# Tobacco Smoking Among School Children in Colombo District, Sri Lanka

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#### Abstract

Tobacco smoking is an important problem among schoolchildren. The authors studied the patterns of tobacco smoking among schoolchildren in Colombo, Sri Lanka, using a self-administered questionnaire. Multistaged stratified random sampling was used to select 6000 students. Response rate was 90.7% (5446), out of which 53.4% were males. Prevalence rates for males and females, respectively, were as follows: having smoked at least 1 complete cigarette: 27.0% and 13.3%, smoked more than 100 cigarettes: 2.3% and 0.3%, daily smoking: 1.8% and 0.2%. Mean age of starting to smoke was 14.16 years. The tobacco products most used were cigarettes (91.5%) and bidis (3.8%). In univariate analysis, male gender, parental smoking, studying non-science subjects, peer smoking, and participating in sports were significantly associated with smoking of at least 1 complete cigarette (P < .05). In multivariate analysis, the most significant correlates were having close friends (odds ratio = 3.29, confidence interval = 2.47-4.37) or parents who smoked (odds ratio = 1.86, confidence interval = 1.28-2.71). Female smoking has increased from previously reported values. These high-risk groups can be targets for preventive programs.

#### Keywords

adolescence tobacco smoking, female smoking, initiation of adolescent smoking, peer influence in smoking, socioeconomic determinants of adolescent smoking

#### Introduction

Tobacco smoking is a leading cause of premature death worldwide. The current estimate of 4 million deaths due to tobacco is expected to double by the year 2020, and tobacco smoking leads to more deaths than any single cause worldwide.<sup>1</sup> Majority of these deaths are expected to

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occur in the developing countries.<sup>2</sup> Tobacco consumption remains to be a significant health problem in South Asia where more than one quarter (25.7%) of the males who were older than 15 years smoked tobacco in the year 2000.<sup>3</sup>

In Sri Lanka and other South Asian countries, tobacco is smoked mainly as cigarettes and locally produced "bidi.<sup>4,5</sup> Betel chewing with tobacco (smokeless tobacco) is another common way of consuming tobacco in this region.<sup>6</sup>

A higher prevalence of smoking among younger age categories has been observed in India.<sup>7</sup> There were several studies carried out among school children between the ages of 11 to 18 years in Sri Lanka. The prevalence of smoking had ranged from 10% to 17% among males and 0.1% to 3% among females. The first study we reviewed was published in 1990 by Mendis et al.<sup>8</sup> The prevalence of male smoking has reduced over time in subsequent studies.<sup>9-11</sup> However, a definitive pattern in female smoking was not noticed.

Adults who started using tobacco early in life are known to be heavier smokers.<sup>12,13</sup> Therefore, it is important to emphasize prevention of smoking among schoolchildren. An understanding of the prevalence and determinants of smoking in this population is essential to develop effective preventive strategies.

#### Methods

This study was conducted in the district of Colombo, which is the capital of and the most populated district in Sri Lanka. In this district, there are both urban and rural areas, according to the classification of the Sri Lankan government. There are approximately 350 000 students studying in more than 400 schools in this district.

#### Sampling Strategy

Students from grades 10 and 12 were selected for this study. Grade 10 students were included to ensure inclusion of those with lower academic performance not proceeding to higher levels after the barrier exam in grade 11 (ordinary level). Students of grades 11 and 13 were excluded since they are preparing for their exams (GCE [General Certificate of Education] ordinary levels and GCE advanced levels respectively). Students younger than these ages were not included to avoid unnecessary exposure to information on addictive substances.

A sample of 1581 was estimated to detect a prevalence of 4.3% obtained from a previous study among schoolchildren<sup>8</sup> with 90% power and 95% confidence interval with 90% power.<sup>14</sup> We failed to obtain intracluster correlation coefficients for Sri Lanka for the calculation of the design effect. Therefore, we decided to use the number 2 as the design effect as a conservatively higher estimate. The final sample size was further inflated to 6000, based on increasing the power for the other illicit substances and accounting for nonresponse. Two-staged stratified random cluster sampling was used for recruitment. A cluster was defined as 30 students, which was the approximate number of students in a classroom in majority of the schools.

The database obtained from the Ministry of Education in Sri Lanka was used for sampling. This database used a stratification of schools based on multiple factors such as resources, number of students, number of teachers, and academic and nonacademic performance of students. Probability proportionate to size technique was used to ensure proper representation from all the strata in this classification.

Principals of selected schools were contacted through the Ministry of Education and the local education authorities to obtain permission. In addition to written information, a script, explaining the objectives and procedures of the study, was read out by one of the data collectors. Written consent of the students was obtained in separate forms.

# Data Collection Procedures

This survey was conducted in the classrooms of the students. Data collection was carried by medical doctors or third- and fourth-year medical students from the Colombo Medical Faculty. They were given a brief training in research, survey procedures, and ethics, including confidentiality in research prior to data collection.

The class teachers were asked to leave the classroom while the questionnaires were administered. To minimize underreporting, students were assured of anonymity and confidentiality. The students and school authorities were reassured that the data will not be analyzed or published at the level of individual schools. Students were instructed to avoid mentioning information that could identify them or their schools. Answer sheets were collected into unmarked, sealed boxes containing answer sheets of several schools.

# Survey Instruments

A self-administered questionnaire was developed initially in English. A group of content specialists did the face validation, and then the questionnaires were administered to a group of students for cognitive debriefing. Then the questionnaires were translated to Sinhala and Tamil languages, both by professional translators and by a group of final-year medical students proficient in English and the native languages. In the validation process, responses were back-translated to English by separate individuals, and the two English versions were compared and further adjustments were made to the Sinhala and Tamil language translates. The survey questionnaire contained 114 items, mostly in the form of multiple-choice questions and short-answer questions. It was designed to be completed in 40 minutes (1 class period). Information on currently practiced drug usage behaviors were obtained from National Dangerous Drugs Authority and the National Alcohol and Tobacco Agency of Sri Lanka. In addition, the questionnaire included items from the Center for Disease Control's Behavioral Risk Factor Surveillance Survey,<sup>15</sup> Transdisciplinary Tobacco Use Research Center,<sup>16</sup> the Global Tobacco Use Survey,<sup>17</sup> and other sources. This questionnaire also assessed the students' socioeconomic status, academic and nonacademic performance, and awareness and perception of smoking behaviors and quitting programs. Because of the large variety and volume of data obtained in this study, this article will focus only on the prevalence and correlates of tobacco smoking.

# Definitions

A lifetime smoker was defined as having smoked 1 or more complete cigarette in his or her lifetime. A student who has consumed 1 or more cigarette in the previous month was considered to be a current smoker. A smoker who has been able to abstain for more than 6 months was considered to be successful in quitting. A lifetime smoker who was not a current smoker and had not consumed cigarettes during the past 6 months was defined as an ex-smoker.

# Data Analysis

Data were entered in duplicate and cleaned. Analysis was performed using STATA version 11 (StataCorp, 2009, Stata Statistical Software: Release 11, College Station, TX). Sampling weights were adjusted to correct sampling error, which occurred because of nested data structure. Estimates of prevalence were obtained using complex survey data analysis method in STATA after declaring the survey design for the dataset.<sup>18</sup> Descriptive and demographic data were obtained using frequency analysis.  $\chi^2$  test was used to compare the prevalence between

different categorical variables. Univariate and multivariate logistic regression analysis were carried out to assess the correlates of smoking.

# Results

#### Participants

A total of 5446 students participated in the survey (response rate: 90.7%). Because of the incompleteness of questionnaires, 93 individuals were excluded from the analysis. Demographic characteristics of the respondents are shown in Table 1.

## Prevalence of Smoking

Prevalence of lifetime smoking was 27.0% for males and 13.3% for females. Prevalence patterns of tobacco smoking are summarized in Table 2. Heavy smoking, which is defined as smoking more than 20 cigarettes per day was reported only among 4 male students (0.6%) and was not reported among the females.

Out of the lifetime smokers, 32.1% of the males and 4% of the females were current smokers. All forms of tobacco smoking were seen to be higher among males (P < .001). Daily smoking was not reported among females. Exposure to passive smoking during the previous week was reported in 16.3% of the students (14.8% of the nonsmokers).

## Parental and Peer Smoking

Parental smoking was reported in 24.4% of the students (male, 26.5%; female, 22.0%; P = .014). Peer smoking (a good friend who smokes) was seen in 41.1% of the males and 7.7% of the females (P < .001). A romantic relationship with the opposite sex (girlfriend or boyfriend) was reported

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Variable <sup>a</sup>	Female	Male	Total	
Total sample	2548 (47.6)	2805 (52.4)	5353 (100)	
Grade				
10	1505 (44.2)	1898 (55.8)	3403	
12	1043 (53.5)	907 (46.5)	1950	
Age in years; mean (SD)	15.8 (1.0)	15.7 (1.0)	15.7 (1.0)	
Subjects				
Ordinary level	1536 (44.8)	1891 (55.2)	3427	
Biological science	147 (50.0)	147 (50.0)	294	
Mathematics	156 (45.1)	190 (54.9)	346	
Commerce	511 (51.0)	491 (49.0)	1002	
Arts	198 (69.7)	86 (30.3)	284	
Ethnicity				
Sinhala	2311 (48.4)	2465 (51.6)	4776	
Tamil	156 (38.1)	254 (61.9)	410	
Sri Lankan Moor	66 (48.9)	69 (51.1)	135	
Other	15 (46.9)	17 (53.1)	32	

#### Table I. Sample Characteristics.

<sup>a</sup>Number of students and the percentage (within parentheses) reported in all the variables except for age where mean and the standard deviation (SD) is reported.

-	-	
Smoking Behavior	Male <sup>a</sup>	Female <sup>a</sup>
Lifetime smoker <sup>b</sup>	27.0 (24.4, 29.6)	3.3 (  .0,  5.6)
Current smoker <sup>b</sup>	8.7 (7.0, 10.3)	0.6 (0.0, 1.1)
Ex-smoker <sup>b</sup>	18.3 (16.3, 20.4)	12.6 (10.5, 14.8)
Daily smokers <sup>b</sup>	1.8 (1.0, 2.6)	0.2 (-0.2, 0.5)
Smoked >100 cigarettes in lifetime <sup>b</sup>	2.3 (1.4, 3.3)	0.3 (-0.0, 00.6)

Table 2. Prevalence Patterns of Smoking Among Males and Females.

<sup>a</sup>Values are reported as percentages and 95% confidence intervals (within parentheses) after adjusting for complex survey design and sampling weights.

<sup>b</sup>Significantly different between males and females at P < .05.

among 42.5% of the males and in 24.8% of the females. From this group, 4.4% males reported that their girlfriends smoked, and 11.4% of the females reported that their boyfriends smoked.

## Initiation of Smoking

A total of 13 students have tried smoking for the first time even when they were younger than 8 years. However, the majority had started smoking after 14 years of age. The mean age of initiating smoking was 14.16 years (SD = 2.09) and 14.30 years (SD = 2.35) years among males and females, respectively. Percentages of smokers who started smoking at different ages are shown in Figure 1.

# Substances Used

Cigarettes were the most used tobacco product (91.5% of the smokers). Other products were used infrequently (bidi, 3.8%; cigars, 1.9%; others, 2.8%). Other forms of tobacco use were also observed. Betel chewing with tobacco was prevalent among 27.8% of the males and 10.2% of the females in this study group.

# Correlates of Smoking

Students from all the ethnic groups in Sri Lanka were included in the study. Prevalence of lifetime smoking was highest among Tamil students (odds ratio [OR] = 3.9) and Burger students



Figure 1. Percentages of students starting smoking at different ages.

(OR = 3.22). Students in the advanced-level classes who were studying in arts and commerce streams (non-science subjects) had 3.03 and 2.5 times the odds to have smoked in their lifetime, when compared with a student following the biological sciences stream (Table 3).

Having a good friend who smoked (OR = 2.87, P < .001), having a boyfriend or girlfriend who smoked (OR = 1.96, P < .001), having a parent who smoked (OR = 1.59, p < 0.001), studying nonscience subjects (OR = 1.54, P < 0.001), and being involved in a sporting activity at school level (OR = 1.44, P < 0.001) were important risk factors in the univariate analysis. Table 4 presents the results of logistic regression analyses of the different correlates for smoking. Most of the variation of lifetime smoking that is explained by commonly identified risk factors (stream of study, pocket money, parents employed in an overseas country) was explained by peer influence as seen in model 2. Parents' job, classification of schools, and ethnicity were not significantly associated with the smoking status (P > .05) when adjusted for the risk factors in Table 3.

In separate multivariate analyses, it was shown that parents' occupation, pocket money received, having parents who were employed overseas, and parents' educational level or occupation did not explain the variation of lifetime smoking or current smoking (P > 0.05) when adjusted for variables on peer influences, stream of study, and ethnicity.

#### Perception of Smoking

Majority (96%) of the respondents agreed that smoking was harmful to their health. However, 40% of the current male smokers believed that they completely avoided this risk by not inhaling the smoke into their lungs.

# Discussion

Among schoolchildren in Colombo District of Sri Lanka, we report a lifetime smoking prevalence of 27.0% in males and 13.3% in females. This is an increase from the previously reported prevalence data in Sri Lanka.

	Male (n = 2803)			Female (n = 2546)		
Variable	Smokers (%) OR		Р	Smokers (%)	OR	P
Ethnicity						
Sinhalese	26.41	I		12.00	I	
Tamil	31.58	3.87	<.001	34.21	0.573	.155
Muslim	24.12	2.02	.022	18.38	0.95	.862
Burger	52.25	3.22	.091	33.45	2.7	.064
Other	70.76	1.88	.573	17.24	5.4	.169
Stream of study						
A/L biology	18.50	I	—	7.37	I	_
A/L math	30.91	1.99	.008	11.37	1.51	.308
A/L commerce	37.84	2.5	<.001	12.56	1.9	.059
A/L arts	44.40	3.03	<.001	20.08	3.43	.001
Ordinary level	24.13	1.37	.145	13.48	1.89	.049

 Table 3. Lifetime Smoking by Ethnicity and Stream of Study, Univariate Analysis.

Abbreviations: A/L, advanced level; OR, odds ratio.

According to our data, the prevalence of male smoking has increased when compared with previous Sri Lankan studies, which have reported prevalence of male smoking ranging from 10.1% to 16.6%. However, this variation may partly be attributed to variations in conducting these studies. The sample recruited in our study is of a higher age category when compared with previous studies. In addition, limiting this study to the District of Colombo, which is the capital of Sri Lanka, may have contributed to the reporting of a higher prevalence of smoking.

The, prevalence of female smoking reported in this study is the highest recorded prevalence in Sri Lanka. The reported prevalence of 13.43% is an increase of more than 100% from the previously recorded highest prevalence, 6.1%, in the World Health Organization's country fact sheet.<sup>17</sup> An increase of this caliber is highly unlikely to be due to differences in sampling or underreporting. Thus, our findings support the observation that more and more females have taken up smoking recently.<sup>19</sup> This may be a result of the tobacco industry targeting their campaign on promoting female smoking for several years, especially in countries such as Sri Lanka.<sup>20</sup>

Heavy smoking and daily smoking were very low in prevalence (daily smoking—male, 1.8%; female, 0.2%; smoked more than 100 cigarettes—male, 2.3%; female, 0.3%) when compared with national-level data, which includes non–school-going populations.<sup>8,10,17,21</sup> Daily smoking was seen in 21% of males and 0.6% of the females in a study done among adults in Sri Lanka.<sup>22</sup> In Sri Lanka, children spend more time with parents. Smoking and consuming alcohol are considered to be socially unaccepted behaviors. Thus, children do not get opportunities to adopt heavier usage behaviors. In 2003, the Global Youth Tobacco Survey (GYTS repeat) showed that only 13.6% of the children who smoked got opportunities to smoke at their home.<sup>9</sup>

#### Correlates of Tobacco Use

Studies in developed countries have revealed that majority of the people who smoked started the habit before 18 years of age. Initial exposure at a younger age is a documented risk factor for heavier tobacco use as an adult.<sup>23-25</sup> Many factors, including home environment, income status, parental smoking, and peer pressure, have been reported to be associated with smoking among children and adolescents in other countries.<sup>12-14,26</sup> Effect of these factors may be different in Asian countries such as Sri Lanka where children are brought up in a different cultural environment.

Findings of this study point at two main categories of correlates of smoking. Peer and parental factors that include having peers or parents who smoked were significantly associated with a higher chance of the child being a smoker. In addition, studying non-science subjects in the class-room was associated with higher rate of smoking. These patterns and factors are useful to identify high-risk individuals or groups at whom intense preventive strategies can be targeted.

In most of the instances students who perform better in academic work choose to study biological science or mathematics for higher studies (advanced level) in Sri Lanka. This clustering of students with a relative low academic performance in the arts and commerce streams in advanced-level classes may contribute to the finding of higher smoking prevalence among these students. Similar trends have been observed in India in 2005 where a higher prevalence of smoking was seen among students with low academic performance, whose fathers or friends smoked tobacco.<sup>27</sup> These risk factors can be used to identify high-risk categories at whom preventive strategies can be targeted.

In Sri Lankan public schools, students of all socioeconomic strata study in the same classroom. Students are mainly evaluated on their academic performance, and better schools are provided for students with better performance. This may have contributed to the absence of a relationship between smoking and parents' occupation or other indicators of socioeconomic status. In contrast, socioeconomic determinants such as pocket money that the students received,

	All Time Smoking		Current Smoker	
Risk Factor	Adjusted Odds Ratio	Р	Adjusted Odds Ratio	Р
Model I				
Participating in school or national level sports	1.365	.053	1.651	.022
Studying a nonscience subject <sup>b</sup>	1.687	.002	1.754	.019
Pocket money received per week	1.000	.042	1.000	.025
Parents/adults smoking at home	1.731	.001	1.591	.040
Parents employed overseas	2.092	.037	1.202	.697
Involvement in extracurricular societies	1.017	.887	0.902	.510
Model 2				
A close friend smoking	3.287	<.001	6.460	<.001
Participating in school or national level sports	1.209	.293	1.312	.282
Studying a nonscience subject <sup>b</sup>	1.299	.171	1.204	.506
Pocket money received per week	1.000	.351	1.000	.285
Parents/adults smoking at home	1.865	.001	1.515	.112
Parents employed overseas	2.087	.060	0.840	.773
Involvement in extracurricular societies	1.064	.640	0.999	.996

Table 4. Logistic Regression	Model for Correlate	s of Smoking for Males <sup>.a</sup>
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<sup>a</sup>In addition to the variables mentioned in the models, age and ethnicity were used in the multivariate analysis. The results for these 2 variables are not mentioned in this table.

<sup>b</sup>Studying in commerce and arts streams.

parents' educational level, occupation are significant correlates for smoking in studies conducted elsewhere.<sup>28</sup>

In this study, we observed that having a good friend who smoked and having a girlfriend or boyfriend who smoked were the most significant correlates for smoking in schoolchildren in Colombo. This has been observed in other studies conducted in Sri Lanka<sup>29</sup> and other countries.<sup>30</sup> In addition, parental smoking remained to be a significant risk factor. Therefore, students should be equipped to resist social influences that encourage smoking. This information is extremely helpful in preventive strategies and is the basis for social influences in smoking prevention programs that are conducted in the United States.<sup>31</sup>

Self-reported data on smoking are considered to be reasonably accurate. However, the accuracy varies in different situations and sometimes depends on external influences on the participants.<sup>32</sup> In self-reporting studies on smoking, confidentiality, exact wording of the questions on smoking, as well as using biochemical markers to confirm the results have an influence on the prevalence values obtained.<sup>32</sup> However, none of the studies conducted in Sri Lanka has used biochemical markers to increase the reliability of data. This is a potential area that needs further investigation.

By requesting the teacher to leave the classroom and assuring that the data will be anonymous and confidential, we have attempted to minimize external influences and underreporting. Collecting the questionnaires in unmarked boxes and informing the students that the box already contains answer sheets from several other schools have assured the participants of their anonymity.

# Conclusions

Prevalence of smoking among schoolchildren is higher than previously published values. This increase is more among female students. Initial exposure to tobacco occurred between 13 and 16 years. Peer and parental smoking and studying in non-science streams for advanced levels were significantly associated with a higher prevalence of smoking. Students following non-science subjects are a high-risk population that can easily be isolated for interventions. This study points to the possibility of reemergence of smoking in Sri Lanka and similar countries in different forms, especially as female smoking.

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