Hardcore smoking after a comprehensive smoke-free legislation and health warning on cigarette package in Hong Kong

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ABSTRACT

Objective   To examine if there were changes in the proportions of hardcore smokers and its associated factors before and after the implementation of a smoking-free legislation and warning labels on cigarette package in Hong Kong in January 2007.

Study Design   Repeated cross-sectional surveys of the general population in Hong Kong.

Methods   We used data from all the daily smokers aged 15 or above in the population-based surveys, Thematic Household Surveys, carried out in 2005 (N=3,740) and 2008 (N=2,958) to estimate the prevalence of hardcore smokers before and after the implementation of the legislation. Logistic regression model was used to identify the factors associated with hardcore smoking and to examine if there is any change in their associations with the likelihood of hardcore smoking after the legislation.

Results   The proportion of hardcore smokers among current daily smokers increased from 22.5% (95%CI 21.1% to 23.8%) in 2005 to 28.3% (95%CI 26.7% to 29.9%) in 2008. There were changes in the magnitudes of the associations of hardcore smoking with three factors: 'Necessity in social functions' (OR = 0.54, 95%CI 0.31 to 0.95) and 'Necessity for killing time' (OR = 0.56, 95%CI 0.36 to 0.89) decreased while that with 'Necessity as refreshment' increased (OR = 3.02, 95%CI 1.43 to 6.39) after the smoking ban and warning labels. In addition, 'Smoking had become a habit' was the strongest factor associated with hardcore smoking (OR = 4.88, 95%CI 4.02 to 5.93).

Conclusions   The proportion of hardcore smokers remained stable in Hong Kong from 2005 to 2008. While the implementation of the two tobacco control measures might have provided an environment to reduce social smoking in hardcore smokers, addiction appeared to be the most important associated factor of hardcore smoking. More effective and tailor-made cessation services that target this group of smokers are needed.

Keywords: hardcore smoking; smoke-free legislation; tobacco control; warning labels

INTRODUCTION

Hong Kong has a long history in tobacco control since the early 1980s including tobacco tax increase, bans on advertisements of tobacco products on broadcast and printed media, and bans on smoking in many public places. The intensity of tobacco control measures increased sharply with a comprehensive smoke-free legislation implemented on 1 Jan 2007. Smoking has been totally prohibited in all indoor workplaces, all public indoor and some outdoor places, and graphic and text health warnings are required on cigarette packages.[1] Similar to studies in other places with stringent tobacco control measures,[2,3] the overall smoking prevalence in Hong Kong declined gradually from 15.7% (male:28.5%; female:2.6%) in 1990, to 14.0% (male:24.5%; female:4.0%) in 2005, and 11.8% (male:20.5%; female:3.6%) in 2008.[4,5]

The reduction in the smoking prevalence might be partially resulted from increased quitting among adult smokers as the rate of former smokers increased from 4.5% in 2005 to 5.1% in 2008. However, there were still 679,500 daily smokers aged ≥15 years in 2008, 55.5% of them had never tried and did not want to give up smoking; and 92.0% of those who did not want to quit would not try any existing cessation service.[4] Indeed, only about 3,000 smokers had actively sought smoking cessation counselling provided by Hong Kong Department of Health from Sept 2003 to Mar 2009.[6] These observations suggest that a sizable group of smokers are resistant to giving up smoking: a hardening of the smoking population as a whole could have occurred in Hong Kong.[7-9]

Although there were controversies in the definitions of hardcore smoking,[10] several studies attempted to quantify the extent of hardcore smoking and to characterize hardcore smokers.[11-18] While hardcore smokers are usually characterized as regular smokers with heavy nicotine dependence, a lack of recent quit attempts and no intention to quit, some studies also included an additional criterion: they were 25 years and older. Among studies with the additional age criterion and used samples of smokers aged over 25, recent estimates indicated that 13.7% were considered hardcore in US and 14.3% in Canada and ranged from 23% in Norway to 39.9% in Poland in European countries.[11-15] Among studies which did not include the age criterion and used samples of daily adult smokers, the proportions of hardcore

smokers were estimated as 2% in Australia, 16% in England, and over 18% in Asian countries ranging from 18.3% in Bangladesh to 29.7% in Thailand.[16-18] In general, hardcore smokers were they were more likely to be males, had low education and income levels, younger at smoking initiation and smoked at home.[15,17-19]

There are currently no estimates of hardcore smoking prevalence or its correlates in Hong Kong which has the lowest smoking rate in the developed world, with a marked difference across gender, intensive tobacco control, and some smoking cessation service. The aims of the present study were to examine the impact of the 2007 smoke-free legislation and health warning on cigarette package on hardcore smoking. Specially, we tested whether there was an increase in the prevalence of hardcore smokers and a change in the associated factors of hardcore smoking in Hong Kong after the implementation of the smoking ban and health warning labels on cigarette package.

METHODS

Source of data

This is a secondary data analysis using population data on pattern of smoking from the Thematic Household Survey (THS) in 2005 and 2008 obtained from the Hong Kong Census and Statistics Department (C&SD) were used in the study. The THS is a territory-wide representative household survey covering about 99% of the Hong Kong resident population excluding inmates of institutions and persons living on board vessels. Each round of the THS was commissioned to an independent private survey firm and coordinated and managed by C&SD. The THS serves as a major source of official government statistics on selected social issues. Since 2000, the THS includes measures of several smoking-related topics, and the design of this survey is to allow for stable estimates of population smoking rate in Hong Kong. The 2005 and 2008 THS included responses from 10,096 persons aged over 11 years and 10,010 persons aged over 9 years and the corresponding response rate was 77% and 75% respectively.[4,5] Only self-reported responses were included in the smoking-related topics.

We included current daily smokers who were 15 years old or over in the analysis. The THS reported that the estimates of smoking rate for youngsters (<15 years old) were

unreliable because (i) smoking among youngsters is less socially acceptable in the community, and (ii) the corresponding age-specific smoking rate is small that the survey did not have enough sample size to achieve a reliable estimate.[4,5] A total of 3740 and 2958 current daily smokers responded to the THS2005 and THS2008 respectively. Because most of the variables including the three major variables, age, age starting smoking and daily cigarette consumption (see below in the measured variable section), were collected in categorical formats in THS2005, we defined hardcore smokers using five criteria: (1) daily smokers, (2) had a smoking history of at least 6 years, (3) had no history of quit attempts in the past, (4) did not want to give up smoking, and (5) smoked at least 11 cigarettes per day on average. There are two discrepancies regarding smoking history and daily cigarette consumption in our definition of hardcore smoking from those reported in the literature. Since we computed smoking history by the difference of age and age starting smoking, for some smokers, we could only know that they had been smoking for 1 to 9 years; and this group of smokers was not classified as hardcore (THS2005: 60, THS2008: 44).

Measured variables

Five types of variables including demographics, socioeconomic-related, work environment, smoking-related, and cessation-related variables were collected in both THS2005 and 2008; and a total of 35 categorical variables were used in the present analysis as follows:

Demographics

Three demographic characteristics including (1) age group (15-29, 30-39, 40-49, 50-59 and 60+), (2) gender, and (3) marital status (single, married, separated/divorce, and widowed).

Socioeconomic-related variables

Five socioeconomic status indicators : (1) educational level (primary or below, secondary, and tertiary or above), (2) household income level (below HK$10000, HK$10000-HK$19999, HK$20000-HK$29999, and HK$30000 or above; US$1 = HK$7.8), (3) employment status (economically active and economically inactive), (4) occupational group (managers and administrators, professionals, associate professionals, clerks, service workers and shop sales workers, craft and related workers, plant and machine operators and assemblers, others or not

applicable), and (5) industry group (manufacturing; construction; wholesale, retail & import/export trades; restaurants & hotel; transport, storage and communications; financing, insurance, real estate and business services; community, social and personal services; and others). There were a few number of missing responses to occupational group (<0.1%) which were classified into the group of 'others or not applicable'.

Work environment variables

There were two questions on working environment in both waves of THS: (1) the nature of the workplace (mainly indoor, mainly outdoor, both indoor and outdoor, indoor only, outdoor only, mainly inside the vehicles, and not applicable), and (2) whether the subject had smokers smoking within 3 meters, in the workplace (yes, no or not applicable).

Smoking-related variables

The THS included three smoking-related questions: (1) age starting smoking cigarettes weekly (under 20, 20-24, 25-29, 30+), (2) daily cigarette consumption (10 or below, 11-20, 21-30, 31+), and (3) ten reasons for their starting to smoke cigarettes were available for selection: influenced by friends, influenced by parents/other family members, out of curiosity/fun, for refreshment, social needs, to kill time, to ease tension, to make oneself look more mature/stylish, influenced by public figures/artists, and influenced by TV programs/movies). Thus, a total of 12 categorical smoking-related variables were included.

Cessation-related variables

Three cessation-related questions were asked in the THS for smokers: (1) whether they were aware of existing smoking cessation service, (2) whether they have heard about telephone smoking cessation services and (3) the reasons for why they did not want to give up smoking with 11 options ('Smoking has become a habit'; 'not enough determination'; 'most friends or colleagues are smokers'; 'severe psychological/physical discomfort when quitting smoking'; 'necessity as a refreshment'; 'necessity in social functions'; 'necessity for killing time'; 'necessity for easing tension'; 'too easy to get cigarettes or other forms of tobacco products (e.g. cigar, pipe, water pipe, hand rolled tobacco)'; 'worry about getting sick after quitting smoking'; and 'worry about getting fat after quitting smoking'. A total of 13 cessation-related variables were included.

Statistical Analysis

Data were analyzed using SPSS20.0. The prevalence of hardcore smoking was estimated overall and by sex and age group for 2005 and 2008 respectively. Bivariate and multivariate analyses were performed to identify potential associated factors of hardcore smoking. In the bivariate analyses, the chi-square test was used to examine the association of hardcore smoking with each of the related variables available in the dataset. Then, we fitted a logistic regression model including a variable 'Year' (0 = '2005' and 1 = '2008'), all the associated variables (with a p-value < 0.2) identified in the bivariate analyses and their interaction terms with Year. Both p-values and the associated 95% confidence intervals of the odds ratios were reported for significant variables in the final logistic regression model.

RESULTS

Overall, 22.5% (95% CI 21.1% to 23.8%) and 28.3% (95% CI 26.7% to 29.9%) of Hong Kong daily smokers aged 15 years or older were hardcore in 2005 and 2008 respectively (table 2). The prevalence of hardcore smokers increased from 24.4% to 30.2% in men and from 11.1% to 17.8% in women; the relative increases in the proportion of hardcore smokers in women (60.4%) more than doubled that in men (23.8%) in the period. The prevalence of hardcore smoking also increased in all the five age groups after the implementation of the comprehensive smoke-free legislation. The hardcore smoking prevalence also increased with age, reaching the highest in the 50-59 year age group, and then dropped in the 60+ age group in both years.

A total of 27 significant associated factors of hardcore smoking were identified in the bivariate analyses (Supplement 1), and they were together with the 'Year' indicator and their interaction terms with 'Year' included in the final logistic regression. Among them, three demographic variables, one socioeconomic variable, one smoking-related variable and seven cessation-related variables remained statistically significant and three interaction terms were also found to be significant in the logistic regression model (Table 3). The results revealed that those smokers in the 15-29 age group and who were married were less likely while those who were male, had smokers within 3 meters in the workplace, and had started smoking under 20 were more likely to be hardcore. Regarding the seven cessation-related variables, those smokers who did not want to give up smoking because of 'Smoking had become a habit', 'Not enough determination', 'Most friends or colleagues are smokers', 'Necessity in social function',

'Necessity for killing time' and 'Necessity for easing tension' were more likely and those who were aware of any smoking cessation services were less likely to be hardcore smokers. For the three significant interaction terms with Year, the results revealed that the strength of the associations of being hardcore smokers with 'Necessity as a refreshment' had increased while that of 'Necessity in social function' and 'Necessity for killing time' had decreased after the smoke-free legislation.

DISCUSSION

In 2005 and 2008, about a quarter of Hong Kong smokers over 14 years old could be considered as hardcore smokers. Although it may not be directly comparable due to the differences in the definitions of hardcore smoking, when compared to studies which did not include the age criterion for hardcore smoking, the prevalence of hardcore smokers in Hong Kong was comparable to those of three Asian countries (18.3% - 29.7%) and higher than that in England and Australia.[16-18] Our results also showed that the proportion of hardcore smoking remained stable before and after the implementation of a smoke-free legislation and warning labels in 2007, which did not support there was a hardening of the smoking population in Hong Kong.[20] Nevertheless, such a high proportion of smokers who had no history of quit attempts and did not want to give up smoking remained after intensive tobacco control measures warrants new effort in helping these particular subgroup of smokers to quit. Similar to many previous studies,[15,17-19] hardcore smokers in the current study differed substantially from their non-hardcore counterparts in terms of their demographic and smoking profiles. Overall smokers who were older, male, and started smoking at a younger age were more likely while those who were married or widowed were less likely to be hardcore smokers.

Our results showed that there might be a change in the function of smoking after the implementation of the smoke-free legislation and addition of warning labels on cigarette packages in Hong Kong. Specially, the strength of the associations of the likelihood of being hardcore smokers with three reasons for not wanting to give up smoking had changed: 'Necessity as refreshment' increased, while that of 'Necessity in social functions' and 'Necessity for killing time' decreased in the study period. This could be due to the changes in the smoking environment - smokers are no longer allowed to smoke indoors at their workplaces and have to break off from

work to smoke outside, and people can no longer smoke when gather for indoor social functions in public places. But further studies should examine this assertion by in-depth interviews or other qualitative methods. Five reasons for not wanting to give up smoking including 'Not enough determination', 'Most friends/colleagues are smokers', 'Necessity in social functions', 'Necessity for killing time', and 'Necessity for easing tension' were significant associated factors of hardcore smoking. These factors seemed to be some psychological factors relating to self-efficacy to resist smoking due to internal and external stimulates which suggest that boosting self-efficacy of hardcore smokers may be a useful way to help them to quit. Nevertheless, additional psychosocial factors, such as attitudes toward second-hand smoke exposure or smoking cessation, perceived health status, perceived stress and quitting self-efficacy should all be examined in future studies.[21]

Nicotine dependency is consistently reported as a predictor of hardcore smoking. Although we did not have direct measures of nicotine dependency in THS2005 and THS2008, 'Smoking had become a habit' (one of the reasons for not wanting to give up smoking) and amount of smoking which are two important components of nicotine dependency were included in the analysis. Unlike a previous study reporting hardcore smokers were more likely to smoke heavier,[22] we found daily cigarette consumption was not associated with hardcore smoking in the bivariate analysis. This result might be due to the small amount of variations in the individual's daily cigarette consumption: about half the sample smoked 1-10 cigarettes, slightly less than half smoked 11-20 and only about 5% smoked more than 20 a day, under both THS2005 and THS2008. Another possible reason was the definition of hardcore smokers regarding daily cigarette consumption (more than 10 cigarettes) used in the current study might have masked the results although another previous study had reported that daily cigarette consumption may not be useful in defining hardcore smokers.[23] Alternatively, we found that 'Smoking had become a habit' was the strongest factor associated with hardcore smoking in the current sample, which still suggested that addiction to smoking might play a more important role in hardcore smoking among Hong Kong smokers. Nevertheless, the findings suggest that hardcore smokers seem to have a particular demographic and smoking profile; and smoking cessation service targeting those hardcore smokers who had no intention to quit such as a smoking reduction approach[24] could be developed.

Awareness of existing cessation clinics was the strongest negative factor associated with hardcore smoking in the final logistic regression analysis. The finding suggested that promoting awareness of existing cessation service could be important even though the association might not be causal and temporal sequence was uncertain. With respect to the recommendations for tobacco control policy of the World Health Organization (WHO), there is clearly room for improvement in Hong Kong. In particular, more public information campaigns should be mounted to raise awareness of existing smoking cessation services among all smokers and motivate them to quit. In addition, although Hong Kong does participate in various events such as World Tobacco Day, the amount of money spent on widespread media campaigns is still relatively small. The government should therefore follow the WHO recommendation to earmark tobacco tax revenues for the funding of tobacco control programmes. In particular, further studies on the suitability of current tobacco control measures in helping hardcore smokers to quit will be needed as most of the evidence from smoking cessation services in the world is not based on hardcore smokers.

The main strength of the present study was the comprehensive smoke-free legislation and warning labels on cigarette package were the only two measures implemented during the study period between 2005 and 2008, hence the results were mainly reflecting the impact of the legislation and warning labels on cigarette packages but not from other tobacco control measures (there was no increase in tobacco tax). In addition, the study employed population-based data which ensures the sample's representativeness for the population in Hong Kong. The present study on the other hand had several limitations and the results should be interpreted with caution. First, since it is a secondary analysis of existing data set and many variables measured in THS2005 were in categorical format making the smoking history of a few of the smokers unclear and they were classified as non-harcore. This could have resulted in an underestimation of the proportion of hardcore smokers in the smoking population. In addition, the difference in the operational definition of hardcore smoking in the current study reduces the comparability of the current findings with those from previous studies. Secondly, there was a lack of valid measure of nicotine dependence although previous studies have highlighted the strong association between hardcore smoking and nicotine dependence. Thirdly, some previously reported predictors of hardcore smoking, such as quitting self-efficacy and perceived stress, were not included in the

THS2005 and THS2008, which not only prevented us from projecting the full picture of factors associated with hardcore smoking in Hong Kong, but also limits the comparability of the current results with those of previous studies in other countries. Fourthly, although we have followed the commonly used procedure in identifying associated factors using two steps of bivariate analyses followed by the logistic regression, the results should be interpreted with caution due to the multiple comparisons made which have inflated the likelihood of chance of significant factors. Finally, due to the nature of repeated cross-sectional samples used in the current analysis, the findings only represent the secular trends in hardcore smoking and no causal inference about the associations of hardcore smoking with the factors could be made.

In conclusion, the proportions of hardcore smokers from 2005 to 2008 remained stable which suggests that a hardening of the smoking population might not have occurred in Hong Kong after the implementation of the comprehensive smoke-free legislation and addition of the warning labels on cigarette packages. The findings also suggest that while the implementation of the two tobacco control measures may have provided an environment to reduce social smoking in the community, individual factors such as addiction to smoking and lack of determination to stop smoking due to both internal and external simulates remained significant associated factors of hardcore smoking. More effective and tailor-made smoking cessation services that focus on self-efficacy in resisting smoking are needed. The results also shed light on the direction that future cessation services might need to deal with hardcore smoking. In particular, treatments should both focus on breaking the linkage between smoking and habit, and also have an additional component that tackles external stimuli such as 'Smoking is for refreshment' and 'easing tension'.

Ethical approval

Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster

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Competing interests

None declared

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Table 1 Prevalence of hardcore smoking in Hong Kong by age, gender, and survey year

	THS2005 (N=3740) Percentage (95% CI)	THS2008 (N=2958) Percentage (95% CI)	p-value
Age Group			
15-29	10.9 (8.5-13.2)	17.1 (13.9-20.3)	0.007
30-39	21.8 (18.9-24.6)	27.4 (23.9-30.9)	0.013
40-49	25.0 (22.2-27.9)	32.1 (28.5-35.6)	0.003
50-59	29.8 (26.3-33.3)	34.6 (30.8-38.4)	0.070
60+	24.6 (21.4-27.8)	28.7 (24.7-32.6)	0.115
Gender			
Male	24.4 (22.9-25.9)	30.2 (28.4-32.0)	<0.001
Female	11.1 (8.5-13.8)	17.8 (14.3-21.3)	0.009
Total	22.5 (21.1-23.8)	28.3 (26.7-29.9)	<0.001

Table 2 Results of the final logistic regression of hardcore smoking

Variables*	Main effect		Interaction term with Year	
	Adjusted Odds ratio (95% CI)	p-value	Adjusted Odds ratio (95% CI)	p-value
Year (2005 as reference)	0.91 (0.28 - 2.94)	0.879	Not applicable	
Demographic characteristics				
Age Group (years)		<0.001		0.119
15 – 29	0.21 (0.13-0.34)		2.32 (1.18-4.55)	
30 – 39	0.73 (0.49-1.08)		1.90 (1.08-3.36)	
40 – 49	1.00 (0.70-1.43)		1.61 (0.96-2.70)	
50 – 59	1.31 (0.94-1.82)		1.27 (0.78-2.05)	
60+	1.00		1.00	
Marital Status		<0.001		0.135
Married	0.53 (0.41-0.68)		1.34 (0.93-1.95)	
Separated /Divorced	0.96 (0.59-1.58)		0.74 (0.37-1.47)	
Widowed	0.49 (0.28-0.84)		1.55 (0.70-3.45)	
Single	1.00		1.00	
Gender		0.013		0.524
Male	1.51(1.09-2.09)		1.16 (0.74-1.81)	
Female	1.00		1.00	
Socioeconomic-related variables				
Smokers within 3 meters in the workplace		0.042		0.960
Yes	1.27 (1.01-1.59)		1.01 (0.71-1.42)	
No	1.00		1.00	
Smoking-related variable				
Age starting smoking cigarette (years)		<0.001		0.174
< 20	1.96 (1.22-3.15)		1.92 (0.86-4.28)	
20-24	1.33 (0.81-2.17)		2.19 (0.96-4.98)	
25-29	1.25 (0.68-2.28)		1.31 (0.47-3.64)	
30+	1.00		1.00	
Cessation-related variable				
Aware of any smoking cessation clinics or centres in Hong Kong	0.67 (0.54-0.82)	<0.001	0.99 (0.72-1.38)	0.960

Reasons for not wanting to give up smoking

Smoking had become a habit	4.88 (4.02-5.93)	<0.001	0.92 (0.70-1.21)	0.537
Not enough determination	1.82 (1.47-2.24)	<0.001	1.06 (0.75-1.50)	0.741
Most friends or colleagues are smokers	1.50 (1.19-1.89)	0.001	1.04 (0.70-1.53)	0.863
Necessity as a refreshment	1.40 (0.96-2.04)	0.077	3.02 (1.43-6.39)	0.004
Necessity in social functions	1.58 (1.17-2.13)	0.003	0.54 (0.31-0.95)	0.031
Necessity for killing time	1.81 (1.35-2.42)	<0.001	0.56 (0.36-0.89)	0.013
Necessity for easing tension	1.62 (1.15-2.29)	0.006	1.47 (0.79-2.72)	0.223