# Influence of Knowledge and Attitudes on Smoking Habits Among Young Military Conscripts in Taiwan

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**Background:** The purpose of this study was to identify and describe the knowledge and attitudes of cigarette smoking that are associated with smoking habits among young military conscripts in Taiwan.

**Methods:** We conducted a cross-sectional survey of young conscripts in southern and eastern Taiwan between August 1 and December 31, 2001. We selected 3,249 young military conscripts who had served more than 1 month in the military, based on specific criteria. We used a standard structured questionnaire to collect information about the respondents' sociodemographic characteristics, lifestyle, knowledge, attitude, and cigarette smoking practices.

**Results:** Our findings showed that among smoking young military conscripts, knowledge about smoking was lower and attitudes toward smoking were more negative when compared with the non-smokers. Knowledge and attitudes about smoking varied with sociodemographic characteristics (age, education level, residential area) and lifestyle (cigarette smoking, betel nut chewing, alcohol drinking), all $p < 0.05$. Subjects with greater knowledge about smoking had a lower risk of smoking (odds ratio, 0.88; 95% confidence interval, 0.86–0.91). But this characteristic diminished after being adjusted for potential confounders. In addition, subjects with a higher attitude score about smoking had relatively lower risk for cigarette smoking when compared to those with a lower attitude score, even after adjusting for potential confounders (odds ratio, 0.93; 95% confidence interval, 0.91–0.94).

**Conclusion:** Knowledge and attitudes about smoking are significantly associated with the status of cigarette smoking. These findings can help public health professionals develop effective policies and smoking prevention and cessation programs among young military conscripts in Taiwan. [*J Chin Med Assoc* 2010;73(8):411–418]

**Key Words:** attitude, cigarette, knowledge, smoking, young military conscripts

## Introduction

Cigarette smoking is an international public health problem[1,2] that has been called the most preventable cause of death.[2–6] It is a significant health hazard that is related to increased morbidity and mortality in many chronic diseases, such as cardiovascular disease, cancer, and chronic obstructive pulmonary disease.[7,8] Therefore, smoking prevention and cessation for young adults are important national health policies in many countries. Recent studies have shown that the prevalence of cigarette smoking increases slightly during military service and is higher in young military conscripts than in the general population.[9] Military efforts to reduce cigarette use can affect conscripts on active duty, their civilian friends, and previous enlistees who have since re-entered civilian life.

Evidence from many empirical studies suggests that national smoking prevention policies, such as banning smoking in public places, increasing cigarette excise taxes, and educating the public on the harmful effects of cigarette smoking, have positive effects on anti-smoking efforts.[10,11] During the past decade in Taiwan, the government has enacted laws to restrict smoking in public places, banned all forms of cigarette advertising in digital media, and set the minimum

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smoking age at 18 years.[12] Some studies have shown that current smokers have lower levels of health knowledge,[13] suggesting that increased health knowledge would reduce the smoking rate in adults. Both knowledge and attitude have been associated with cigarette smoking practices in many studies.[14–18] However, few large surveys have investigated the knowledge and attitudes toward smoking among young military conscripts in Taiwan, and updated information about such knowledge and attitudes is needed to verify the effectiveness of preventive interventions. Furthermore, in order to qualify future conscripts for smoking prevention interventions, it is important to know whether young military conscripts are aware of the health consequences of smoking and the relatively negative public attitudes toward smoking. Therefore, we assessed the knowledge, attitudes, and behaviors regarding cigarette smoking, and examined the relationships between knowledge, attitudes, and smoking practice among young military conscripts in Taiwan.

## Methods

### *Study sample and design*

We conducted a cross-sectional survey among conscripts in southern and eastern Taiwan between August 1 and December 31, 2001. Informed consent was obtained from all participants. A total of 4,238 conscripts who had more than 1 month of military service were enrolled in the study (except for those who were on holiday during the time the survey was conducted). After excluding missing and incomplete data, 3,249 conscripts were analyzed.

### *Data collection and measurement*

All participants completed a structured questionnaire that included questions about their sociodemographic characteristics, lifestyle (including cigarette smoking, betel nut chewing, and alcohol consumption), knowledge about and attitudes toward about cigarette smoking. Sociodemographic characteristics included age, education level, residential area, and duration of military service.

The structured questionnaires for both knowledge and attitudes with regard to cigarette smoking consisted of 10 questions (see Appendix). The knowledge questions were scored using a 3-category scale, i.e. "agree", "uncertain", and "disagree". Each correct answer received a score of 1 point, so the total score could range from 0 to 10 points. The questions were organized into 3 categories: (1) knowledge about the health effects of smoking on physical function and disease promotion; (2) knowledge about the health effects of smoking on the mother and unborn child; and (3) knowledge about the effects of second-hand smoke on pregnant women and young children.

Attitude questions were scored using a 5-point Likert scale, i.e. "not at all", "not much", "somewhat", "a lot", and "extremely", scored from 1 to 5 points, respectively. The average scores were used to compare the different subgroups. Attitude questions included: (1) attitudes toward restrictions on smoking in public settings and the prohibition of advertising; (2) attitudes toward the hazards of second-hand smoke on friends; (3) attitudes toward the alleged beneficial effects of cigarette smoking; and (4) attitudes toward identification with peers on smoking.

The draft questionnaires for knowledge and attitudes about cigarette smoking were reviewed by and discussed with experts on smoking-related health education. Internal consistency was assessed by Cronbach's $\alpha$, with satisfactory results. Cronbach's $\alpha$ values of scores for knowledge and attitudes about cigarette smoking were 0.843 and 0.825, respectively.

Lifestyle variables included cigarette smoking, alcohol consumption, and betel nut chewing. Our questionnaire was a modified version of that used by the World Health Organization.[19] Current smokers were defined as persons who had smoked $\geq 1$ cigarette/day during the past 30 days and who had smoked $> 100$ cigarettes in their lifetime or retained the habit of smoking during military service. If the person had not smoked cigarettes during the past 30 days, but had smoked $> 100$ cigarettes in their lifetime or did not have the habit of smoking during military service, he was defined as a former smoker. If a subject had not smoked cigarettes during the past 30 days and had not smoked $> 100$ cigarettes in his lifetime or did not have the habit of smoking during military service, he was defined as a non-smoker. Subjects were designated as current drinkers if they had consumed $\geq 2$ drinks/week of liquor (or equal alcohol concentration) in their lifetime (designation was based on alcohol concentration classification) or if they still had the habit of alcohol drinking before or during military service;[20] otherwise, they were defined as non-drinkers. Subjects were considered current betel nut chewers if they had chewed at least 1 betel nut during the past 30 days, had chewed at least 1 betel nut/week, and had chewed $> 50$ betel nuts in their lifetime before or during military service;[20] otherwise, they were defined as non-chewers.

### *Statistical analysis*

We used number and percentage to describe categorical parameters such as general characteristics (i.e. age

group, education level, residential area, and duration of military service) and lifestyle (cigarette smoking, betel nut chewing, and alcohol drinking status), and then conducted $\chi^2$ tests to compare differences in cigarette smoking status (i.e. non-smoker, former smoker, and current smoker). We used mean and standard deviation to describe continuous parameters such as knowledge about and attitudes toward cigarette smoking, and then conducted analysis of variance to compare the differences in the means of each group (i.e. age group, education status, residential area, and duration of military service); we used *post hoc* comparisons to evaluate the difference between each subgroup (with statistical significance at $p<0.01$). Finally, we used multivariate logistic regression analyses to calculate the odds ratio (OR) to determine the probability of cigarette smoking relative to associated factors such as knowledge about and attitudes toward cigarette smoking. A 2-tailed $p<0.05$ was considered significant. All statistical analyses were conducted using the SAS statistical package (SAS Institute Inc., Cary, NC, USA).

## Results

The associations between general characteristics and smoking status are presented in Table 1. The mean age of the subjects was $21.4\pm1.6$ years; the largest age group was the 21-year-old group (36.5%). The prevalence of cigarette smoking was 50.8%. Smoking was significantly associated with general characteristics such as age, educational level, residential area, and time served in the military (all $p<0.05$). Younger age and lower education level were associated with a higher prevalence of cigarette smoking. The prevalence of cigarette smoking for those ≥24 years of age was 27.6%,

**Table 1.** General characteristics and smoking status among study subjects*

| | Non-smoker ($n=1,576$) | Former smoker ($n=21$) | Current smoker ($n=1,652$) | $\chi^2$ test |
|---|---|---|---|---|
| Age (yr) | | | | 188.4† |
| ≤20 | 367 (37.2) | 6 (0.6) | 613 (62.2) | |
| 21 | 518 (43.6) | 9 (0.8) | 660 (55.6) | |
| 22 | 235 (56.3) | 2 (0.5) | 180 (43.2) | |
| 23 | 187 (65.6) | 2 (0.7) | 96 (33.7) | |
| ≥24 | 269 (71.9) | 2 (0.5) | 103 (27.6) | |
| Education level | | | | 458.9† |
| Junior high school or below | 111 (19.4) | 2 (0.4) | 459 (80.2) | |
| Senior high school | 812 (45.1) | 15 (0.8) | 974 (54.1) | |
| College | 332 (68.9) | 2 (0.4) | 148 (30.7) | |
| University or above | 321 (81.5) | 2 (0.5) | 71 (18.0) | |
| Residential area | | | | 14.2† |
| Northern | 279 (55.1) | 4 (0.8) | 223 (44.1) | |
| Middle | 184 (47.2) | 3 (0.8) | 203 (52.0) | |
| Southern | 1,044 (47.7) | 12 (0.6) | 1,132 (51.7) | |
| Eastern | 69 (41.8) | 2 (1.2) | 94 (57.0) | |
| Time served in the military (mo) | | | | 27.5† |
| 1–6 | 243 (43.7) | 6 (1.1) | 307 (55.2) | |
| 7–12 | 556 (49.8) | 4 (0.4) | 556 (49.8) | |
| 13–18 | 499 (53.8) | 5 (0.5) | 424 (45.7) | |
| >18 | 278 (42.9) | 6 (0.9) | 365 (56.2) | |
| Betel nut chewing | | | | 630.1† |
| No | 1,551 (59.3) | 18 (0.7) | 1,048 (40.0) | |
| Yes | 25 (3.9) | 3 (0.5) | 604 (95.6) | |
| Alcohol drinking | | | | 241.2† |
| No | 1,507 (54.0) | 18 (0.7) | 1,265 (43.3) | |
| Yes | 69 (15.0) | 3 (0.7) | 387 (84.3) | |

**Data presented as n (%); †$p<0.05$.*

whereas the prevalence was 62.2% for those ≤ 20 years of age. About 17.6% had an educational level of junior high school or below, 55.4% had completed high school, and 27.0% had college education or higher. The prevalence of cigarette smoking was 18.0% for those with a university degree or above, whereas the prevalence was 80.2% for those who had not progressed beyond junior high school.

Most subjects (67.3%) resided in southern Taiwan, but those who resided in eastern Taiwan had the highest prevalence of cigarette smoking. The prevalence of cigarette smoking was 55.2% for those who had served in the military less than 6 months and 56.2% for those who had served more than 18 months. Among personal behaviors, smoking was significantly associated with alcohol drinking and betel nut chewing (all $p < 0.05$). The prevalences of smoking among chewers and drinkers were 95.6% and 84.3%, respectively.

Table 2 shows the associations between general characteristics and the scores for knowledge about smoking. Among Taiwanese conscripts, the knowledge score was significantly associated with age, education level, residential area, cigarette smoking, betel nut chewing, and alcohol drinking (all $p < 0.05$). Younger subjects had significantly lower scores for knowledge about smoking, and subjects with higher levels of education had higher scores for knowledge about smoking. Subjects who lived in the middle area of Taiwan

**Table 2.** Knowledge about smoking among young military conscripts in Taiwan

| | Knowledge* | | | F test |
|---|---|---|---|---|
| | *n* | Mean | SD | |
| Age (yr) | | | | 34.71† |
| ≤ 20 | 986 | 5.66 | 3.06 | |
| 21 | 1,187 | 5.69 | 3.13 | |
| 22 | 417 | 6.57 | 2.81 | x, y |
| 23 | 285 | 7.08 | 2.65 | x, y |
| ≥ 24 | 374 | 7.21 | 2.53 | x, y, z |
| Education level | | | | 83.29† |
| Junior high school or below | 572 | 4.71 | 3.13 | |
| Senior high school | 1,801 | 6.01 | 3.04 | q |
| College | 482 | 7.05 | 2.53 | q, r |
| University or above | 394 | 7.30 | 2.40 | q, r |
| Residential area | | | | 2.88† |
| Northern | 506 | 6.44 | 2.99 | |
| Middle | 390 | 5.95 | 3.04 | |
| Southern | 2,188 | 6.03 | 3.03 | m |
| Eastern | 165 | 6.15 | 3.01 | |
| Time served in the military (mo) | | | | 0.25 |
| 1–6 | 556 | 6.14 | 2.94 | |
| 7–12 | 1,116 | 6.04 | 3.02 | |
| 13–18 | 928 | 6.14 | 3.09 | |
| > 18 | 649 | 6.06 | 3.03 | |
| Cigarette smoking | | | | 108.61† |
| No | 1,576 | 6.65 | 2.71 | |
| Yes | 1,652 | 5.56 | 3.21 | |
| Betel nut chewing | | | | 60.65† |
| No | 2,617 | 6.29 | 2.98 | |
| Yes | 632 | 5.26 | 3.09 | |
| Alcohol drinking | | | | 34.59† |
| No | 2,790 | 6.22 | 3.00 | |
| Yes | 459 | 5.32 | 3.06 | |

**Knowledge scores ranged from 0 to 10 points; †$p < 0.05$. SD = standard deviation. Post hoc comparison for x: $p < 0.01$ vs. age ≤ 20; for y: $p < 0.01$ vs. age 21; for z: $p < 0.01$ vs. age 22; for q: $p < 0.01$ vs. junior high school or below; for r: $p < 0.01$ vs. senior high school; for m: $p < 0.01$ vs. northern.*

had the lowest scores for knowledge about smoking in residential areas. Moreover, subjects with behaviors such as smoking, betel nut chewing, and alcohol drinking also had lower scores for knowledge about smoking when compared with non-chewers and non-drinkers.

Table 3 shows the associations between general characteristics and scores on attitudes toward smoking. The overall attitude towards smoking among young military conscripts was significantly associated with age, education level, residential area, cigarette smoking, betel nut chewing, and alcohol drinking (all $p<0.05$). Older subjects had higher scores than younger subjects, and subjects with higher levels of education had higher scores than less educated subjects. In addition, subjects who lived in the middle area of Taiwan had lower scores for attitude toward smoking in residential areas. Subjects who were smokers, betel nut chewers, or drinkers had lower scores for attitudes toward smoking compared with non-chewers and non-drinkers.

The results of multivariate logistic regression analyses to explore the associations between knowledge about and attitudes toward smoking and the practice of cigarette smoking are presented in Table 4. In an unadjusted logistic regression model, we found that both knowledge about and attitudes toward smoking were significantly associated with cigarette smoking. Subjects with higher scores on knowledge or attitudes had a relatively lower risk of cigarette smoking when

**Table 3.** Attitudes toward smoking among young military conscripts in Taiwan

| | Attitude* | | | F test |
|---|---|---|---|---|
| | *n* | Mean | SD | |
| Age (yr) | | | | 39.74† |
| ≤20 | 986 | 3.64 | 0.63 | |
| 21 | 1,187 | 3.70 | 0.63 | |
| 22 | 417 | 3.88 | 0.63 | x, y |
| 23 | 285 | 3.93 | 0.60 | x, y |
| ≥24 | 374 | 4.04 | 0.59 | x, y, z |
| Education level | | | | 126.39† |
| Junior high school or below | 572 | 3.40 | 0.56 | |
| Senior high school | 1,801 | 3.75 | 0.63 | q |
| College | 482 | 4.02 | 0.59 | q, r |
| University or above | 394 | 4.05 | 0.57 | q, r |
| Residential area | | | | 4.97† |
| Northern | 506 | 3.85 | 0.64 | |
| Middle | 390 | 3.70 | 0.60 | m |
| Southern | 2,188 | 3.75 | 0.64 | m |
| Eastern | 165 | 3.82 | 0.60 | |
| Time served in the military (mo) | | | | 2.61 |
| 1–6 | 556 | 3.75 | 0.61 | |
| 7–12 | 1,116 | 3.73 | 0.64 | |
| 13–18 | 928 | 3.80 | 0.64 | |
| >18 | 649 | 3.78 | 0.64 | |
| Cigarette smoking | | | | 521.53† |
| No | 1,576 | 4.00 | 0.62 | |
| Yes | 1,652 | 3.53 | 0.56 | |
| Betel nut chewing | | | | 574.98† |
| No | 2,617 | 3.88 | 0.61 | |
| Yes | 632 | 3.26 | 0.48 | |
| Alcohol drinking | | | | 196.22† |
| No | 2,790 | 3.82 | 0.62 | |
| Yes | 459 | 3.39 | 0.58 | |

**Attitude scores ranged from 1 to 5; †$p<0.05$. SD = standard deviation. Post hoc comparison for x: $p<0.01$ vs. age ≤20; for y: $p<0.01$ vs. age 21; for z: $p<0.01$ vs. age 22; for q: $p<0.01$ vs. junior high school or below; for r: $p<0.01$ vs. senior high school; for m: $p<0.01$ vs. northern.*

**Table 4.** Knowledge about and attitudes toward smoking associated with cigarette smoking

| Independent variables | OR | 95% CI |
|---|---|---|
| Unadjusted model | | |
| Knowledge | 0.88 | 0.86–0.91 |
| Attitudes | 0.88 | 0.86–0.89 |
| Multivariate model | | |
| Knowledge | 0.98 | 0.97–1.01 |
| Attitudes | 0.88 | 0.88–0.89 |
| Multivariate model* | | |
| Knowledge | 1.02 | 1.00–1.05 |
| Attitudes | 0.89 | 0.89–0.91 |
| Multivariate model† | | |
| Knowledge | 0.99 | 0.98–1.03 |
| Attitudes | 0.93 | 0.91–0.94 |

**Adjusted for age, education level and residential area; †adjusted for age, education level, residential area, betel nut chewing, and alcohol drinking. OR = odds ratio; CI = confidence interval.*

compared to those with lower levels of knowledge or attitudes [knowledge: OR, 0.88; 95% confidence interval (CI), 0.86–0.91; and attitudes: OR, 0.88; 95% CI, 0.86–0.89]. After adjusting for general characteristics and lifestyle variables, we found that knowledge about smoking was not significantly associated with cigarette smoking. After adjusting for age, education level, residential area, duration of military service, betel nut chewing and alcohol drinking, subjects with higher attitude score had a relatively lower risk of cigarette smoking compared to those with lower attitude score (OR, 0.93; 95% CI, 0.91–0.94).

## Discussion

This is the first study to explore whether knowledge about and attitudes toward smoking are associated with cigarette smoking among young military conscripts in Taiwan. In this cross-sectional survey, we found that cigarette smoking was significantly associated with age, education level, residential area, time served in the military, betel nut chewing, alcohol drinking, and knowledge about and attitudes toward smoking. Furthermore, after adjusting for potential confounders, subjects with a lower attitude score had a relatively higher risk of cigarette smoking compared to those with a higher attitude score.

Previous studies have shown that demographic characteristics (age, educational level, residential area, and time served in the military) and personal behaviors (alcohol drinking and betel nut chewing) are associated with cigarette smoking.[21–27] Similarly, we found that demographic characteristics and personal behaviors were associated with knowledge, attitudes, and practice of smoking. Additionally, we showed that age, educational level, residential area, time served in the military, alcohol drinking, and betel nut chewing were potential confounders related to cigarette smoking.

In general, subjects who are young and who have good health are not concerned about health hazards, which may explain why young military conscripts may not pay attention to available information about the health effects of smoking and exposure to secondhand smoke. In addition, we demonstrated that young military conscripts who had a low level of knowledge about smoking (lower knowledge score) and who expressed negative attitudes toward smoking (lower attitude score) were more likely to smoke. In agreement with previous studies, each subject's knowledge about and attitude toward smoking were significantly associated with the practice of cigarette smoking.[14–18] Interestingly, we found that attitudes toward smoking were associated with the practice of smoking, even after adjusting for potential confounders. However, the strength of the association between knowledge about smoking and the practice of smoking was attenuated when multivariate analysis was performed. Finally, we found that attitudes toward smoking were more strongly associated with cigarette smoking than was knowledge about smoking. Thus, subjects with more negative attitudes toward smoking were more likely to be smokers.

This study has some limitations. Firstly, there could be response error in the survey of knowledge about smoking. Because the degree of knowledge about smoking was not high for young military conscripts in this study, there might be a relationship between the level of knowledge about smoking and cigarette smoking. Secondly, since we used a self-report, cross-sectional survey design, there could be bias among respondents. However, assessment of smoking status using the self-report method was found to be accurate in cases of interviewer-administered questionnaires.[28] In addition, the cross-sectional survey design limits our ability to explore the causal relationship between the variables, because all observations were made at the same time.

In conclusion, our data indicate that among young military conscripts in Taiwan, the prevalence of cigarette smoking is high, the knowledge about smoking is poor, and attitudes toward smoking are not positive. Smokers need to be counseled about the diseases caused by smoking, and positive attitudes should be strengthened. We also showed that both knowledge about and attitudes toward smoking were associated

with the practice of cigarette smoking. After adjusting for potential confounders, we found that attitudes toward smoking were associated with the practice of smoking, whereas increased knowledge about smoking attenuated the practice. These findings will help public health professionals develop effective policies and interventions to address knowledge about and attitudes toward smoking in order to limit smoking among young military conscripts in Taiwan.

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**Appendix.** Structured questionnaires for knowledge and attitudes with regard to cigarette smoking

Knowledge About Cigarette Smoking

*For each of the 10 statements listed, select the best answer (correct, incorrect, don't know) to represent your knowledge about cigarette smoking.*

| | | Correct | Incorrect | Don't know |
|---|---|---|---|---|
| 1 | The nicotine in cigarettes is not addictive to humans. | ① | ② | ③ |
| 2 | Smokers are more likely to get lung cancer than non-smokers. | ① | ② | ③ |
| 3 | Smoking in pregnancy only harms maternal health, but has no effect on the fetus. | ① | ② | ③ |
| 4 | The health of second-hand smokers is not affected. | ① | ② | ③ |
| 5 | Smoking can relieve stress and lower blood pressure. | ① | ② | ③ |
| 6 | Smoking can make you feel fatigued easily. | ① | ② | ③ |
| 7 | Nicotine first stimulates the human nervous system, and then inhibits it. | ① | ② | ③ |
| 8 | Smoking increases the air exchange capacity of the lungs. | ① | ② | ③ |
| 9 | Long-term smoking causes respiratory mucosa cilia to atrophy. | ① | ② | ③ |
| 10 | The carbon monoxide in cigarettes decreases the binding ability between hemoglobin and oxygen in red blood cells. | ① | ② | ③ |

Attitudes Toward Cigarette Smoking

*For each of the 10 statements listed, select the best answer (strongly agree, agree, disagree, strongly disagree, no opinion) to represent your attitudes toward cigarette smoking.*

| | | Strongly agree | Agree | Disagree | Strongly disagree | No opinion |
|---|---|---|---|---|---|---|
| 1 | Smoking signifies that one is a grown-up. | ① | ② | ③ | ④ | ⑤ |
| 2 | Smoking relaxes (tension) and reduces stress. | ① | ② | ③ | ④ | ⑤ |
| 3 | Smoking is a disgusting behavior. | ① | ② | ③ | ④ | ⑤ |
| 4 | Smoking is hazardous to the health of others. | ① | ② | ③ | ④ | ⑤ |
| 5 | Smoking helps thinking. | ① | ② | ③ | ④ | ⑤ |
| 6 | Accepting a friend's offer of a cigarette will cause you to be more accepted by the friend. | ① | ② | ③ | ④ | ⑤ |
| 7 | For the good of public health, smoking should be strictly prohibited in public areas. | ① | ② | ③ | ④ | ⑤ |
| 8 | Smoking is a personal freedom and others have no right to interfere. | ① | ② | ③ | ④ | ⑤ |
| 9 | I prefer being with friends who do not smoke. | ① | ② | ③ | ④ | ⑤ |
| 10 | I hope that my children will not smoke. | ① | ② | ③ | ④ | ⑤ |