31	51	33	53	31	50	34	55
Language								
Mandarin	50	54	57	61	53	57	54	58
Cantonese	40	54	38	51	47	64	48	65
Education Level								
High school under	51	59	45	52	52	60	55	63
University degree and above	53	66	50	62	48	60	47	59

We were also interested to identify the *social and cultural* aspects of smoking habits (continued smoking). When asked the question of whether '*most people in my culture smoke*' to assess

participants' perceived commonality of smoking in their communities, there was a significant difference between male and female participants (χ^2 = 5.424, df = 1, P<0.05) ; more males (n=46, 34%) believed that smoking was a cultural habit in their community than females (n=17, 57%) did. Similar findings were observed between Mandarin and Cantonese (χ^2 = 5.182, df = 1, P<0.05); more Mandarin (n=65) answered yes to the question than Cantonese smokers (n=39). Many participants (61%) indicated they normally smoked when they were 'with friends'; with the highest proportion reported among the <35 years old participants (82%) and male participants (70%). Remarkably, 70% of the <35 years old participants indicated they smoked when they had alcohol. The rate was 60% among female participants, 57% among males, and 57% among both Mandarin and Cantonese smokers. In terms of attitudes towards exposing others to second or third-hand smoke, we asked participants *'do you mind smoking in front of non-smokers'* ? Younger smokers (<35 years of age) were more likely (n=72) to mention that they did not mind smoking in front of non-smokers compared to older smokers (≥35 years of age) (n=52). The mean difference was significant (χ^2 = 7.133, df = 1, P<0.01). Also, when the participants were asked whether they minded smoking in front of young children, similarly, more younger smokers (<35 years of age) (n=97) mentioned that they *'did not mind smoking in front of young children'* than the older smokers (n=55) and the difference was significant (χ^2 = 5.123, df = 1, P<0.05). We also aimed to assess smokers' viewpoints regarding second hand smoking and its harm. We asked whether *'second and third hand smoke was as harmful as first hand smoke'*, again, relatively more males said 'no' when compared to female smokers (n= 40 and n= 10, respectively) and the difference was significant (χ^2 = 4.736, df = 1, P<0.05). Finally, we assessed smokers' beliefs about their own smoking pattern with a self-reported question of '*I have a smoking routine/pattern*'. No significant differences were identified between gender, age,

and language groups. However, we found that more people with high school education or less mentioned they didn't have a routine/pattern (n=30) compared to people with higher education (n=12) and the difference was significant ($\chi^2 = 7.156$, df = 1, $P<0.01$).

Perceptions about smoking

We assessed smokers' perceived *enjoyable feeling* that they may have due to smoking by asking whether '*there is a different feeling when comparing times I smoke and don't smoke*' and found a statistically significant difference between male and female participants ($\chi^2 = 4.237$; df = 1, $P<0.05$). Significantly more males (n=47) mentioned experiencing a different feeling when they smoked compared to not smoking than female smokers (n=15). In addition, younger smokers (<35 years of age) as well claimed to have a different feeling when comparing times smoking and not smoking (n=46) compared to older smokers (n=16), and the differences were statistically significant ($\chi^2 = 3.889$, df = 1, $P<0.05$). Likewise, more Mandarin smokers (n=41) than Cantonese smokers (n=20) reported having a different feeling when they smoke compared to when they were not smoking ($\chi^2 = 5.188$, df = 1, $P<0.05$). For this outcome there was no significant differences between highly educated (college/university and above) and lower educated (high school or lower).

Additionally, we assessed smokers' perceptions about *helpfulness* of smoking to alleviate their anxiety and stress. We noticed that 77% of female smokers, 69% of younger smokers (aged 34 years or younger), and 52% of older smokers (age 35 or older) smoked to reduce their sense of helpfulness. Male smokers perceived that smoking helped them to minimize the feeling of being bored (80%) and made them more connected to their group of friends (69%).

Smoking cessation

We aimed to identify willingness to quit smoking and *perceived barriers and facilitators* to cessation. The majority of participants, in particular young male and female smokers, mentioned their desire to quit and attempted to several times, before giving up and smoking again. A few people mentioned using medications or seeking professional advice to quit smoking but mainly relied on their own willpower to quit. Also, older participants indicated trying to quit due to health related issues such as heart disease or cancer. We were also interested to find out whether participants were under pressure by someone close to them to quit smoking. When asked *'I was nagged by someone to quit smoking'*, no statistically significant differences were identified in different gender, age, language, and education groups. However, when we asked whether they *'would encourage others to quit',* more Mandarin speaking smokers answered yes to (n=45) than Cantonese speaking smokers (n=23) (χ^2 = 5.172, df = 1, P<0.05). No significant differences were identified based on age, gender, and level of education. In addition, most participants (87%) said "No" to the question: "*Would you encourage non-smokers to smoke?"* Furthermore, we also asked whether living in a smoking restricted society like Canada would encourage smokers to quit or cut down on their smoking. More Mandarin speaking smokers (n=56, 60%) mentioned that '*living in Canada influenced their smoking habits or desire to quit*', compared to Cantonese speaking smokers (n=30, 41%) (χ^2 = 6.424, df = 1, P =0.011).

More people with high school or lower education (n=34) agreed with the statement *'I would benefit more from smoking than suffering from withdrawal symptoms due to quitting'*, compared to the more educated smokers (n=12) (χ^2 = 6.102, df = 1, P<0.05). When asked whether they *'tried nicotine replacement therapy to quit smoking'*, more Mandarin speaking smokers (n=32)

mentioned that they had tried this aid to quit smoking compared to Cantonese speaking smokers (n=12 (χ^2 = 7.275, df = 1, *P* =0.007).

In general, participants identified language and literacy issues as barriers to accessing smoking cessation information as well as lack of useful information in a social media format. For instance, older participants mentioned that they had limited exposure to public sources of information on cessation services that were developed in their native language. A small minority of these smokers had received advice and information about the health issues attributed to smoking from their physicians. Younger smokers mentioned the lack of disseminating smoking cessation messages through social media such as text messaging to promote quitting services in their native language.

Our synthesis of the interview data identified seven barriers to the participants' cessation which are summarized in Table 4.

Table 4. *Barriers to Smoking Cessation identified by the participants*

Barriers
(a) the problems of managing their lives in a highly stressful environment
(b) their isolation and the limited support systems in their community or work/school environments
(c) the availability of smoking as a social-connection to their peers and limited resources for pleasure
(d) perceived minimal health risks of smoking, (e) the commonality of smoking in their community

(e) the commonality of smoking in their community

(f) the scarce or non-existent information about how to stop smoking

(g) the belief that all they can quit on their own whenever they decide to

DISCUSSION

The main goal of this study was to gain insights on the beliefs and perceptions associated with smoking behaviors and smoking cessation among Chinese Cantonese and Mandarin speaking current smokers, taking into account culturally specific knowledge and practices. The results have implications for the development of appropriate smoking cessation programs and educational interventions to prevent and control tobacco-related health issues among the target communities. Such interventions may have policy implications in health promotion programs to prevent smoking onset among younger population groups in the immigrant communities.

Several participants in this study indicated their desire to quit and attempted to do so many times, many of whom did it relying on their own willpower. Only a few, mainly among older smokers, tried to quit because of health related issues. They mentioned that a better communication with primary care providers and ease of access to culturally and linguistically appropriate smoking cessation resources would promote smoking cessation in their communities. Similar findings have been reported in studies done in other countries as well as among many immigrant communities in Canada who tried to quit smoking.[25-28] In addition to elucidating these barriers to smoking cessation and despite continued smoking, participants showed being knowledgeable in health related and other negative aspects of smoking as on average, 70% of the participants indicated they were aware of the health consequences of smoking. This finding has

been confirmed in other studies. [28] In our study, we found that higher education, better knowledge, and smoking regulations contributed to having a greater intent to quit smoking. For instance, we found that most participants were not ignorant of the dangers of smoking, with the vast majority recognizing that smoking posed risks to their own health and the health of those around them. This knowledge is much higher than that of Chinese smokers who were previously surveyed in China, where only 36% of participants believed smoking can cause lung cancer and only 4% were aware of the relationship of smoking to heart disease.[29] In addition, many of the smokers in our study already accepted limitations on the use of cigarettes in Canada, and many, mostly younger smokers, supported restrictions on indoor smoking and also mentioned not smoking at home or where children are present. This could be attributed to the smoking restriction rules as well as the strong anti-smoking educational campaigns in Canada. For example, since 2001, Health Canada has spent more than $480 million for a 5-year program to encourage tobacco cessation programs for all Canadians.[30] These regulations might be important to reduce the risk of second-hand and third-hand smoking and related health issues among young children and other non-smoker family members.

In terms of reasons to continue smoking, perceived advantages of smoking such as ‘smoking does make me feel more comfortable’ and ‘smoking helps me to be stress-free when I have problems’ appeared to be more important factors to promote smoking continuation among our study participants than perceived disadvantages around ‘health issues’ and ‘money’ which shown to be strong motivators in quitting smoking in some studies. Some studies found that smokers may not be aware of the diseases caused by smoking and therefore, they may perceive themselves less susceptible to the risks of smoking.[30-34] For instance, health consequences

and costs of smoking were not perceived as strong motivators to quit smoking among young participants. They reported the stimulating and anti-stress effects of smoking (smoking may actually made them feel happier, more alert, etc), the feelings that may reinforce their tobacco use and have associated these feelings with being around other smokers. In older smokers, most of which showed low self-efficacy on being able to quit, the rationale for continuing to smoke was different. For instance, for over 16% of smokers in this age group the disadvantages of quitting were perceived to outweigh its advantages. Some reasons mentioned by older participants were: the addiction of nicotine, being too late to quit, and that their body needed nicotine. In other studies among mainstream populations, self-efficacy expectations and advantages of smoking cessation appeared to be the most important associates of quitting smoking among older smokers.[35,36] Therefore, this issue should be revisited in future studies with ethno-cultural communities. The results of this study suggest that understanding health beliefs and perceptions around smoking and improving self-efficacy are useful tools in promoting smoking cessation among smokers in Chinese immigrant communities.

Limitations

Some limitations need to be considered. First, this study used a convenience sample, so it may not reflect the actual smoking prevalence and patterns among Mandarin and Cantonese immigrants in the GVA. We could not explore the effect of acculturation on smoking habits and patterns. There was no previous data on smoking patterns among Chinese immigrants in Canada, and attempting a community based assessment would have been inherently difficult for an exploratory study. Therefore the findings of this study cannot be generalized to larger Mandarin

and Cantonese speaking communities residing in the GVA. The goal was to explore the links to smoking cessation among Mandarin and Cantonese populations in order to gain insight into the need to adapt smoking cessation programs in these groups. In future research, a longitudinal design in which our results can be tested is recommended. A second limitation is the fact that all responses were by self-report and validation of smoking behaviors or reasons to quit or continue smoking was not possible with a cross-sectional design. A third limitation is the absence of a native mainstream (English-speaking) reference group, due to a lack of resources. This could be a problem for interpreting the additional 'culturally specific' beliefs, because these were not elicited from mainstream population group. Nevertheless, to assess whether the beliefs we identified in this study are really 'culturally specific', a cohort study with all significant beliefs for main ethnic groups in the GVA, including mainstream population, might be useful.

CONCLUSIONS

The results of our study suggest that an effective anti-smoking campaign in the Chinese community should go beyond traditional English language efforts, utilize Chinese resources, and build upon existing cultural attitudes (such as the belief that smoking is inappropriate for young people) and knowledge (such as health risks) about smoking. Particular attention should be paid to differences between female and male smokers and between younger and older smokers related to their knowledge, beliefs and attitudes about smoking, and perceived barriers and facilitators to smoking cessation. We also identified different beliefs and perceptions about the harms and benefits of smoking, based on language, age, and gender group. The findings indicate the importance of addressing risk perceptions about the immediate and long-term consequences of smoking. Therefore, future interventions can prove the applicability of a risk perception model

on smoking cessation among Mandarin and Cantonese speaking smokers. Despite finding significant differences between the genders, educational level, ethnicity and age groups in our study, we believe a larger sample size is needed to address this issue. The findings build a window of opportunity to promote tailored cessation interventions incorporating cultural beliefs, perceptions, and practices for Chinese immigrant communities.

Practical Implications

Our study identified the health beliefs and perceptions about smoking and its cessation among Mandarin and Cantonese immigrants that could be considered by healthcare decision makers to develop health promotion programs preventing smoking onset among younger population groups in Chinese community. Interventions should take account of the specific profiles that Mandarin and Cantonese immigrants in terms of knowledge, attitudes, beliefs and perceptions on their smoking habits and patterns. Given the results of this study, we plan to conduct further research to assess the applicability of a risk perception model to the smoking behavior of routine smokers in the target immigrant communities. The model has been shown effective in terms of modifying risk-taking behaviors, promoting positive perceptions, and improving self-efficacy that have been applied for changing smoking habits/behavior .[37-39]

ACKNOWLEDGEMENTS

We would like to thank the community members, facilitators, ethno-cultural serving agencies (SUCCESS), and key-informants from the Mandarin and Cantonese communities in the Greater Vancouver Area who helped us with all aspects of this research.

FUNDING

This project was funded by a community grant from The Vancouver Foundation, Vancouver, Canada.

COMPETING INTERESTS

We declare that there is no conflict of interest in terms of ownership of shares, consultancy, speaker's honoraria or research grants from commercial companies or professional or governmental organizations with an interest in the topic of the paper (the ICMJE form for Disclosure of Potential Conflicts of Interest from the Corresponding Author is also attached to this submission).

CONTRIBUTOR STATEMENT

JMF and IP planned the conception and study design. IP prepared the proposal draft to the funding agency and applied for the ethics approval. JS coordinated the study, recruited participants, and facilitated the community involvement. IP analyzed and interpreted the study data. IP and JS drafted the manuscript for important intellectual content.

DATA SHARING STATEMENT

No additional data available.

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The effect of a multi-dimensional smoking cessation intervention on Mandarin and Cantonese-speaking immigrants residing in the Greater Vancouver Area: A community-based program

Please respond to the following questions:

A. All about you

1. **What is your gender?**
   □ Male □ Female

2. **What is your age?**
   □ 21-25 years old
   □ 26-35 years old
   □ 36-45 years old
   □ 46-55 years old
   □ 56 years old and above

3. **Which language(s) do you speak most with your friends, family, or co-workers?**
   □ Mandarin
   □ Cantonese
   □ English
   □ Others, please specify_____

4. **What is your marital status?**
   □ Single, never married
   □ Married
   □ Living under common-law
   □ Divorced
   □ Widowed/Living alone

5. **What is your highest level of education?**
   □ Never attended school
   □ Elementary school
   □ High school
   □ University degree
   □ University degree and above
   □ Others, please specify_____

6. **What is your current employment status?**
   □ I am a student
   □ I am employed
   □ I am self-employed
   □ I am unemployed
   □ I am retired

B. Smoking onset questions

1. **At what age did you start smoking?**
   - □ Under 18 years old
   - □ 19-25 years old
   - □ 26-39 years old
   - □ 40 years old and older

2. **Why did you start smoking? (Choose all that are applicable to you and explain)**
   - □ Social factors, please specify
     _____
   - □ Emotional factors, please specify
     _____
   - □ Environmental factors, please specify
     _____
   - □ Others, please specify
     _____

3. **At the time you started smoking, did somebody in your social network smoke?**
   (Choose all that are applicable to you)
   - □ None or Not applicable
   - □ Family, who, please specify_____
   - □ Colleagues, from where, please specify _____
   - □ Friends
   - □ Classmates, at what age, please specify_____
   - □ Others, please specify_____

4. **At the time you started smoking, did somebody tell you about the health problems smoking a cigarette can cause?**
   (Choose all that are applicable to you)
   - □ None or Not applicable
   - □ Family, who, please specify_____
   - □ Colleagues
   - □ Friends
   - □ Classmates, at what age, please specify_____
   - □ Media
   - □ Health professionals
   - □ Others, please specify_____

5. **At the time you started smoking, did you know the side effects of smoking?**
   - □ Yes □ No

   If yes, which one(s) did you know?
   - □ Makes teeth yellow
   - □ Causes wrinkles

□ Makes smokers smell bad
□ Causes more phlegm
□ Shortness of breath
□ Causes bad breath
□ Cough
□ Increased risk of lung cancer
□ Greater risk of heart disease
□ Others, please specify_____

6. **Why did you become a regular smoker?**
(Choose all that are applicable to you)
□ I have never been a regular smoker **(After choosing, please skip to question 7)**
□ I craved cigarettes if I didn't smoke regularly
□ I was around smokers a lot of time
□ I found smoking pleasurable
□ I enjoy the taste
□ Smoking relaxed me
□ Smoking helped me focus and concentrate better
□ Smoking helped me feel less stressed
□ I smoke to fit in with other people
□ I like the image of a smoker
□ Smoking helped me control my weight
□ Since others in my family smoked, it was easy to see myself as a smoker too
□ Others, please specify_____

7. **If you are not a regular smoker, why didn't you become a regular smoker?**
(Choose all that are applicable to you)
□ I did not enjoy smoking
□ Smoking cigarettes made me feel sick
□ I did not like the taste and/ or the smell of cigarettes
□ I did not want to become addicted to cigarettes
□ I was concerned about the effects of smoking on my health
□ I was concerned about the effects of smoking on the health of the people around me
□ I don't hang out with people who are smokers that often
□ I was encouraged to stop smoking by my friends
□ I was encouraged to stop smoking by an adult such as my parents/ guardians, a teacher, or a doctor
□ I did not like the image of being a smoker
□ It was hard for me to obtain cigarettes
□ Cigarettes are expensive
□ I had trouble finding places to smoke
□ Since I grew up in a non-smoking family, I just could not see myself as a smoker
□ I don't want people to know that I smoke
□ Others, please specify_____

C. Which characteristic best describes you as a smoker?

1. **How much do you smoke now per day?**
   # Packs_____ or # Cigarettes_____

2. **How much do you spend weekly on buying cigarettes?**
   □ Under $25/week
   □ $25-50/week
   □ $50-75/week
   □ $75-100/week
   □ $101+/week

3. **I have a smoking routine/pattern.**
   □ True □ False □ Not sure

4. **I smoke**
   (Choose all that are applicable to you)
   □ When I am bored
   □ When I am upset
   □ When I am having a break
   □ When I am partying
   □ When I am driving
   □ When I am under stress
   □ When I am with friends
   □ When I am alone
   □ When I am in a social gathering
   □ Mostly at home
   □ At work or at school
   □ When I have alcohol
   □ First thing when I wake up
   □ Mostly in the morning
   □ Mostly in the afternoon
   □ At night before I head to bed
   □ After every meal
   □ After every tea or coffee
   □ During every phone conversation
   □ Before I go to the washroom
   □ Before I head to work on an assignment/task
   □ After I finish an assignment/task
   □ When I want to relax
   □ Others, please specify_____

5. **There is a different feeling when comparing times I smoke and don't smoke.**
   □ True □ False □ Not sure □ Depends on the situation, please explain_____

6. **What are the things you like about smoking?**
(Choose all that are applicable to you)
□ It helps me to relax
□ It helps to break up my working time
□ It helps me to cope with stress
□ It keeps me busy when I am bored
□ I just enjoy it
□ It is something I have in common with my friends or family
□ It stops me from putting on weight

7. **What are the things you don't like about your smoking?**
□ I don't have anything that I dislike about smoking
□ It is expensive
□ It affects my health
□ I don't like feeling dependent on cigarettes
□ It makes my clothes and breath smell
□ It is a bad example for children
□ It is unpleasant for people near me
□ It makes me less fit
□ People put a negative image on me
□ It is bad for the health of people near me

8. **Certain situations trigger me to smoke**
□ True □ False □ Not sure
If true, what are the situations?
□ Happiness/ Joy
□ Relaxed
□ Social gathering
□ Receive bad news
□ Receive good news
□ Stress
□ Frustration
□ Boredom
□ Loneliness
□ Anger
□ Sadness
□ Lost concentration
□ Wanting to be like others (e.g., friends, members of my group)
□ Other, please specify_____

9. **Where do you smoke mostly?**
□ Indoors
□ Porch/outside of home
□ Outside
□ Workplace
□ In the car
□ Others, please specify_____

D. Your perception about the following statement

1. **Smoking kills germs and bacteria.**
   □ True □ False □ Not sure

2. **My body needs nicotine.**
   □ True □ False □ Not sure

3. **Smoking is an addiction.**
   □ True □ False □ Not sure

4. **Smoking is cool.**
   □ True □ False □ Not sure

5. **Smoking has changed my daily routine (work, study, exercise, food intake, and sleep).**
   □ True □ False □ Not sure
   If true, how has it changed your daily routine?
   _____

6. **Smoking has affected my health (i.e., lung disease, coughing, phlegm, cancer, shortness of breath, heart disease, blood pressure, energy, wrinkles, asthma)?**
   □ True □ False □ Not sure
   If true, how has it affected your health?
   _____

7. **There are health-related problems I'm worried about while I smoke.**
   □ True □ False □ Not sure
   If true, what are they?
   □ Lung disease
   □ Shortness of breath
   □ Cough
   □ Cancer
   □ Heart disease
   □ Change in blood pressure
   □ Less energized
   □ Dependence on medication intake
   □ Decrease in oxygen intake
   □ Wrinkles
   □ Early death
   □ Others, please specify_____

8. **What do you think are the advantages of you smoking cigarettes?**
   _____

9. **What do you think are the disadvantages of you smoking cigarettes?**
   _____

10. Do you have any other feelings about you smoking cigarettes?

_____

E. Your experience and thoughts on quitting and quitting methods

1. **I was nagged by someone to quit smoking.**
   □ True □ False
   If true, who nagged you?
   _____
2. **I have gone to the doctor for symptoms related to my lungs.**
   □ True □ False □ Not related to my smoking
3. **I have had a lung examination at the physician's office or hospital.**
   □ True □ False □ Not related to my smoking
4. **I have tried to quit before.**
   □ True □ False
   If true, how many times have you tried? _____
   What methods did you try?
   _____
   What was the longest duration you were able to quit for?
   _____
   Why couldn't you quit?
   _____
5. **Where have you received or heard of smoking cessation methods?**
   (Choose all that are applicable to you)
   □ I never heard about or received any information
   □ Family or friends
   □ Hospitals/clinics
   □ Pharmacy
   □ Media
   □ Others, please specify_____
6. **I have thought about cutting down my cigarette intake before.**
   □ True □ False □ Not sure
   If true, what was your reason to cut down?
   _____
   If true, has your intake of cigarettes cut down now? □ Yes □ No
7. **I have tried nicotine replacement therapy.**
   □ True □ False □ Not sure what nicotine is

   If true, did it work? Why or why not?
   _____
   _____

8. **I have thought about (intention) quitting before.**
□ True □ False □ Not sure
If true, what was your reason for quitting?
_____
If false, what was the reason for not quitting?
_____

9. **I have met difficulty in quitting before.**
□ True □ False □ Not applicable
If true, what was your difficulty?
□ I enjoy smoking too much
□ I don't think I have enough willpower
□ I think I would put on weight
□ I would be too stressed
□ I think I am too addicted to cigarettes
□ My partner smokes
□ My best friend smoke
□ I would miss smoking with friends
□ I don't really want to stop
□ I would be bored
□ I would miss smoking breaks at work
□ Others, please specify_____

10. **In your opinion, what are the withdrawal symptoms due to quitting?**
_____
□ I don't know what the withdrawal symptoms are.

11. **I would benefit more from smoking than suffering from withdrawal symptoms due to quitting.**
□ True □ False □ Not sure
If true, why is it?
_____

12. **There are people that support me for quitting.**
□ True □ False □ Not sure □ Not applicable
If true, who supports you?
_____
If true, what kinds of support did they provide you?
_____

13. **I would consider quitting in the future.**
□ True □ False □ Not sure
If true, what would be your reason for quitting in the future?
_____
If true, what immediate reward would you like to get?
_____

14. I would quit smoking if people I spend time with quit also.
□ True □ False □ Not sure
If true, why?
_____

15. I will be able to quit whenever I want.
□ True □ False □ Not sure

16. If you were to quit, what would be the most influential motivation?
_____

17. What positive feelings would most help you in becoming a non-smoker? (Choose all that are applicable to you)
□ Confidence
□ Determination
□ Calm
□ Relaxation
□ Caring about myself
□ Caring about others
□ Others, please specify_____

18. Imagine that you are now a former smoker:
a) What could you do with the money you save?
_____
b) How would your medication be different, if you are currently taking medication?
_____
c) What would be your energy level?
_____
d) What would be the quality of your life?
_____
e) How would you be feeling physically as a non-smoker?
_____

F. Your relationship with others

1. **My smoking behaviour has changed my relationship with others. (Family, co-workers, classmates, and friends)**
□ True □ False □ Not sure
If true, how has it changed your relationship with others?
_____

2. **Which people, or organization that you know, would approve of you smoking cigarettes?**
_____

3. **Which people, or organization that you know, would disapprove of you smoking cigarettes?**

_____

4. **I would encourage others (Family, co-workers, classmates, and friends) to smoke.**
   □ True □ False □ Not sure
   If true, why would you encourage others to smoke?
   _____
   If false, why would you not encourage others to smoke?
   _____

5. **I would encourage others to quit.**
   □ True □ False □ Not sure
   If true, what do you think is the best model to encourage people in your age group to quit?
   _____

6. **I mind smoking in front of non-smokers.**
   □ True □ False □ Not sure
   If true, why would you not smoke in front of non-smokers?
   _____

7. **I mind smoking in front of young children.**
   □ True □ False □ Not sure
   If true, why would you not smoke in front of young children?
   _____

8. **I think second and third hand smoke is not as harmful as first hand smoke.**
   □ True □ False □ I don't know what third hand smoke is

G. Cultural and environmental influences for your desire to smoke or to quit

1. **Media such as visual warnings on cigarette packages has influenced me to quit smoking.**
   □ True □ False □ Not sure □ Not applicable

2. **Living in Canada has influenced my smoking habits or desire to quit.**
   □ True □ False □ Not sure
   If true, how has it influenced your smoking habits or desire to quit?
   _____

3. **The different social norms in Canada have influenced my smoking behaviour in comparison to my native country.**
   □ True □ False □ Not sure
   If true, how has it influenced your smoking behaviour in comparison to your native country?

   _____

4. **In your culture, smoking is a behaviour that one gender engages in more than other.**
   □ True □ False □ Not sure
   If true, which gender?
   □ Male □ Female

5. **In your culture, smoking is a behaviour that a certain career profession engages in more than other.**
   □ True □ False □ Not sure
   If true, which career profession?

   _____

6. **People do not accept the smoking habit in my culture.**
   □ True □ False □ Not sure
   If true, why do they not accept the smoking habit?

   _____

7. **Most people in my culture smoke.**
   □ True □ False □ Not sure

8. **What is your image of a smoker? Do you think it is a positive or negative image?**
   □ Positive image □ Negative image □ Not sure
   Why? Please explain.

   _____

9. **In your opinion, how can a smoker harm or benefit the society?**

   _____

10. **In your opinion, what would be a good enforcement to stop the younger generation from smoking?**

    _____

11. **In your opinion, what should be the role of mass media?**

    _____

12. **What do you know about a cigarette? What does it do to the human body?**

    _____

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding
		(*b*) Describe any methods used to examine subgroups and interactions
		(*c*) Explain how missing data were addressed
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
		(*e*) Describe any sensitivity analyses

Continued on next page

Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time
		Case-control study—Report numbers in each exposure category, or summary measures of exposure
		Cross-sectional study—Report numbers of outcome events or summary measures
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.