


Factors Associated With Smoking Intentions Among Chinese College Students

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Abstract

Smoking intention is a strong predictor of future smoking behavior. The aim of this study is to identify the significant factors associated with smoking intention among Chinese college students. A total of 2,827 students in Eastern, Middle, and Western regions of China, randomly selected using a multistage sampling method, completed the self-administered questionnaires. The association of independent variables with smoking intention was evaluated using the logistic regression model. Overall, the proportion of college students with a strong smoking intention was 6.9%. Male students (odds ratio [OR] 2.205, 95% confidence interval [CI] [1.374, 3.538]), those students whose mothers smoked (OR 3.328, 95% CI [1.527, 7.252]), those whose mothers had a higher educational level (OR 0.583, 95% CI [0.346, 0.984]), current smokers (OR 14.081, 95% CI [9.306, 21.307]), former smokers (OR 3.824, 95% CI [1.728, 8.463]), and those for whom most (OR 2.663, 95% CI [1.348, 5.261]) or a few (OR 1.826, 95% CI [1.045, 3.191]) of their closest friends were smokers had statistically significant associations with the smoking intentions of Chinese college students. Further studies are needed to elucidate mechanisms and pathways across various factors, and these factors should be incorporated into future multilevel interventions designed to decrease smoking intention among college students.

Keywords

smoking intention, college students, factors, China

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In 2015, smoking was listed as one of the five leading risk factors by disability-adjusted life-years (DALYs) in 109 countries and territories. It was estimated that 11.5% of global deaths (6.4 million), of which 52.2% took place in four countries (China, India, the United States, and Russia), were attributable to smoking (GBD 2015 Tobacco Collaborators, 2017). In China, prevalence of smoking among men was 52.9% (one of the highest rates in the world) and among women was 2.4% (one of the lowest), and secondhand smoking exposure was as high as 72.4%. The proportion of deaths attributable to tobacco increased from 12.8% (9.9–16.9) in 1990 to 16.4% (12.8–19.9) in 2010 and will increase because of the lag between tobacco consumption and death rates (Yang et al., 2013). International and domestic research concluded that adolescents have a high risk of smoking and the smoking rates would rise with increasing age (Home, 2004). College students comprised one of the groups especially prone to adopting risky behavior such as smoking and

illicit substance use (Abdullah, Fielding, & Hedley, 2010; Farajat, Hoving, & De Vries, 2011); the association of risky behavior and the underdevelopment of emotional instability and sensitivity has been verified (Alharthi & Aladawi, 2002).

Behavior intention precedes actual behavior, as proven by behavioral theories, such as the theory of Reasoned Action (Fishbein & Ajzen, 1975) and the theory of Planned

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Behavior (Ajzen & Madden, 1986). Accordingly, intention to smoke is regarded as a strong predictor of future smoking behavior. Being aware of smoking intention and the related predictors can provide considerable advantages in terms of seeking to control smoking.

Numerous determinants may contribute to smoking intention of college students. First, social demographic determinants were the most frequently expressed reasons for smoking intention. Stronger smoking intention is usually associated with deprivation and disadvantage, including poor housing, low income, single parenthood, unemployment, and homelessness (Muller, 2007; Wilkinson & Marmot, 2003). Second, psychological factors were also common determinants that influenced smoking intention (Tyas & Pederson, 1998). Stress and risk-taking tendency were factors significantly associated with smoking intention (Ra & Cho, 2016). Many people choose smoking as a means of relieving stress, anxiety, and other negative psychological states. Studies have concluded that a large cohort of college student smokers initiate smoking to cope with academic stress (Chassin, Presson, Pitts, & Sherman, 2000) and identity developmental concerns (Mandil, Hussein, Omer, Turki, & Gaber, 2007).

Smoking among college students is of particular public concern because they will play a leading role in public health policy-making to control tobacco use as educated professionals in the future (Taheri, Ghorbani, Salehi, & Sadeghnia, 2015). As intention usually represents a decision to exert effort to perform the behavior (Burton, Sussman, Hansen, Johnson, & Flay, 2010; Higgins & Conner, 2003; Tickle, Hull, Sargent, Dalton, & Heatherton, 2006), it is crucial to identify the underlying determinants of college students' smoking intention in order to target the right determinants for tobacco control among them. However, there is less available evidence of the status of college students' smoking intention and the associated determinants in China, as the majority of research has mainly been targeted at current smokers. The purpose of this study was to examine the status of smoking intention and to identify the factors associated with smoking intention among Chinese college students.

Materials and Methods

Data Source and Sampling

Data were collected from a cross-sectional survey conducted in the Eastern, Middle, and Western regions of China in June 2017. Regions in China are customarily separated into three geographic regions: East China, Middle China, and West China. Areas belonging to the same geographic region share similar socioeconomic status. Generally, East China has the best economic performance, followed by

Middle China, with the worst economic performance in West China. In this study, prefecture-level city was defined as the primary sampling unit.

A multistage, stratified, cluster, random sampling method was employed in this survey. First, three prefecture-level cities were randomly selected according to their socioeconomic status. Nanjing, Taiyuan, and Guilin were the selected sample cities. Second, two universities were selected within each city. Third, 15 classes were sampled within each college. Finally, a random sample of college students was selected from each class. This sample included all students, no matter what their current smoking status. The number of students selected from each college was proportionate to the enrolment of each college. The sample size estimate was calculated using G*Power Version 3.13 (Faul, Erdfelder, Buchner, & Lang, 2009). This study used the maximum tolerable error of 3% with a design effect of 0.67 and assumed intraclass correlation coefficient of 0.5. A total of 2,864 college students were selected based on the prevalence of smoking intention of 6% for college students. The effective sample sizes for three districts in Eastern, Middle, and Western China were 965 (33.7%), 796 (27.8%), and 1,103 (38.5%), respectively. Finally, 2,827 responses were collected, comprising a response rate of 98.7%. All interviews were conducted by trained investigators using a structured questionnaire, which included the general characteristics, smoking status, smoking intention of the college students, and the potential associated determinants. All participants provided informed consent. Ethical approval including the consent procedure was obtained from the Research Ethics Committee of (Nanjing Medical University, Nanjing), China.

Measures

The primary outcome measure was smoking intention. It was assessed by self-reports using a previously used question: "Do you intend to start smoking in the future?" A 5-point Likert scale was used in the answer format (1 = *certainly not*; 2 = *no*; 3 = *I don't know*; 4 = *yes*; 5 = *certainly yes*). College students who indicated *no* or *certainly not* or *I don't know* were categorized as not having a strong smoking intention (coded as 0). Otherwise, college students were categorized as having a strong smoking intention (coded as 1). For the purposes of this study, only a limited number of the comprehensive list of sociodemographic and socioeconomic indicators included in the questionnaires were analyzed, as many were correlated with each other and we wished to focus on the social determinants. The variables selected were sex, age, type of college, region, number of children in the family, type of family, parents' educational attainment, domestic violence, academic performance, living expenses, and household income.

Data Analysis

All data were processed using the program SPSS 22.0 (SPSS, Inc., Chicago, IL, USA) and Epidata 3.1. QQ plots and Kolmogorov–Smirnov test were used to test the normality of distribution. For the comparison of categorical variables, Pearson’s χ^2 test or Fisher’s exact test was used, as appropriate. Multivariate logistic regression analysis was performed to identify factors associated with the delivery mode. In the regression model, the stepwise method was adopted to achieve a final model considering that multicollinearity might exist. The standard for the variable inclusion was based on SLE = 0.05, and the exclusion standard was SLS = 0.10. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated, and *p* values < .05 were considered statistically significant.

Results

Sociodemographic and Socioeconomic Characteristics

Table 1 provided the results of the association between smoking intention and sociodemographic and socioeconomic characteristics. Overall, the proportion of college students with a strong smoking intention was 6.9% (194/2,827). The proportion of male students with a strong smoking intention was much higher than that of female students (160 [12.2%] vs. 34 [2.3%]), and the proportion of students aged over 20 years with a strong smoking intention was higher than that of students aged 20 years or younger (104 [8.9%] vs. 90 (5.4%)). Moreover, college students living in West China, being the only child in the family, having a mother with a higher educational level, having a lower academic performance, having higher monthly living expenses, or being in a richer family were more likely to have a strong smoking intention.

Smoking Exposures

Table 2 revealed the result of the associations between smoking intention and smoking exposures. Students who were current smokers or whose mothers or roommates were current smokers were more likely to have a strong smoking intention. Moreover, there was a significant difference in the students’ smoking intention if they had a different number of very close friends who were smokers. However, father’s smoking status did not influence the student’s smoking intention, and intention to smoke among smokers did not differ by average cigarettes smoked per day over the past weeks or the age of starting smoking.

Table 1. Baseline Characteristics of College Students With Strong and Weak Smoking Intention.

| | Strong intention | Weak intention | <i>p</i> value |
|---|------------------|----------------|----------------|
| Total (%) | 194 (6.9) | 2,633 (93.1) | |
| Sex | | | <.001* |
| Male | 160 (12.2) | 1,156 (87.8) | |
| Female | 34 (2.3) | 1,477 (97.7) | |
| Age (years) | | | <.001* |
| ≤20 | 90 (5.4) | 1,564 (94.6) | |
| >20 | 104 (8.9) | 1,069 (91.1) | |
| Type of college | | | .071* |
| Medical college | 73 (5.9) | 1,166 (94.1) | |
| Nonmedical college | 121 (7.6) | 1,467 (92.4) | |
| Region | | | <.001* |
| East | 50 (5.3) | 897 (94.7) | |
| Middle | 60 (5.5) | 1,024 (94.5) | |
| West | 84 (10.6) | 712 (89.4) | |
| The only child in family | | | .029* |
| Yes | 88 (8.2) | 987 (91.8) | |
| No | 106 (6.1) | 1,646 (93.9) | |
| Single-parent family | | | .298* |
| Yes | 18 (8.6) | 191 (91.4) | |
| No | 176 (6.7) | 2,442 (93.3) | |
| Father’s educational level | | | .087* |
| High school and below | 127 (6.3) | 1,876 (93.7) | |
| Above high school | 67 (8.1) | 757 (91.9) | |
| Mother’s educational level | | | .004* |
| High school and below | 130 (6.1) | 2,008 (93.9) | |
| Above high school | 64 (9.3) | 625 (90.7) | |
| Experiencing domestic violence | | | .086** |
| Often | 5 (11.6) | 38 (88.4) | |
| Seldom | 40 (8.6) | 423 (91.4) | |
| Never experienced domestic violence | 149 (6.4) | 2,172 (93.6) | |
| Academic performance | | | <.001* |
| A/B/C | 140 (5.8) | 2,264 (94.2) | |
| D/E | 54 (12.8) | 369 (87.2) | |
| Average monthly living expenses (RMB) | | | <.001* |
| ≤1,500 | 151 (6.2) | 2,298 (93.8) | |
| >1,500 | 43 (11.4) | 335 (88.6) | |
| Average monthly household income (RMB) | | | .028* |
| ≤6,000 | 132 (6.3) | 1,979 (93.7) | |
| >6,000 | 62 (8.7) | 654 (91.3) | |

Note. Data shown are number (percentage) for all variables. **p* value is based on χ^2 test. ***p* value: Fisher’s exact test.

Factors Associated With Smoking Intention

The results of the multivariate logistic regression analysis assessing the factors of smoking intention among college

Table 2. Smoking Exposures of College Students With Strong and Weak Smoking Intention.

| | Strong intention | Weak intention | p value |
|--|------------------|----------------|---------|
| Total (%) | 194 (6.9) | 2,633 (93.1) | |
| Current smoking status | | | <.001** |
| Smoking | 108 (54.4) | 129 (45.6) | |
| Have quit smoking | 10 (19.2) | 42 (80.8) | |
| Never smoked | 76 (3.0) | 2,462 (97.0) | |
| Average number of cigarettes smoked per day | | | .189 |
| ≤1 | 17 (41.5) | 24 (58.5) | |
| 1–10 | 46 (55.4) | 37 (44.6) | |
| >10 | 22 (61.1) | 14 (38.9) | |
| Age of starting to smoke | | | .958 |
| ≤18 | 74 (41.8) | 103 (58.2) | |
| >18 | 34 (41.5) | 48 (58.5) | |
| Current smoking status of father | | | .661 |
| Smoking | 126 (7.1) | 1,644 (92.9) | |
| Have quit smoking | 22 (7.1) | 286 (92.9) | |
| Never smoked | 46 (6.1) | 703 (93.9) | |
| Current smoking status of mother | | | <.001** |
| Smoking | 14 (23.0) | 47 (77.0) | |
| Have quit smoking | 2 (13.3) | 13 (86.7) | |
| Never smoked | 178 (6.5) | 2,573 (93.5) | |
| Current smoking status of roommates | | | <.001** |
| Smoking | 110 (17.3) | 526 (82.7) | |
| Have quit smoking | 4 (23.5) | 13 (76.5) | |
| Never smoked | 80 (3.7) | 2,094 (96.3) | |
| Number of smokers among closest friends | | | <.001** |
| None | 17 (1.8) | 902 (98.2) | |
| A few ^a | 124 (7.4) | 1,558 (92.6) | |
| Most ^b | 51 (23.0) | 171 (77.0) | |
| All | 2 (50.0) | 2 (50.0) | |

Note. Data shown are number (percentage) for all variables.

^aThe proportion of smokers in the total number of closest friends is less than 50%. ^bThe proportion of smokers in the total number of closest friends is more than 50%.

*p value is based on χ^2 test. **p value: Fisher's exact test.

students are presented in Table 3. The prevalence of male students with a strong smoking intention was twice that of female students (OR 2.205, 95% CI [1.374, 3.538]). Students were more likely to have a strong smoking intention if their mothers were smokers (OR 3.328, 95% CI [1.527, 7.252]), but fathers' smoking status did not significantly impact on students' smoking intention.

Table 3. Multivariate Analysis of the Association of Factors With Smoking Intention Among College Students.

| Variables | OR | 95% CI | p value |
|--|-----------|-----------------|---------|
| Sex | | | |
| Male | 2.205 | [1.374, 3.538] | .001 |
| Female | Reference | | |
| Age | | | |
| ≤20 | 0.810 | [0.572, 1.146] | .234 |
| >20 | Reference | | |
| Type of college | | | |
| Medical college | 0.908 | [0.629, 1.310] | .606 |
| Nonmedical college | Reference | | |
| Region | | | |
| East | 1.032 | [0.655, 1.626] | .891 |
| Middle | 0.871 | [0.568, 1.337] | .528 |
| West | Reference | | |
| The only child in family | | | |
| Yes | 0.886 | [0.600, 1.307] | .541 |
| No | Reference | | |
| Single-parent family | | | |
| Yes | 1.042 | [0.556, 1.953] | .898 |
| No | Reference | | |
| Father's educational level | | | |
| High school and below | 0.996 | [0.593, 1.673] | .988 |
| Above high school | Reference | | |
| Mother's educational level | | | |
| High school and below | 0.583 | [0.346, 0.984] | .043 |
| Above high school | Reference | | |
| Experiencing domestic violence | | | |
| Often | 0.685 | [0.219, 2.142] | .515 |
| Seldom | 0.965 | [0.626, 1.488] | .872 |
| Never experienced domestic violence | Reference | | |
| Academic performance | | | |
| A/B/C | 0.710 | [0.472, 1.069] | .101 |
| D/E | Reference | | |
| Average monthly living expenses (RMB) | | | |
| ≤1,500 | 0.892 | [0.556, 1.433] | .638 |
| >1,500 | Reference | | |
| Average monthly household income (RMB) | | | |
| ≤6,000 | 0.867 | [0.584, 1.287] | .478 |
| >6,000 | Reference | | |
| Current smoking status | | | |
| Smoking | 14.081 | [9.306, 21.307] | <.001 |
| Have quit smoking | 3.824 | [1.728, 8.463] | .001 |
| Never smoked | Reference | | |
| Current smoking status of father | | | |
| Smoking | 1.011 | [0.673, 1.521] | .956 |
| Have quit smoking | 0.895 | [0.477, 1.679] | .730 |
| Never smoked | Reference | | |
| Current smoking status of mother | | | |
| Smoking | 3.328 | [1.527, 7.252] | .002 |
| Have quit smoking | 2.523 | [0.377, 16.873] | .340 |
| Never smoked | Reference | | |
| Current smoking status of roommates | | | |
| Smoking | 1.094 | [0.719, 1.664] | .676 |
| Have quit smoking | 1.557 | [0.301, 8.039] | .597 |
| Never smoked | Reference | | |
| Number of smokers among closest friends | | | |
| None | 2.288 | [0.285, 18.341] | .436 |
| A few ^a | 2.663 | [1.348, 5.261] | .005 |
| Most ^b | 1.826 | [1.045, 3.191] | .035 |
| All | Reference | | |

Note. 95% CI = 95% confidence interval; OR = odds ratio.

^aThe proportion of smokers in all closest friends is less than 50%. ^bThe proportion of smokers in all closest friends is more than 50%.

Students whose mothers had lower educational levels were less likely to have a strong smoking intention (OR 0.583, 95% CI [0.346, 0.984]), compared with those whose mothers had higher educational levels. Students who were current smokers obviously had a stronger smoking intention (OR 14.081, 95% CI [9.306, 21.307]). Similarly, those who had quit smoking still had a stronger smoking intention (OR 3.824, 95% CI [1.728, 8.463]).

Moreover, students were significantly more likely to have a strong smoking intention if most (OR 2.663, 95% CI [1.348, 5.261]) or a few (OR 1.826, 95% CI [1.045, 3.191]) of their closest friends were smokers (Table 3). Here “most” referred to the proportion of smokers in the total number of closest friends, which was greater than 50%; and “a few” referred to the proportion of smokers in the total number of closest friends, which was fewer than 50%.

Discussion

In the present study, 6.9% of college students had a strong intention to start smoking in the future. The prevalence of intention to smoke is lower than that reported in previous studies such as those conducted in Malaysia (10.7%; Hock et al., 2014), in the Global Youth Tobacco Surveillance (GYTS) survey (10.7% among adolescents who were nonsmokers), and in Turkey (16.2%; Ertas, 2007). A possible explanation of the difference in prevalence rate of intention to smoke among these studies may be differences in participants' sex ratios or age groups, which would have influenced the overall prevalence.

The findings of the multivariate analysis demonstrate that sex, mother's educational level, current smoking status, current smoking status of mothers, and the number of smokers among closest friends are significantly associated with the smoking intention of college students.

In the present study, male college students were more likely than female students to have a strong smoking intention, which is similar to the findings of previous studies (Cheng-Ye, Chen, & Song, 2009; Lou, 2015). This is related not only to differences in personality traits by gender or to traditional views but also to the differences in their social contacts. In China, smoking and drinking by females are viewed as taboos in traditional culture, but are regarded as common ways for males to socialize with each other, particularly in rural areas. This in turn might influence the intention to smoke in the future for the male and female respondents.

In terms of maternal influence on smoking intention, the results indicated that both maternal educational level and current smoking status influence the students' intention to smoke in the future. Historically, in Chinese families, mothers usually spend more time with their children and have more control over daily parenting compared to fathers. Mothers play a more important role in their child's development, character, and attitudes. This study reported

a strong association between college students' smoking intention and mother's smoking status (OR 3.328, 95% CI [1.527, 7.252]), which is in accordance with the results of studies conducted in other countries (Almutairi, 2014; Hock et al., 2014; Ra & Cho, 2016). For example, research from Korea and the Netherlands both identified a rising trend of strong smoking intention among students whose mothers were current smokers (Cremers, Mercken, de Vries, & Oenema, 2015; Ra & Cho, 2016). Research in China has also reported a significant correlation between the smoking behavior of adolescents and the smoking status of their mothers (Lin, Fang, & Li, 2008). Therefore, it is necessary to continue to strengthen mothers' monitoring effect and communication with their children for the purposes of tobacco control. As regards the association between mother's educational level and students' smoking intention, however, the present study reported that having a mother with a lower educational level was a protective factor, which is inconsistent with previous research. We are, however, limited in our ability to explain this finding. More specific research is needed to confirm this result.

The association of current smoking status and smoking intention of students was also analyzed. According to statistical analysis, the results showed that students who were current smokers or former smokers tended to be more likely to have a strong smoking intention, which is in accordance with the findings of previous studies (Klein, Sterk, & Elifson, 2014; National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health, 2012). The possible reason is that most current smokers or people who have had smoking experience perceive themselves to experience benefits as a result of their smoking, such as being free from tension and anxiety, enjoyment of the taste or smell of tobacco, and the ritual involved in smoking. Perceiving benefits from smoking was associated with an increased likelihood of strong smoking intention.

Generally, from the present study, the greater the number of smokers among the student's closest friends, the stronger the student's intention to smoke. This may be related to the desire to get along well with one's closest friends or to changes in thinking after long-term contact with close friends. Adolescents seem to perceive that smoking is one of the ways to gain recognition from peers (Cremers et al., 2015; Hock et al., 2014; Ra & Cho, 2016). In Western cultures, acceptance by close friends due to smoking has been associated with smoking intention in adolescents. It was reported that the influence exerted by perceived peer norms on substance use was stronger relative to that exerted by distal social norms (Ra & Cho, 2016). However, the impact was not significant if all of the student's closest friends were smokers, which was hard to explain. A possible reason is that this situation was extremely rare and accordingly the sample size was limited.

Strengths and Limitations

The strengths of the present study are that it considers the combination of multiple factors within the same population and uses a sample size large enough to allow analysis while controlling for important covariates. There are two limitations that should be noted, however. First, the study design was cross-sectional, limiting the ability to address causality or direction of the associations observed. Future work should collect data longitudinally or use path analysis and structured equation modeling on cross-sectional data as ways to understand the underlying relationships. Second, some potential existence of confounding factors may influence the real association, which could be accounted for in future studies.

Conclusions

This study identified the factors associated with smoking intention among Chinese college students. The intention to smoke increased among male students. Current smokers or former smokers were more likely to have a strong intention to smoke. Also, maternal educational level and the number of close friends who were smokers were significantly associated with increases in the intention to smoke. Therefore, college students' sociodemographic and socioeconomic characteristics should be reflected in interventions for smoking prevention. Moreover, the associated factors are contextual factors, which may vary by region and additional work is needed to fully understand these relationships. Further studies are needed to elucidate mechanisms and pathways across various factors, and these factors should be incorporated into future multilevel interventions designed to decrease smoking intention among college students.

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