Prevalence of Cigarette Smoking and Associated Risk Factors amongst Middle-School Students in Ongkharak District, Thailand

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Background: *Cigarette smoking is a common tobacco use which is the leading preventable cause of death in Thailand. Prevalence and risk factors of cigarette smoking are varied amongst communities.*
Objective: *The present study aimed to determine the prevalence and associated risk factors of cigarette smoking amongst middle-school students studying in the Ongkharak district, central Thailand.*
Material and Method: *A cross-sectional survey was conducted with students of the public schools in Ongkharak district, central Thailand, in 2013. Of 677 middle-school students (grade 7-9) who currently enrolled in the classes, 130 were randomly selected. Data on smoking as well as demographic characteristics were collected using an anonymous self-administered questionnaire which was modified from the 2013 Middle School Youth Risk Behavior Survey (YRBS) and translated into Thai.*
Results: *The prevalence of children who smoked or had smoked before was 24.6% (38.9% amongst males and 6.9% amongst females, p-value <0.001), of this proportion 50% were current smokers. Logistic regression analysis showed that the risk factors for having ever smoked were being male (OR = 7.63, 95% CI 2.26-26.90), of an older age (OR = 2.30, 95% CI 1.40-3.76), high coffee or tea consumption (OR = 2.95, 95% CI 1.08-8.05) and sharing a household with a smoker (OR = 2.96, 95% CI 1.09-8.06). Those who have smoked reported higher prevalence of asthma compared to those who have never smoked (25.0% vs. 9.2%, p-value = 0.033).*
Conclusion: *About a quarter of middle-school students in Ongkharak district smoked cigarettes. Anti-smoking and prevention policies should be encouraged to tackle this rising major public health problem.*

Keywords: *Adolescent, Prevalence, Risk factor, Smoking, Tobacco use*

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Tobacco smoking is a major public health problem that is a cause of increasing morbidity and mortality around the world[1]. The World Health Organization reported that tobacco smoking is cause of death of nearly 6 million people each year, and if this trend continues, the mortality rate may increase to 8 million people per year by 2030[1]. Its health hazards are associated with multiple chronic conditions, including cardiovascular diseases, pulmonary diseases, immune disease, asthma and cancer[2]. Cigarette smoking is amongst the most common type of tobacco use in Thailand. Adolescence is the susceptible age group for the initiation of substance abuse. Regardless of the type of tobacco used, smoking which starts at a young age represents a significant ongoing health risk. An adolescent smoker is prone to continue smoking until adulthood; long-term smoking is correlated to greater intensity of adverse health effects. Prevalence of cigarette smoking in adolescents has been reported worldwide and varied amongst studies[3-5].

Differences in ethnicity, social norms, parents, peer and school environment are all contributors to the difference in prevalence of smoking[6,7]. There have been a few studies of prevalence of cigarette smoking amongst Thai adolescents. The available data are varied amongst geographic differences and the time at which the studies took place, with the prevalence ranging from 9.0 to 31.0%[3-5]. The latest survey (2010) from the Buriram province, North-Eastern Thailand, found the lowest prevalence of current smokers to be 9.0%[3].

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There was a high variation amongst prevalence ranges, with no new information since then, and with no particular data pertaining to the Ongkharak District; hence the present study aimed to report the prevalence of cigarette smoking and the associated risks amongst adolescents studying in the Ongkharak district, Thailand.

Material and Method

A cross-sectional survey was conducted in students who studied at the public middle-schools in the Ongkharak district, Thailand, in 2013. Ongkharak district, with a population of 61,236 (December 2012), has 10 public middle-schools. At the time of study, there were 677 middle-school students enrolled in the classes. Four schools were randomly selected, on consideration of the total number of students in each school. All students who currently studied in grade 7-9 of those 4 schools were invited to participate in the study. The required minimal sample was determined to be 130 students based on the estimated prevalence of those who had ever smoked of 20% with an allowed error of 7%. Of a total of 320 students of these 4 schools (school A = 124, B = 53, C = 43, D = 100), 288 (90%) participated, as 10 absented from schools on the collecting days and 22 did not return a signed consent and/or assent form. Of 275 students, 130 were randomly selected (school A = 67, B = 19, C = 13, D = 31) to participate to the study. The study was approved by the Ethics committee of the Faculty of Medicine, Srinakharinwirot University, Thailand. Written informed consent and assent were obtained from the student's parents or guardians as well as from the participating students.

Data were collected using an anonymous self-administered questionnaire, which was modified from the 2013 middle-school Youth Risk Behavior Survey (YRBS)[8] and translated into Thai. The survey items included as follows: demographic characteristics (sex, age, current weight and height), cigarette smoking status ("Never smoker", "Ever smoker", and current smoker), smoking in the family, alcohol consumption (never or ever consumption), coffee or tea consumption (never or ever consumption), estimated sleep duration, physical activity (numbers of day that have physical activity amounting to at least 60 minutes per day), screen viewing time (time of television viewing and computer use per day), and presenting of asthma and violence-related behaviors. Body mass index (BMI) was calculated as the ratio of weight (kg) to square of height (m). Sex- and age-specific BMI criteria of the International Obesity Task Force (IOTF) were used to define "Overweight" and "Obese"[9].

Participants returned the questionnaires to research staff in a sealed envelope. Participants were classified as "Ever smoker" if they answer "Yes" to the question "Have you ever smoked a cigarette, even one or two puffs?". Participants who answered "No" to that question were classified as "Never smokers". Participants who reported to "smoke cigarettes during the past 30 days" were classified as "Current smokers". Participants were classified as having asthma if they answered "Yes" to the question "Have a doctor or nurse ever told you that you have asthma?" Participants were classified as having a violence-related behavior if they answered "Yes" to either of the following questions: "Have you ever carried a weapon, such as a gun, knife, or a club?" and "Have you ever been in a physical fight?".

Statistical analysis

Continuous variables were tested for the normal distribution using the Kolmogorov-Smirnov test. Normally, distributed variables were descriptively presented as mean and standard deviations, whereas non-normally distributed variables were descriptively presented as medians and interquatile ranges. The Pearson Chi-square test or the Fisher exact test was used, where appropriate, to compare proportion between groups. The students' t-tests and Mann-Whitney U tests were used to compare the differences of the normally, distributed, continuous variables and non-normally distributed, continuous variables, respectively. A binary logistic regression analysis was conducted to determine odds ratios, adjusted odd ratios and their 95% confidence interval (CI) of the independent risks of being "Ever smokers". Statistical analysis was performed using the SPSS 19.0 software package (SPSS Inc., Chicago, IL). A two-tailed *p*-value of less than 0.05 was considered statistically significant.

Results

Of 130 participants, the average age was 14.0 years (range 12.0-16.1 years) and 72 (55.4%) were males. 43 (33.1%), 49 (37.1%) and 38 (29.2%) students studied in grade 7, 8 and 9, respectively. Overall rate of normal weight, overweight and obesity were 67.0%, 14.6% and 18.4%, respectively. There were 59 (45.4%) students who reported to be living with family members who were smokers.

The prevalence of "Ever smoking" was 24.6%; of this proportion 50% were current smokers. The

average of age of beginning to smoke was 12 years (interquartile range 11, 14 years). Demographic characteristics and anthropometric data of "Never smokers" and "Ever smokers" are presented in Table 1. "Ever smoking" students were significantly older (14.6 vs. 13.8 years, *p*-value <0.001) and studied in higher grades than "Never smoking" students. Of 72 male students, 28 (38.9%) reported to be "Ever smokers", whereas, 4 of 58 female students (6.9%) reported to be "Ever smokers" (*p*-value <0.001). "Ever smokers" reported a higher prevalence of alcohol consumption (25.0% vs. 9.2%, *p*-value = 0.033), coffee or tea consumption (62.5% vs. 30.6%, *p*-value = 0.002) and asthma (25.0% vs. 9.2%, *p*-value = 0.033) than "Never smokers". There were no significant differences in body weight, height, BMI, obesity prevalence, sleeping duration, exercise,television viewing and computer-use time, and violence relating behavior between "Never smokers" and "Ever smokers".

Results of logistic regression analysis for identifying associated risks that affect "Ever smoking" are showed in Table 2. In the multivariable regression model, male gender (OR = 7.63, 95% CI 2.26-26.90), older age (OR = 2.30, 95% CI 1.40-3.76), coffee or tea consumption (OR = 2.95, 95% CI 1.08-8.05) and presence of a household smoker (OR = 2.96, 95%CI 1.09-8.06) increased the adjusted odd ratios of being "Ever smokers". Alcohol consumption had an increased risk of smoking (OR = 3.30, 95% CI 1.15-9.45) in the univariable regression model, however, there was no significant increased risk (adjusted OR = 1.55, 95% CI 0.43-5.50) in the multivariable regression analysis.

Discussion

The present study showed that prevalence of smokers in Thai middle-school students was relatively high, as approximately one quarter of students reported having ever smoked, and half of them were current smokers. Being male, of an older age, coffee or tea consumption and the presence of a household smoker

Table 1. Demographic characteristics and anthropometric data of "Never smoking" and "Ever smoking" adolescents*

	Never smoke (n = 98)	Ever smoke (n = 32)	*p*-value
Sex, n (%)			<0.001
Male	44 (44.9)	28 (87.5)	
Female	54 (55.1)	4 (12.5)	
Age, year	13.8 (0.9)	14.6 (1.1)	<0.001
Weight, kg	42.7 (9.0)	50.4 (13.1)	0.392
Height, cm	157.1 (7.1)	159.3 (9.1)	0.392
Body mass index, kg/sqm.	19.71 (3.40)	19.76 (4.33)	0.954
Weight status, n (%)			0.707
Normal	66 (67.3)	21 (65.6)	
Overweight	13 (13.3)	6 (18.8)	
Obesity	19 (19.4)	5 (15.6)	
School year, n (%)			<0.001
Grade 7	38 (38.8)	5 (15.6)	
Grade 8	42 (42.9)	7 (21.9)	
Grade 9	18 (18.4)	20 (62.5)	
Sleep duration, hours/day**	8.5 (8.0-9.5)	8.3 (8.0-9.5)	0.746***
Present of household smoker, n (%)	40 (40.8)	19 (59.4)	0.101
Alcohol consumption, n (%)	9 (9.2)	8 (25.0)	0.033
Coffee or tea consumption, n (%)	30 (30.6)	20 (62.5)	0.002
Having violence related behavior, n (%)	32 (32.7)	14 (43.8)	0.177
Exercise >60 minutes at least 1 day in the past week, n (%)	82 (83.7)	22 (68.8)	0.061
Screen viewing time, hours/day	4.1 (2.4)	4.7 (2.6)	0.228
Asthma, n (%)			0.033
No	89 (90.8)	24 (75.0)	
Yes	9 (9.2)	8 (25.0)	

* Present as mean (SD) unless otherwise indicated; ** Present as median (interquartile ranges); *** Mann-Whitney U test

Table 2. Logistic regression analysis for identifying associated risks that affect smoking, adjusted for sex, age, coffee or tea consumption, alcohol consumption and household smokers

	Crude OR	95% CI	*p*-value	Adjusted OR	95% CI	*p*-value
Sex						
Female	1.00	Reference		1.00	Reference	
Male	8.59	2.80-26.35	<0.001	7.63	2.26-26.90	0.002
Age	2.36	1.48-3.76	<0.001	2.30	1.40-3.76	0.001
Coffee or tea consumption						
No	1.00	Reference		1.00	Reference	
Yes	3.78	1.64-8.71	0.002	2.95	1.08-8.05	0.001
Alcohol consumption						
No	1.00	Reference		1.00	Reference	
Yes	3.30	1.15-9.45	0.027	1.55	0.43-5.51	0.503
Household smoker						
No	1.00	Reference		1.00	Reference	
Yes	2.12	0.94-4.78	0.700	2.96	1.09-8.06	0.034

all increased the risk of becoming a smoker. "Ever smoking" adolescents had a higher prevalence of asthma than "never smoking" adolescents.

Prevalence of cigarette smoking amongst Thai adolescents was consistent with those found in other studies, especially from other Asian countries[10-16]. It is noted that even in the same country, prevalence of smoking in adolescents is variable by region[12,13,16]. In Malaysia, a neighboring country of Thailand, the prevalence of "Ever smoking" in adolescents is reported to be 14.6 to 29.7%, and the prevalence of current smokers ranged from 5.5 to 23.5%[12,13,16-18]. This difference in prevalence may be explained by differences in study design, geographic area of the studies, demographic characteristics of the population, the surrounding environment and years of study. It is essential to maintain regular surveillance of the trend of smoking in all available areas in the country, which will help to form enhanced prevention efforts with regards to smoking.

There was a little available data with regards to smoking in adolescents in Thailand. Rudatsikira et al[4], reporting in the "2005 Thai global youth tobacco survey" found that prevalence of "Ever smokers" and current smokers were 31% and 13.8%, respectively. Later surveys were conducted during 2005-2008 in Bangkok, and 4 regions of Thailand reported that the prevalence of current smoking ranges from 12.0-18.3%[5]. However, a recent study in Burirum province, a province in the north-east of Thailand, found that the prevalence of current smoking in youths was 9.0%[3]. Prevalence of "Ever smoking" (24.6%) and current smoking (12.3%) in the present study did not reveal any significant difference from the national survey conducted in 2005. However, it is difficult from a cross-sectional study to suggest the direction of trend of cigarette smoking in this geographic area. Further long-term surveillance studies on a large sample are required to explore this trend.

Smoking in adolescence is found to be influenced by their surrounding environment, such as having family members or peers who are smokers[19,20]. The present study found that students who had smokers in their family had three times the risk of being smokers than students who had no smokers in family. This finding was consistent with the recent studies around the world[10,12,14,15,21]. A previous Thai study in 2005 also showed 1.6 times increased in risks of being smokers in school-going adolescents if they have smoking parents[4]. Although it may not be a direct comparison to the odds ratio of the previous study, due to the difference in the regions of population, it appears that the influence of household smoking has increasing from 2005. The increase of smoking amongst adolescents may be explained by the attitudes or preferences of their parents; their children may well be mimicking those behaviors. Moreover, the exposure to second-hand smoke or the accessibility to parent's cigarettes may lead to smoker initiation. A family-based intervention policy is urgently needed to explore and combat this increasing problem. Peer groups and friends also have influence over the behavior of

adolescents, including smoking. There is a trend of friends selecting with similar habits and behavior[22]. However, the present study did not intend to explore the effect of peer groups on smoking behavior. Further study on this issue is therefore warranted.

The direct association between alcohol and coffee/tea consumption and having smoked, as found in the present study, was previously demonstrated in both adults[23] and adolescents[14]. It was shown that caffeine in coffee or tea contributed to the risk of smoking[24]. Gurpegui et al[25] also showed that both nicotine and caffeine consumption enhanced dopaminergic neurotransmission, which had a direct effect on certain personality traits, such as novelty seeking, therefore leading to the initiation of other habits such as smoking. Contrary to the present study, some studies found that students who drink alcohol had increased the risk of being smokers by 2.3 to 5.4 times, after adjusting for other confounding factors[3,14,16]. The explanation for this discrepancy between studies may be that the numbers of population in this study were not ideal for the purpose of acknowledging this association.

Further studies with adequate numbers of population to explore the association of alcohol consumption and cigarette smoking in Thai students may be required. As indicated in previous studies[14,26-28], the present study found that students who smoked tended to have less sleeping time and exercise, but tended to having higher violence-related behavior and screen viewing time, when compared to students who never smoked. However, these associations in the present study did not reached statistical significance, which might be explained by the same reasons of inadequate sample size to answer each specific question.

The present study was consistent with previous studies in that smokers were more likely to report having a diagnosis of asthma[10,29]. It was found that both active and passive smoking had adverse effects associated with asthma which can occur since intrauterine life. The fetus' passive exposure to smoking via the mother have the higher risk of developing asthma in childhood than those without exposure[30]. Active smoking or exposure to environmental tobacco smoke affects bronchial responsiveness and make it more easily sensitized to several allergens. Smoking has also been found to contribute to several aspects of asthma, such the development of airway inflammation and obstruction leading to the declination of lung function. This pathogenesis of asthma leads to symptom exacerbation, impaired therapeutic response and poor disease resistance[30,31]. Cessation of smoking has been found to help in controlling asthma symptoms and reducing airway inflammation with neutrophils[31]. Even though the effect of smoking cessation asthmatics is not within the scope of the present study, the authors encourage the cessation of smoking in all subjects, especially in asthmatic patients.

There are some limitations in the present study. Firstly, the present study used a self-reported survey, which may be the cause of under- or over-reporting the smoking prevalence. However, the study by self-reported survey proven its reliability for use in adolescents[32]. Moreover, an anonymous self-administered questionnaire might restrict the bias of over- or under-reporting. Secondly, participants were selected at random from the eligible students who presented in schools and returned a signed consent and/or assent form. Students who were absent from school or did not return the forms might have differences in smoking practices, which might be considered as bias in the study. However, the number of 90% of total students who agreed to participate in the study might be acceptable. Thirdly, a cross-sectional study might not allow for confirming the link between causation of smoking-related conditions, such as asthma, to smoking. This association can be considered an implication only. Finally, the present study involved only students from middle-schools in the Ongkharak district, and hence it may not be justifiably generalized for adolescents in other parts of Thailand.

Conclusion

Prevalence of cigarette smoking was 24.6% amongst middle-school students in the Ongkharak District, Thailand. Cigarette smoking was associated with the prevalence of asthma. After adjusting for confounding risks, being of the male gender, being of older age, consuming coffee or tea and having household smokers all provided an increased risk of being a cigarette smoker. Efforts to foster reduced smoking and prevent any new cases of smoking in Thai adolescents are needed and should address all levels, including the individual, family and surrounding environmental levels. Longitudinal studies are encouraged to maintain surveillance on and follow-up this major public health problem.

What is already known on this topic ?

Tobacco use is the leading cause of preventable death worldwide.

Adolescence is the susceptible group for initiation of substance abuse, with a high reported prevalence of cigarette smoking.

Differences in ethnicity, social norms, parents, peer and school environment are contributors to the difference in prevalence of smoking.

There were few studies of prevalence of cigarette smoking amongst Thai adolescents, and the available data showed high variations in prevalence.

What this study adds ?

The prevalence of "Ever smoking" amongst middle-school students in the Ongkharak District was 24.6%, and of this proportion 50% were current smokers.

The risk factors for "Ever smoking" were being male (OR = 7.63, 95% CI 2.26-26.90), being of older age (OR = 2.30, 95% CI 1.40-3.76), high coffee or tea consumption (OR = 2.95, 95% CI 1.08-8.05) and the presence of household smokers (OR = 2.96, 95% CI 1.09-8.06).

"Ever smokers" reported a higher prevalence of asthma compared to "Never smokers" (25.0% vs. 9.2%, *p*-value = 0.033).

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Potential conflicts of interest

None.

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ความชุกของการสูบบุหรี่และปัจจัยเสี่ยงในนักเรียนชั้นมัธยมศึกษาตอนต้นในอำเภอองครักษ์ ประเทศไทย

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ภูมิหลัง: การสูบบุหรี่เป็นสาเหตุที่สำคัญของการเสียชีวิตที่สามารถป้องกันได้ในประเทศไทย ความชุกและปัจจัยเสี่ยงของการสูบบุหรี่ มีความแตกต่างกันในระหว่างชุมชน

วัตถุประสงค์: ศึกษาความชุกและปัจจัยเสี่ยงของการสูบบุหรี่ในนักเรียนระดับมัธยมศึกษาตอนต้นที่เรียนในอำเภอองครักษ์

วัสดุและวิธีการ: การศึกษาแบบตัดขวางในเด็กนักเรียนระดับมัธยมศึกษาตอนต้นที่เรียนอยู่ที่โรงเรียนในอำเภอองครักษ์ในปี พ.ศ. 2556 จากจำนวนนักเรียนทั้งหมด 677 คน ทำการการสุ่มเข้าร่วมโครงการจำนวน 130 คน การเก็บข้อมูลเกี่ยวกับการสูบบุหรี่ และข้อมูลประชากรโดยใช้แบบสอบถามที่ตอบด้วยตนเองโดยไม่ระบุชื่อที่ได้รับการดัดแปลงมาจากแบบสำรวจความเสี่ยงทางพฤติกรรมสำหรับเยาวชน ระดับมัธยมศึกษาตอนตอนต้น ปี พ.ศ. 2556 (The 2013 Middle School Youth Risk Behavior Survey) ที่แปลเป็นภาษาไทย

ผลการศึกษา: ความชุกของเด็กที่เคยสูบบุหรี่เท่ากับร้อยละ 24.6 (โดยเพศชายเคยสูบบุหรี่ร้อยละ 38.9 และเพศหญิงร้อยละ 6.9, p-value <0.001) โดยร้อยละ 50 ของผู้ที่เคยสูบบุหรี่จะยังคงสูบบุหรี่จนถึงปัจจุบัน การวิเคราะห์การถดถอยโลจิสติกพบว่า ปัจจัยเสี่ยงสำหรับการสูบบุหรี่ ได้แก่ เพศชาย (OR = 7.63, 95% CI 2.26-26.90) อายุ (OR = 2.30, 95% CI 1.40-3.76) ผู้ที่ดื่มกาแฟหรือชา (OR = 2.95, 95% CI 1.08-8.05) และการมีสมาชิกในครอบครัวที่สูบบุหรี่ (OR = 2.96, 95% CI 1.09-8.06) ผู้ที่สูบบุหรี่จะมีรายงานความชุกของโรคหอบหืดสูงกว่าผู้ที่ไม่เคยสูบบุหรี่ (ร้อยละ 25.0 เทียบกับร้อยละ 9.2, p-value = 0.033)

สรุป: ประมาณหนึ่งในสี่ของนักเรียนระดับมัธยมศึกษาตอนต้นในอำเภอองครักษ์สูบบุหรี่จึงควรสนับสนุนให้มีมาตรการเพื่อป้องกันและต่อต้าน การสูบบุหรี่เพื่อจะแก้ไขปัญหาสาธารณสุขที่สำคัญที่กำลังเพิ่มขึ้นอย่างรวดเร็วนี้