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Title: Exploratory study on the relationship between smoking and other risk behaviours among young smokers

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Abstract

Aims and objectives: This study aimed to explore the relationship between smoking and other risk behaviours among Chinese young people in Hong Kong.

Background: There is growing concern about coexisting risk behaviours in young smokers. Information about smoking and other risk behaviours is crucial for developing interventions to promote smoking abstinence and adoption of healthy lifestyles. The relationship between smoking and other risk behaviours among Chinese young people in Hong Kong has not been explored.

Design: This is a mixed-methods retrospective population-based study.

Methods: A retrospective population-based study was conducted with 1,147 young smokers through Youth Quitline between November 2011 and July 2016. Attitudes, behaviours and experiences related to smoking and risk behaviours among Chinese young smokers were examined in semi-structured qualitative interviews with 30 participants randomly selected from the retrospective population-based study.

Results: In total, 45.5% participants reported engaging in at least one other risk behaviour. The interviews revealed that drinking alcohol may have a significant impact on quitting smoking. In addition, smoking may be a gateway for more serious risk behaviours during adolescence. Low health awareness may explain the unhealthy lifestyles among young smokers.

Conclusions: This study bridges a gap in existing literature by exploring relationships between smoking and other risk behaviours among young people in Hong Kong.

Relevance to clinical practice: Given the interrelationships between smoking and other risk behaviours, a holistic approach should be used to promote smoking cessation and healthy lifestyles among young smokers. If young smokers improve their health and quit smoking at the same time, their physical and mental development will benefit as a secondary outcome.

Trial registration: ClinicalTrials.gov identifier: NCT02778139 (April 3, 2017).

Keywords: adolescent health, attitudes, behaviour, health education, health risks

Impact Statement

What does this paper contribute to the wider global clinical community?

- A holistic approach should be adopted enhancing the effectiveness of smoking cessation and relapse prevention by incorporating preventive measures for other risk behaviours as an integral part of counselling.
- It is essential to deliver healthy lifestyle messages such as recommendations related to physical and psychological health.
- Future large-scale studies should further examine the relationships between smoking and other risk behaviours in adolescents and longitudinal research is also warranted to confirm the sequence of risk behaviours.

Introduction

Smoking among adolescents is a global concern, and there is an increasing public awareness of risk behaviours associated with tobacco use in young people. Evidence suggests that health behaviours tend to coexist (Prochaska, Spring, & Nigg, 2008), and young people that behave healthily in one

aspect tend to act similarly in others. Conversely, involvement in certain risk behaviours predicts involvement in others. Previous studies showed that smoking was associated with other unhealthy lifestyle choices such as physical inactivity (Guo et al., 2013; Larson, Story, Perry, Neumark-Sztainer, & Hannan 2007; Paavola, laska, Lytle, & Moe, 2004) and poor dietary habits (Guo et al., 2013; Larson et al., 2007; Wilson et al., 2005). Epidemiological studies conducted also found a relatively high prevalence of alcohol (Curran, Burk, Pitt, & Middleman, 2017; Kim & Kim, 2013; Torabi, Bailey, & Majd-Jabbari, 1993) and substance use in young smokers compared with their non-smoking peers (Curran et al., 2017; Torabi et al., 1993), notwithstanding the prevalence may be different between the urban and rural areas (Zhou et al., 2006). Currently, most existing smoking cessation interventions for young people focus on smoking behaviours, and coexisting unhealthy habits are generally overlooked. Therefore, it is crucial for healthcare professionals to develop appropriate interventions that are effective in helping young smokers quit, and also support them in adopting healthy lifestyles.

Background

Similar to the United Kingdom and many parts of the world, the Hong Kong government has devoted enormous efforts in tobacco control, such as completely banning smoking in public indoor areas and workplaces (The Government of the Hong Kong Special Administrative Region, 2015). The daily prevalence of cigarette smokers has decreased to 10.5 % in 2015, which is one of the lowest around

the world (Census & Statistics Department, 2016). When compared with other age groups, the prevalence of smoking amongst those 15 to 19 years of age was lower, accounting for only 0.6% of all daily smokers (Census & Statistics Department, 2016). Despite the low prevalence, there were still 38,478 daily smokers in this age group (Census & Statistics Department, 2016), a finding that should not be undervalued as young people who smoke are likely to continue into adulthood (Winkleby, Fortmann & Rockhill, 1993).

Developing understanding of the relationships between smoking and other risk behaviours among young smokers is essential to achieve the aim of developing appropriate and effective interventions for young smokers; particularly the attitudes, behaviours and experiences related to risk behaviours. Nevertheless, in a systematic review of the clustering of smoking, nutrition, alcohol and physical activity health risk factors, the results indicate that younger age was less clearly associated with riskier behaviours (Noble, Paul, Turon, & Oldmeadow, 2015). Moreover, information about smoking and associated risk behaviours among young people in the Chinese population is scarce. In addition, how coexisting risk behaviours affect Chinese young smokers is relatively underexplored. Hong Kong was formerly a British colony. Therefore, its culture represents a sophisticated fusion of East and West. Because the cultural context of Hong Kong Chinese young people differs slightly from that of young people in Western countries, attitudes, behaviours and

experiences related to smoking and risk perception are also likely to differ. This study aimed to identify and explore the relationships between smoking and other risk behaviours among Chinese young smokers in Hong Kong.

Methods

Design

A retrospective population-based study was conducted through Youth Quitline (YQ) between November 2011 and July 2016 to develop understanding about risk behaviours among Chinese young smokers in Hong Kong. YQ was the first hotline to provide smoking cessation counselling for young smokers in Hong Kong.

We also conducted qualitative interviews with participants randomly selected from the retrospective population-based study to examine attitudes, behaviours and experiences related to smoking and risk behaviours among Chinese young smokers. To be eligible to participate in the interviews, young smokers should have engaged in at least one other risk behaviour (e.g. drinking alcohol or other substance abuse, unhealthy diet or physical inactivity). We used a phenomenological approach to summarise and understand the lived experience of these selected young smokers (Streubert & Carpenter, 2011). This approach is an approach to understand people's

perceptions, perspective and understandings of a particular phenomenon (Pathak, 2017). The consolidated criteria for reporting qualitative studies checklist (See supporting information/table 1; Tong, Sainsbury, & Craig, 2007) was followed.

Participants

Study enrolment criteria included young people (i) aged 12–25 years, (ii) who had been smoking in the past 30 days, (iii) were fluent Cantonese speakers and (iv) were not currently participating in other smoking cessation programmes.

Data Collection

Young smokers who participated in the retrospective population-based study completed a structured questionnaire before receiving YQ telephone counselling on smoking cessation. The questionnaire collected demographic and socioeconomic characteristics and smoking-related information, such as daily cigarette consumption, years of smoking, nicotine dependence, and stage of readiness to quit. In addition, participants were asked to indicate any risk behaviours they had engaged in, including: drinking alcohol (drank at least once over the past month); physical inactivity (did not perform at least 30 minutes of moderate to vigorous physical activity in the past week);

unhealthy diets (had breakfast ≤6 days/week, fruits and vegetables ≤1 times/day, milk products ≤2 days/week, soft drinks ≥1 times/day or fast foods ≥2 times/day); and drug abuse in the past week.

Participants who engaged in at least one other risk behaviour were then randomly selected to attend a semi-structured qualitative interview. Accordingly, each of these participants was assigned a number. A research assistant who was independent from our research team then invited one of them for the interview according to a random number generated by a computer programme. The same procedures were carried out to identify more participants for interviews. Data saturation was achieved after 30 participants were interviewed. Each selected participant underwent an individual audiotaped interview conducted by two research assistants. One research assistant acted as an interviewer to encourage the participants to freely express their feelings, thoughts and opinions, and the other as an observer to document the participants' non-verbal language.

A semi-structured interview guide was developed by a group of experts (including a professor, associate professor and a postdoctoral fellow from a local university) with rich experience in conducting qualitative research. The interview guide covered four major areas: (1) smoking and cessation behaviours; (2) current and past experiences with other risk behaviours; (3) perceptions toward smoking and other risk behaviours; and (4) barriers to quitting smoking and resisting other risk behaviours.

All interviews started with general questions, such as “Can you tell me a bit more about your smoking history and quitting experience?” Nondirective questions, including “Why do you feel that way?” or “Could you please provide me some examples?” were asked to obtain more detailed responses. Additional information was solicited using probing techniques as appropriate.

Recordings were transcribed verbatim immediately after the interviews. Important statements and phases were identified and translated into English for reporting purposes by a bilingual translator having 5 years of experience in doing translation jobs. To avoid the essence of meaning that might have been lost in translation, two researchers of our team separately compared the translated statements with the Chinese version to determine whether the essence of meaning has been retained. Any disagreement and ambiguity were resolved in our regular meetings.

Ethical considerations

Ethical approval was obtained from the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster (UW 15-218). Before written consent was obtained, all eligible Chinese young smokers received a full explanation of the study. Participants were assured of confidentiality, that all information would be stored in a safe place accessible only by research team members, and that their names would not appear in any research report or publication.

The legal age of consent in Hong Kong is 18. Although some of the eligible smokers were aged below 18, it was not ethical to obtain their parental consent as we had to protect their privacy especially when this study focused on their risk behaviors. After seeking advice from the Institutional Review Board, the Board suggested us to directly obtain consent from the eligible smokers, even for those were aged below 18, as long as they were competent to do so. To ensure their competence, the research assistant assessed whether the young smokers understood the information provided and also whether they had reached a sufficient understanding and intelligence to be capable of decision-making.

Data Analysis

Quantitative data were analysed using SPSS version 23.0 for Windows. Descriptive statistics were used to report the baseline characteristics of young smokers. In particular, mean and standard deviation were used for continuous variables, while frequency and percentage for categorical variables. Colaizzi's (1978) descriptive phenomenology method was used for qualitative data. The researchers who conducted the analysis repeatedly read the transcripts and listened to the recordings multiple times to get a general sense of participants' feelings and responses. Important statements related to smoking or risk behaviours were extracted from the transcripts. The underlying meanings of these statements were then formulated to reflect the participants' intent.

The formulated meanings were compared with the original transcripts to ensure consistency, and then grouped to form categories, clusters and themes. Finally, the categories, clusters and themes were placed into a list of exhaustive descriptions of the phenomenon.

Different strategies were used to enhance the trustworthiness of the qualitative part. For dependability and transferability, we provided a comprehensive description of the study to allow other researchers to replicate the work and guide readers in making an informed judgement on the transferability of the findings to different settings (Houghton, Casey, Shaw, & Murphy, 2013; Shenton, 2004). The member checking method was used to ensure credibility, with 15 participants randomly invited to comment on our descriptions to ensure we accurately presented their lived experience (Shenton, 2004). We also used the peer debriefing technique, in which data were analysed by two research team members separately, and their coding and syntheses of the thematic structure were compared for similarities. Discrepancies were discussed and resolved in research team meetings (Shenton, 2004). Field notes were taken during the interviews, covering participants' nonverbal cues, important events, unanswered questions and the physical environment. Confirmability was achieved through reflective observation (Gerrish & Lacey, 2006; Shenton, 2004). The two researchers who conducted the analysis were experienced in smoking cessation; therefore their background might affect how they interpreted participants' descriptions. To avoid such bias, these researchers acknowledged their values and perceptions in separate interviews with an

independent qualitative research expert. The expert guided the two researchers to identify their preconceived thoughts about the phenomenon and provided direction on putting aside such thoughts when analysing the data.

Results

The retrospective population-based study included 1,147 young smokers who met the enrolment criteria and consented to participate. 73.3% (n= 910/1,147) of participants were male, 71.7% (n=822/1,147) were full-time students and 93.1% (n=1,068/1,147) were single, 93.8% (n=1,076/1,147) had no children (See Table 1). The mean daily cigarette consumption of participants was 9.8 (standard deviation [SD] = 7.9) cigarettes per day, and 65.1% (n=747/1,147) had mild nicotine dependence. Table 2 shows 45.5% (n=522/1,147) of participants reported at least one other risk behaviour (See Table 2). 24.2% (n=277/1,147) of participants drank alcohol at least once over the past month. In the past 7 days, 39.2% (n=450/1,147) had not performed at least 30 minutes of moderate to vigorous physical activity, 42.0% (n=482/1,147) had unhealthy eating habits, and 3.7% (n=42/1,147) had abused drugs.

The semi-structured interviews lasted 30–45 minutes on average. The relationships between cigarette smoking and risk behaviours were categorised into three main themes: (1) drinking alcohol, (2) smoking marijuana and (3) unhealthy lifestyles. The theme regarding the relationship between smoking and drinking alcohol was further divided into four subthemes: (i) reasons for increased tobacco consumption when drinking; (ii) drinking as a highly tempting situation for lapse/relapse; (iii) smoking and drinking as ways to relieve stress and express negative emotions; and (iv) awareness of adverse health consequences. Table 3 presents the themes, subthemes and their related quotes identified from the interviews.

Theme 1: Relationship between smoking and drinking alcohol

A large proportion of participants (n=27/30) indicated they often smoked cigarettes and drank alcohol at the same time. They argued that these two behaviours went hand-in-hand and could not be disentangled. One participant said, "You will think about smoking after drinking for a while. Cigarettes and alcohol…Alcohol and cigarettes…They are friends and cannot be separated. You will feel much more comfortable having these two at the same time."

Some participants (n=20/30) admitted they tended to smoke more cigarettes than usual when drinking and smoking at the same time. In particular, some (n=13/30) enjoyed "taking a puff" for every few sips of alcohol. Others (n=6/30) mentioned they chain-smoked and were not able to recall how many cigarettes they smoked when drinking alcohol.

(i) Reasons for increased tobacco consumption when drinking

Some participants (n=15/30) said they smoked more than usual because they unconsciously lit cigarettes when drinking with friends. One participant said, "I usually pay attention to the number of cigarettes smoked, and tell myself not to smoke more than half a pack per day. I was able to do this at first, but I realise that I can't do it anymore when I drink with my friends, and unconsciously light cigarettes…Until I finish an entire pack; I realised that I am smoking more than usual."

Other participants (n=10/30) said that as there were many smokers in bars, they were tempted to smoke when watching others smoke, smelling the smoke from their cigarettes, or being offered a cigarette by others. As one participant reported, "I know I smoke more than usual when drinking alcohol. However, it is hard for me to resist when I see someone smoking outside the bar. My friends will also invite me to smoke outside when they see others doing so. This may be the reason why I smoke more."

A small proportion of participants (n=5/30) were not able to explain why they smoked more than usual when drinking alcohol. They said they just felt the urge to do so.

(ii) Drinking as a tempting situation for lapses/relapses

Some participants (n=17/30) identified drinking alcohol as a highly tempting situation for smoking lapses and relapses. Participants (n=12/30) who had tried to quit reported that most of their friends were smokers and usually offered them cigarettes when drinking alcohol. They did not refuse offered cigarettes to avoid embarrassment. However, they relapsed to smoking after such occasions, as described by one participant, "I have tried to quit smoking before. However, my friends who were smokers always offered me cigarettes when drinking alcohol. It sounded very embarrassing to refuse. Once I took a puff on a cigarette, I could not resist the temptation and relapsed to smoking."

Some participants (n=11/30) commented that, "If you really want to quit smoking, you have to stop drinking alcohol as well."

(iii) Smoking and drinking to relieve stress and express negative emotions

A majority of participants (n=25/30) regarded smoking and drinking as ways to relieve stress and express their emotions. One participant said, "Drinking is a way to cheer myself up when I am in a bad mood. I will drink until getting drunk. If so, I can escape stress. Smoking is also a way for me to

relieve stress and negative emotions. I often feel much more capable of managing stressful events and coping with my emotions after smoking cigarettes."

(iv) Awareness of adverse health consequences

Many participants (n=24/30) were aware of the health consequences of smoking and drinking. Nevertheless, they had misconceptions that a moderate amount (e.g. half a pack of cigarettes and a bottle of beer per day) might not be detrimental to their health. In addition, they believed that health consequences would only occur many years later and therefore continued these behaviours. One participant said, "Smoking and drinking do not have much health impact…Even though there are some threats in the long run, such threats are not imminent."

Other participants (n=3/30) did not perceive drinking as harmful to their health; one participant said, "I don't think drinking is a problem to my health. Some news reported that drinking alcohol regularly, but not excessively, can prevent heart disease."

Theme 2: Relationship between cigarette smoking and marijuana

Six participants were drug abusers, with the commonly abused drug being marijuana. All of these participants reported having a habit of smoking and drinking. Some (n=2/6) told us that they had previously used smoking cigarettes and drinking alcohol as ways to cope with stress and negative emotions. They started smoking marijuana because of curiosity, but continued as they found it to be more effective in coping with stress and negative emotions. One participant noted, "I am working for an insurance company which requires me to meet a sales quota. You know how stressful it is. I couldn't sleep well and used to wake up at night. I first tried using tobacco and alcohol to cope, but later on, I found smoking marijuana was even more useful."

In addition, these participants (n=5/6) generally did not perceive that cigarette smoking and drinking alcohol presented problems for their health. This perception also meant that they were less aware of the consequences of other more serious risk behaviours, which increased their acceptance of smoking marijuana. As indicated by one participant, "I have not experienced any health consequences after smoking and drinking for a long time. Hence, when my friends invited me to try smoking marijuana, I did not refuse as I thought it might not have any serious consequence as well."

Theme 3: Relationship between smoking and unhealthy lifestyles

Nearly all participants (n=29/30) described themselves as physically inactive and having unhealthy diets. Nevertheless, they did not recognise the importance of changing their current lifestyles, because they did not think about the (possibly more serious) consequences of smoking. One participant said, "I don't even care how smoking will affect my health. Why do I have to bother performing physical activity and eating healthily?"

Discussion

There is growing public concern about the coexistence of risk behaviours in young smokers. Information about smoking and other risk behaviours is crucial for developing appropriate interventions to promote smoking abstinence and healthy lifestyles. This study addressed a gap in existing literature by exploring the relationship between smoking and other risk behaviours among Chinese young people in Hong Kong. We also aimed to describe how coexisting risk behaviours might affect smoking in young people.

Our quantitative data showed that, of all current young smokers in our sample, nearly half (n=522/1,147, 45.5%) also engaged in other risk behaviours. The semi-structured interviews revealed a connection between cigarette smoking and alcohol use, which is consistent with previous

literature (Reed, Wang, Shillington, Clapp, & Lange, 2007). According to classical conditioning theory, a stimulus (known as a conditioned stimulus), through repeatedly pairing with another stimulus (known as an unconditioned stimulus), comes to elicit a behavioural response previously associated with the unconditioned stimulus alone (Pavlov, 1927). Reed and colleagues (2007) hypothesised that alcohol could serve as a conditioned stimulus that triggers a learned response of cigarette craving after pairing with smoking. Our qualitative findings support that hypothesis, as some participants (n=5/30) described themselves as having a sudden urge to smoke after drinking alcohol.

Of 30 participants who participated in qualitative interviews, 20 reported that they smoked more than usual when drinking alcohol. In addition, some (n=17/30) reported that they had quit smoking, but relapsed after consuming alcohol. Consistent with a previous study, the interviews suggested lower odds in smoking cessation for smokers who drank alcohol (Kahler et al., 2009). Existing literature indicates that drinking alcohol presents a high risk situation for smoking relapse (Borland, 1990). Our qualitative findings clarified why young smokers find it difficult to resist temptation to smoke when drinking alcohol. Some participants (n=10/30) claimed that seeing other people smoking in a bar was a great temptation, with smelling cigarette smoke or being offered a cigarette being particularly tempting.

The quantitative results indicated that 3.7% (n=42/1,147) of participants admitted substance abuse (other than smoking and drinking alcohol). A previous cross-sectional study found that adolescents easily engaged in more serious health-comprising behaviours after smoking and drinking alcohol over a period of time (Kandel & Yamaguchi, 1993). A possible explanation is that smoking and drinking alcohol are gateways to more serious behaviours. Lee, Akers and Borgs (2004) claimed that engaging in smoking and drinking alcohol over a period of time could result in normalisation, leading young people to escalate their health-risk behaviours. This study provides support for this argument, as adolescents who smoked marijuana generally regarded cigarette smoking and drinking as not being unhealthy behaviours. This decreased their awareness of risk-taking behaviour or promoted unintentional experimentation with other more serious risk behaviours.

Our retrospective population-based study showed that a number of young smokers reported having unhealthy eating habits (n=482/1,147, 42.0%) and being physically inactive (n=450/1,147, 39.2%). These results might be explained by a common lifestyle among young smokers; for example, staying up late at night with friends and falling asleep in the morning. As such, they may feel tried during the day and lack motivation to perform physical activity. In addition, waking up late means they may consume fast foods to curb hunger (Pasch, Laska, Ltyle, & Moe, 2010). Despite these behaviours generally being regarded as unhealthy, participants (n=29/30) in our study did not intend to change because they were not bothered by the health consequences of smoking. This indicates

low health awareness among young smokers, which might account for their coexisting unhealthy habits. It also provides an explanation for the relatively high prevalence of physical inactivity and poor dietary habits among smokers compared with the general population reported in previous epidemiological studies (Guo et al., 2013; Larson et al., 2006; Paavola et al., 2004; Wilson et al., 2005).

Our interviews highlighted that many participants (n=27/30) were not aware of the harmfulness of drinking alcohol, but believed only excessive alcohol use could lead to increased risk of health problems. In particular, they believed that drinking a moderate amount of alcohol regularly was good for their health, as it could help lower the risk of cardiovascular disease. This may be attributable to misleading information about the beneficial effects of drinking alcohol that has been widely publicised in the media. Evidence indicates that alcohol is associated with numerous morbidities (Rehm, Gmel, Sempos, & Trevisan, 2003). A growing number of studies have highlighted that a combination of smoking and drinking can lead to excessive mortality (Hart, Smith, Gruer, & Watt, 2010). It is crucial for healthcare professionals to warn smokers about the adverse health consequences of smoking, and to help demystify misconceptions about drinking alcohol.

A majority of interview participants (n=25/30) regarded smoking cigarettes and marijuana and drinking alcohol as ways to vent negative emotions and cope with stress. However, evidence shows that engaging in these behaviours does not relieve stress and regulate emotions, but results in more tension and anxiety, leading to a vicious cycle (Moylan, Jacka, Pasco, & Berk, 2013). Clarifying these misconceptions and teaching young people alternative strategies for coping with negative emotions and stress could be a feasible approach to improving the efficacy of smoking cessation interventions targeting youth smokers with coexisting risk behaviours.

This study showed that risk behaviours were closely connected with smoking. This highlights a major limitation in YQ counselling services in Hong Kong (Li et al., 2017) and in many other parts of the world (Zhu, Anderson, Johnson, Tedeschi, & Roeseler, 2000), which often address smoking as an independent health-risk behaviour and neglect its connections with other risk behaviours. In Hong Kong, YQ did not start to introduce questions to assess the risk behaviours of young smokers during telephone counselling until 2011. Given the interrelationships between smoking and other risk behaviours, existing quitlines (including YQ) should consider adopting a holistic approach to promoting smoking cessation.

Limitations

Participants in this study were recruited through a quitline, which might limit the generalisability of the findings. Future studies should recruit young smokers using multiple sources to ensure the findings are more generalisable. In addition, some participants who abused drugs refused to participate in our semi-structured interviews, possibly because of social desirability bias. Future studies should use snowball sampling to enhance the participation rate.

Conclusion

This study bridges a gap in existing literature by exploring the relationship between smoking and other risk behaviours among young people in Hong Kong. Given the interrelationships between smoking and other risk behaviours, a holistic approach should be used to promote smoking cessation and encourage adoption of healthy lifestyles among young smokers.

Relevance to clinical practice

Provided with the interrelationships between smoking and other risk behaviours, a holistic approach to promoting smoking cessation should be considered in the existing quitlines (including YQ). Specifically, young smokers should simultaneously be advised to stop engaging in other risk

behaviours. Preventive measures for other risk behaviours should be considered as an integral part of counselling, thus precluding young smokers from advancing to more serious risk behaviours. Importantly, as well as encouraging young smokers to quit smoking as soon as possible, it is essential to deliver healthy lifestyle messages such as recommendations related to physical and psychological health This may enhance the effectiveness of smoking cessation and relapse prevention. If young smokers improve their health and quit smoking at the same time, their physical and mental development will benefit as a secondary outcome. Future large-scale studies should further examine the relationships between smoking and other risk behaviours in adolescents. In particular, more statistical analyses can be carried out to study the associations between demographic variables, and importantly how these variables may impact on the risk behaviours engaged by young smokers. Longitudinal research is also warranted to confirm the temporal sequence of risk behaviours.

Conflict of Interest

All authors report no conflict of interest.

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Contributions

KYH, WHCL, MPW and THL designed the study. KYH, WHCL, MPW and VWFC contributed to data collection and analysis. All authors have been actively involved in the interpretation of the results, drafting and critical revision of the manuscript. All authors read and approved the manuscript.

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References

Borland, R. (1990). Slip-ups and relapse in attempts to quit smoking. *Addictive Behaviors, 15*(3), 235-245. doi: 10.1016/0306-4603(90)90066-7

Census and Statistics Department (2016). Thematic Household Survey Report No. 59. Hong Kong, China: Census and Statistics Department, Hong Kong SAR.

Colaizzi, P. F. (1978). Psychological research as the phenomenologist views it. In R. S. Valle & M. King (Eds.), *Existential phenomenological alternatives for psychology* (pp. 48-71). New York, NY: Plenum.

Curran, K., Burk, T., Pitt, P., & Middleman, A. B. (2017). Tobacco use trends and associated drug and alcohol use in Oklahoma adolescents. *Journal of Adolescent Health, 60*(2), S13-S14. doi: 10.1016/j.jadohealth.2016.10.047

Guo, S. E., Huang, T. J., Huang, J. C., Lin, M. S., Hong, R. M., Chang, C. H., & Chen, M. Y. (2013). Alcohol, betel-nut and cigarette consumption are negatively associated with health promoting behaviors in Taiwan: A cross-sectional study. BMC Public Health, 13, 257. doi: 10.1186/1471-2458-13-257

Gerrish, K., & Lacey, A. (2006). *The research process in nursing* (5th ed.). Oxford, UK: Blackwell Publishing Ltd.

Hart, C. L., Smith, G. D., Gruer, L., & Watt, G. C. (2010). The combined effect of smoking tobacco and drinking alcohol on cause-specific mortality: a 30 year cohort study. *BMC Public Health, 10*, 789. doi: 10.1186/1471-2458-10-789

Houghton, C., Casey, D., Shaw, D., & Murphy, K. (2013). Rigour in qualitative case-study research. *Nursing Research, 20*(4), 12-17.

Kahler, C. W., Borland, R., Hyland, A., McKee, S. A., Thompson, M.E., & Cummings, K.M. (2009). *Alcohol consumption and quitting smoking in the International Tobacco Control (ITC) Four Country Survey. Drug Alcohol Depend. 100*(3), 214–220. doi: 10.1016/j.drugalcdep.2008.10.006

Kandel, D., & Yamaguchi, K. (1993). From beer to crack: Developmental patterns of drug involvement. *American Journal of Public Health, 83*(6), 851-855. doi: 10.2105/AJPH.83.6.851

Kim, O., & Kim, B. H. (2013). Association of asthma symptoms with cigarette smoking and alcohol consumption in Korean adolescents. Nursing & Health Sciences, 15(1), 65-72. doi: 10.1111/j.1442-2018.2012.00737.x.

Larson, N. I., Story, M., Perry, C. L,, Neumark-Sztainer, D., & Hannan, P. J. (2007). Are Diet and Physical Activity Patterns Related to Cigarette Smoking in Adolescents? Findings From Project EAT. *Preventing Chronic Disease, 4*(3), A51.

Lee, G., Akers, R. L., & Borg, M. J. (2004). Social Learning and Structural Factors in Adolescent Substance Use. *Western Criminology Review, 5*, 17-34.

Li, W. H. C, Chan, S. S. C., Wang, M. P., Ho, K. Y., Cheung, Y. T. Y., Chan, V .W. F., & Lam, T. H. (2017). An Evaluation of the Youth Quitline Service Young Hong Kong Smokers. *Journal of Adolescent Health, 60*(5), 584-591. doi: 10.1016/j.jadohealth.2016.11.022

Moylan, S., Jacka, F. N., Pasco, J. A., & Berk, M. (2013). How cigarette smoking may increase the risk of anxiety symptoms and anxiety disorders: a critical review of biological pathways. *Brain and Behavior, 3*(3), 302–326. doi: 10.1002/brb3.137

Noble, N., Paul, C., Turon, H., & Oldmeadow, C. (2015). Which modifiable health risk behaviours are related? A systematic review of the clustering of Smoking, Nutrition, Alcohol and Physical activity ('SNAP') health risk factors. *Preventive Medicine, 81*, 16-41. doi: 10.1016/j.ypmed.2015.07.003

Paavola, M., Vartiainen, E., & Haukkala, A. (2004). Smoking, alcohol use, and physical activity: a 13-year longitudinal study ranging from adolescence into adulthood. *Journal of Adolescent Health, 35*(3), 238–244. doi:10.1016/j.jadohealth.2003.12.004

Pasch, K. E., Laska, M. N., Lytle, L. A., & Moe, S. G. (2010). Adolescent Sleep, Risk Behaviors, and Depressive Symptoms: Are They Linked? *American Journal of Health Behavior, 34*(2), 237-248. doi: 10.5993/AJHB.34.2.11

Pathak, V. C. (2017). Phenomenological Research: A Study of Lived Experiences. *International Journal of Advance Research And Innovative Ideas In Education, 3*(1), 1719 – 1722.

Pavlov, I. P. (1927). *Conditioned Reflexes.* Dover: New York.

Prochaska, J. J., Spring, B., & Nigg, C.R. (2008). Multiple health behavior change research: an introduction and overview. *Preventive Medicine, 46*(3), 181-188. doi: 10.1016/j.ypmed.2008.02.001

Reed, M. B., Wang, R., Shillington, A. M., Clapp, J. D., & Lange, J. E. (2007). The relationship between alcohol use and cigarette smoking in a sample of undergraduate college students. *Addictive Behaviors, 32*(3), 449-464. doi: 10.1016/j.addbeh.2006.05.016

Rehm, J., Gmel, G., Sempos, C. T., & Trevisan, M. (2003). Alcohol-related morbidity and mortality. *Alcohol Research & Health, 27*(1), 39-51.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information, 22*(2), 63-75.

Streubert, H. J., & Carpenter, D. R. (2011). *Qualitative research in nursing: Advancing the humanistic imperative* (2nd ed.). Philadelphia, PA: Wolters Kluwer Health/Lippincott Williams & Wilkins.

The Government of the Hong Kong Special Administrative Region (2015, January 13).What locations are “Statutory No Smoking Areas”?. Retrieved from http://www.1823.gov.hk/eng/based/aboutus.aspx

Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care, 19*(6), 349-357. doi: 10.1093/intqhc/mzm042

Torabi, M., Bailey, W. J., & Majd-Jabbari, M. (1993). Cigarette smoking as a predictor of alchohol and other drug use by children and adolescents: Evidence of the "gateway drug effect". *Journal of School Health, 63*(7), 302-306. doi: 10.1111/j.1746-1561.1993.tb06150.x

Wilson, D. B., Smith, B. N., Speizer, I. S., Bean, M. K., Mitchell, K. S., Uguy, L. S., & Fries, E.A. (2005). Differences in food intake and exercise by smoking status in adolescents. *Preventive Medicine, 40*(6), 872–879. doi: 10.1016/j.ypmed.2004.10.005

Winkleby, M. A., Fortmann, S. P., & Rockhill, B. (1993). Cigarette smoking trends in adolescents and young adults: The Standford Five-city project. Preventive Medicine, 22 (3), 325-334.

Zhou, X., Su, Z., Deng, H., Xiang, X., Chen, H., & Hao, W. (2006). A comparative survey on alcohol and tobacco use in urban and rural populations in the Huaihua District of Human Province, China. Alcohol, 39(2), 87-96.

Zhu, S. H., Anderson, C. M., Johnson, C. E., Tedeschi, G., & Roeseler, A. (2000). A centralised telephone service for tobacco cessation: The California experience. *Tobacco Control, 9*(Suppl2), 48–55. doi: 10.1136/tc.9.suppl_2.ii48

Table 1. Demographic and socio-economic characteristics and smoking-related information of the participants (N = 1147).

	N (%)	Mean (SD)
Age		18.1 (3.0)
Gender		
Male	910 (73.3)	
Female	232 (20.2)	
Missing	5 (0.4)	
Education level		
Primary or below	3 (0.3)	
Junior secondary	293 (25.5)	
Senior secondary	240 (20.9)	
Sub-degree or above	500 (43.6)	
Other	34 (3.0)	
Missing	77 (6.7)	
Employment status		
Full-time students	822 (71.7)	
Employed/Self-employed	174 (15.2)	
Unemployed/Other	58 (5.1)	
Missing	93 (8.1)	
Marital status		
Single/separated/divorced	1068 (93.1)	
Married/cohabitated	19 (1.7)	
Missing	60 (5.2)	
Number of children		
0	1076 (93.8)	
1	3 (0.3)	
Missing	68 (5.9)	
Age of start smoking		
≤12	232 (20.2)	

	N (%)	Mean (SD)
13-18	788 (68.7)	
19-25	58 (5.1)	
Missing	69 (6.0)	
Years of smoking		
Less than 1 year	71 (6.2)	
1-3 years	517 (45.1)	
4-6 years	331 (28.9)	
≥7 years	209 (18.2)	
Missing	19 (1.7)	
No. of cigarette per day		
≤10	767 (66.9)	
11-20	301 (26.2)	
21-30	47 (4.1)	
≥31	19 (1.7)	
Missing	13 (1.1)	
Nicotine dependency level (Score ranged 0-10)[†]		
Mild (Score 0-3)	747 (65.1)	
Moderate (Score 4-5)	224 (19.5)	
Severe (Score 6-10)	151 (13.2)	
Missing	25 (2.2)	
Stage of readiness to quit (ITT)[‡]		
Pre-contemplation	324 (28.2)	
Contemplation	209 (18.2)	
Preparation	482 (42.0)	
Action	132 (11.5)	
Number of coexisting risk behaviors other than smoking		
0	625 (54.5)	
1	77 (6.7)	

	N (%)	Mean (SD)
2	201 (17.5)	
3	204 (17.8)	
4	40 (3.5)	

† By Fagerstrom test

‡ By Trans-theoretical Model

Table 2. Prevalence of different risk behaviours in the participants (N=1147).

	N (%)
Drinking alcohol	
Yes	277 (24.2)
No[†]	870 (75.8)
Physical inactivity	
Yes[‡]	450 (39.2)
No	697 (60.8)
Unhealthy diet	
Yes[§]	482 (42.0)
No	665 (58.0)
Drug abuse[¶]	
Yes	42 (3.7)
No	1105 (96.3)

[†]: Drank at least once over the past month

[‡]: Did not perform at least 30 minutes of moderate to vigorous physical activity in the past week

[§]: Had breakfasts ≤ 6 days/week; fruits and vegetables ≤ 1 times/day; milk products ≤ 2 days/week; soft drinks ≥ 1 times/day or fast foods ≥ 2 times/day

[¶]: Abused drug in the past week

Table 3. Themes, subthemes and their related quotes identified from the semi-structured interviews (n=30)

	Theme	Subtheme	Quote
1.	Relationship between smoking and drinking alcohol	Reasons for increased tobacco consumption when drinking	"I know I smoke more than usual when drinking alcohol. However, it is hard for me to resist when I see someone smoking outside the bar. My friends will also invite me to smoke outside when they see others doing so. This may be the reason why I smoke more."
		Drinking as a tempting situation for lapses/relapses	"I have tried to quit smoking before. However, my friends who were smokers always offered me cigarettes when drinking alcohol. It sounded very embarrassing to refuse. Once I took a puff on a cigarette, I could not resist the temptation and relapsed to smoking."
		Smoking and drinking to relieve stress and express negative emotions	"Drinking is a way to cheer myself up when I am in a bad mood. I will drink until getting drunk. If so, I can escape stress. Smoking is also a way for me to relieve stress and negative emotions. I often feel much more capable of managing stressful events and coping with my emotions after smoking cigarettes."
		Awareness of adverse health consequences	"Smoking and drinking do not have much health impact…Even though there are some threats in the long run, such threats are not imminent."
2.	Relationship between cigarette smoking and marijuana	-	"I am working for an insurance company which requires me to meet a sales quota. You know how stressful it is. I couldn't sleep well and used to wake up at night. I first tried using tobacco and alcohol to cope, but later on, I found smoking marijuana was even more useful."
3.	Relationship between smoking and unhealthy lifestyles	-	"I don't even care how smoking will affect my health. Why do I have to bother performing physical activity and eating healthily?"